ICAR

Kharif Agro-Advisories for Farmers 2025

भारतीय कृषि अनुसंधान परिषद्, नई दिल्ली
Indian Council of Agricultural Research, New Delhi

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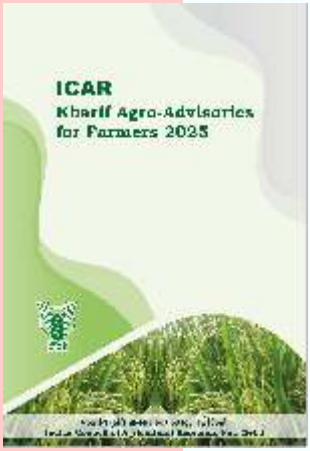

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MESSAGE

श्री शिवराज सिंह चौहान
कृषि एवं किसान कल्याण और ग्रामीण विकास मंत्री, भारत सरकार

सम्माननीय किसान भाईयों और बहनों,

हार्दिक नमस्कार!

आप सभी भली–भांति परिचित हैं कि भारत की अर्थव्यवस्था और सामाजिक संरचना की मजबूत नींव हमारी कृषि व्यवस्था है। वर्ष भर चलने वाली हमारी कृषि गतिविधियाँ अलग–अलग ऋतुओं रबी, खरीफ और जायद पर आधारित हैं, जो न केवल विविधता प्रदान करती हैं, बल्कि देश की खाद्य आवश्यकताओं को भी संतुलित रूप से पूरा करती हैं। खरीफ मौसम की फसलों की बात की जाए तो ये फसलें मुख्यतः वर्षा पर आधारित होती हैं जो खाद्य सुरक्षा, औद्योगिक कच्चे माल, निर्यात और ग्रामीण जीवनयापन में अहम योगदान देती हैं। इन फसलों की उत्पादकता बढ़ाकर हम न केवल किसानों की आय में वृद्धि कर सकते हैं, बल्कि देश की पोषण सुरक्षा को भी सुदृढ़ कर सकते हैं। हमारा देश 'विकसित भारत' के लक्ष्य की ओर तेजी से अग्रसर है। वर्ष 2047 तक भारत को एक समृद्ध, आत्मनिर्भर, नवाचार प्रेरित एवं टिकाऊ राष्ट्र के रूप में स्थापित करने के लिए कृषि का सशक्तीकरण अनिवार्य है। यह तभी संभव है जब हमारा किसान आधुनिक जानकारी, संसाधनों और बाजार तक पहुँच से सुसज्जित हो। कृषि क्षेत्र का आधुनिकीकरण एवं डिजिटलीकरण इस दिशा में एक महत्वपूर्ण कदम है।

माननीय प्रधानमंत्री श्री नरेंद्र मोदी जी के नेतृत्व में केंद्र सरकार किसानों की समृद्धि हेतु अनेक योजनाएं संचालित कर रही है, जिनमें से **प्रधानमंत्री किसान सम्मान निधि, प्रधानमंत्री फसल बीमा योजना**, राष्ट्रीय प्राकृतिक कृषि मिशन, **ई–नाम**, **राष्ट्रीय खाद्य सुरक्षा मिशन,** मृदा स्वास्थ्य कार्ड, किसान ड्रोन योजना, डिजिटल एग्रीकल्चर मिशन आदि प्रमुख हैं। इन योजनाओं के माध्यम से सरकार न केवल किसानों की आय बढ़ाने में लगी है, बल्कि कृषि को एक आत्मनिर्भर, आधुनिक और पर्यावरण–संवेदनशील क्षेत्र में रूपांतरित कर रही है।

भारतीय कृषि अनुसंधान परिषद (ICAR), कृषि विश्वविद्यालय (AUs) एवं कृषि विज्ञान केंद्र (KVKs) देश की कृषि प्रगति में अग्रणी भूमिका निभा रहे हैं। फसल सुधार, जलवायु अनुकूल किस्मों का विकास, कीट– रोग प्रबंधन, जैविक खेती, जल प्रबंधन, स्मार्ट कृषि तकनीकों तथा पशुपालन एवं मत्स्यपालन क्षेत्र में नवाचारों को किसानों तक पहुंचाने का कार्य निरंतर चल रहा है। मेरा मानना है कि **'लैब से लैंड'** तक ज्ञान को पहुंचाना, और किसानों को प्रशिक्षित करना ही देश की उत्पादन क्षमता को दोगुना करने की कुंजी है।

मुझे यह अत्यंत प्रसन्नता एवं गर्व की अनुभूति हो रही है कि खरीफ मौसम के लिए 'कृषि परामर्श पुस्तक' का विमोचन किया जा रहा है। यह पुस्तक भारत के लाखों किसानों के लिए एक बहुमूल्य मार्गदर्शिका सिद्ध होगी, जो उन्हें खरीफ फसलों की वैज्ञानिक खेती, जलवायु

आधारित निर्णय और उन्नत तकनीकों की जानकारी सुलभ रूप में प्रदान करेगी। यह प्रयास न केवल खेती को अधिक लाभकारी बनाने में मदद करेगा, बल्कि 'विकसित भारत –2047' के हमारे राष्ट्रीय संकल्प को भी सशक्त आधार प्रदान करेगा।

मैं इस महत्वपूर्ण पुस्तक के लिए इसके संपादकों, वैज्ञानिकों, विस्तार कार्यकर्ताओं एवं सभी सहभागी संस्थाओं को बधाई देता हूँ, जिन्होंने खरीफ मौसम की खेती के लिए एक उपयोगी, सरल एवं प्रभावी परामर्श गाइड तैयार की है। मुझे पूर्ण विश्वास है कि यह पुस्तक हमारे अन्नदाताओं को खरीफ फसलों की वैज्ञानिक खेती हेतु सशक्त मार्गदर्शन प्रदान करेगी, जिससे उनकी उपज, आय एवं जीवन स्तर में उत्तरोत्तर सुधार होगा।

आइए, हम सब मिलकर कृषि क्षेत्र को सशक्त बनाएं, ताकि एक समृद्ध, आत्मनिर्भर और टिकाऊ 'विकसित भारत' के सपने को साकार किया जा सके।

जय जवान, जय किसान, जय विज्ञान, जय अनुसंधान।

भारत माता की जय।

(शिवराज सिंह चौहान)

MESSAGE

श्री भागीरथ चौधरी
केंद्रीय राज्य कृषि एवं किसान कल्याण मंत्री, भारत सरकार

प्रिय कृषक भाईयों एवं बहनों,
आप सभी को सप्रेम नमस्कार !

हम सभी किसान इस तथ्य से अवगत हैं कि भारत एक कृषि प्रधान राष्ट्र है, और हमारे अन्नदाता किसान देश की अर्थव्यवस्था, खाद्य सुरक्षा और सामाजिक समरसता के सशक्त आधार हैं। आपके अधक परिश्रम और लगन के कारण भारत आज वैश्विक मंच पर एक मजबूत कृषि शक्ति के रूप में स्थापित हो चुका हैं। साथियों, हम सभी जानते हैं कि खरीफ मौसम भारतीय कृषि प्रणाली में अत्यंत महत्वपूर्ण स्थान रखता है और इस मौसम में वर्षा आधारित फसलें जैसे धान, मक्का, सोयाबीन, कपास, बाजरा, मूंगफली, उड़द, तुअर आदि बोई जाती हैं। बदलते जलवायु परिदृश्य और प्राकृतिक चुनौतियों को देखते हुए अब पारंपरिक ज्ञान के साथ वैज्ञानिक तकनीकों और आधुनिक कृषि विधियों को अपनाना समय की आवश्यकता बन गई है।

भारत सरकार किसानों की समृद्धि और कृषि के सतत विकास के लिए निरंतर प्रतिबद्ध है। माननीय प्रधानमंत्री श्री नरेंद्र मोदी के नेतृत्व में प्रारंभ की गई अनेकों योजनाओं के माध्यम से हम कृषि क्षेत्र को और अधिक आधुनिक, आत्मनिर्भर और प्रतिस्पर्धी बना रहे हैं जिसके लिए हमारे वैज्ञानिक निरंतर प्रयासशील हैं और नई–नई तकनीकें विकसित कर रहे हैं। इसी दिशा में यह खरीफ कृषि परामर्श पुस्तिका एक सराहनीय पहल है, जो किसानों को फसल चयन, उन्नत बीज, मृदा परीक्षण, संतुलित उर्वरक उपयोग, जल प्रबंधन और कीट एवं रोग नियंत्रण जैसे विषयों पर सरल और व्यावहारिक जानकारी उपलब्ध करवाएगी। यह पुस्तिका किसानों को न केवल उत्पादन बढ़ाने में मदद करेगी, बल्कि कृषि को लाभकारी और टिकाऊ बनाने की दिशा में भी मार्गदर्शक सिद्ध होगी। मैं सभी किसानों से आग्रह करता हूँ कि वे इस पुस्तिका में दी गई जानकारियों का पूरी तरह से उपयोग करें और नवीन तकनीकों को अपनाकर कृषि के विकास में भागीदार बनें।

मैं इस पुस्तिका के प्रकाशन हेतु भारतीय कृषि अनुसंधान परिषद (ICAR) कृषि वैज्ञानिकों, विषय विशेषज्ञों तथा अन्य सहयोगी संस्थानों को हार्दिक बधाई देता हूँ। मुझे पूर्ण विश्वास है कि यह प्रयास किसानों के हित में एक प्रभावी कदम साबित होगा।

आपका

(भागीरथ चौधरी)

FOREWORD

Dr. M.L. Jat
Secretary (DARE) & Director General (ICAR)

It is with great pleasure that I present the "ICAR Kharif Agro-Advisories for Farmers 2025"- a timely and comprehensive guide developed to empower India's farming community with science-based, region-specific advisories for the upcoming Kharif season. This publication marks a significant step toward strengthening climate-resilient agriculture and enhancing farm productivity across diverse agro-climatic zones.

Agriculture in India stands at a critical juncture. While it continues to serve as the backbone of rural livelihoods, it faces unprecedented challenges due to climate variability, resource degradation, pest dynamics, and market volatility. In this context, the role of timely and location-specific agro-advisories has become more crucial than ever. These advisories act as a bridge between cutting-edge agricultural research and its practical application in farmers' fields.

This publication offers practical guidance on region-based suitable varieties, nutrient management, pest and disease control, and harvesting practices tailored for major Kharif crops such as rice, maize, pulses, oilseeds, and cotton. It is the result of collaborative efforts by ICAR Institutes, Agricultural Universities, Krishi Vigyan Kendras (KVKs), and Subject Matter Experts working at the grassroots level.

At ICAR, we remain committed to the vision of a knowledge-driven, inclusive, and sustainable agricultural system. The advisories compiled herein reflect our continuous efforts to translate scientific knowledge from laboratories into actionable insights for every farmer. I urge extension officers, KVK teams, farmer producer organizations (FPOs), and progressive farmers to widely disseminate and implement the recommendations provided in this book.

I extend my heartfelt appreciation to all scientists, experts, and field professionals who have contributed to the preparation of this publication. I am confident that this agro-advisory compilation will serve as a valuable resource for farmers during upcoming Kharif season, enabling them to make informed decisions that lead to improved productivity, profitability, and sustainability.

Let us move forward together to build a resilient, prosperous, and empowered farming community #Viksit Bharat 2047.

Jai Kisan, Jai Vigyan!

(M.L. Jat)

PREFACE

Dr. Rajbir Singh
Deputy Director General (Agricultural Extension), ICAR

India's agricultural landscape is rich in diversity, yet increasingly influenced by climatic uncertainties, resource constraints, and changing socio-economic dynamics. To address these challenges effectively, there is a growing need to equip farmers with timely, localized, and scientifically validated information that enhances their decision-making capacity. This compilation "ICAR Kharif Agro-Advisories for Farmers 2025" is a well-conceived effort in this direction.

This book compiles region-specific advisories that reflect the latest research and field-level insights from ICAR institutes, Agricultural Universities, and Krishi Vigyan Kendras (KVKs) across the country. It is designed to serve as a practical guide for extension personnel, progressive farmers, farmer producer organizations (FPOs), and agri-entrepreneurs engaged in Kharif crop planning and management. The advisories encompass timely, location-specific, and scientifically backed recommendations and cover major crops, livestock, and fisheries, with a focus on improving productivity, profitability, and sustainability.

At ICAR, we believe that technology transfer and knowledge dissemination are as vital as research itself. The role of the extension system, particularly KVKs, has been pivotal in bridging the gap between research institutions and farming communities. This book is a result of collaborative efforts between research and extension systems and exemplifies our commitment to farmer-centric innovation.

I congratulate the scientists, editors, and extension professionals involved in compiling this publication. I also encourage field functionaries and stakeholders to use this resource extensively to support farmers during the Kharif season.

Let us continue to work together to transform Indian agriculture into a more resilient, productive, and sustainable sector.

(Rajbir Singh)

INTRODUCTION

Agriculture remains the cornerstone of India's economy, supporting nearly half of the population and providing employment, nutrition, and rural development. The Kharif season, spanning from June to October, is particularly vital due to its reliance on the south-west monsoon. Approximately 55% of India's net sown area is rainfed, making the timely and equitable distribution of monsoon rains crucial for agricultural success.

In 2025, the India Meteorological Department (IMD) forecasts an above-normal monsoon season, with cumulative rainfall expected at 105% of the Long Period Average (LPA) of 87 cm. The monsoon's onset is anticipated to be slightly delayed in southern India but should reach Maharashtra by May 27, facilitating timely sowing preparations. The IMD's forecast of an above-normal monsoon offers a promising outlook but still carries risks of intra-seasonal dry spells and localized flooding. The Indian government's initiatives, such as the "Panchayat Mausam Seva," aim to deliver hyper-local weather forecasts at the panchayat level, ensuring that farmers receive accurate and timely information.

The Kharif season witnesses the cultivation of a diverse array of crops across India's agro-climatic zones, including rice, maize, cotton, soybean, groundnut, bajra, jowar, tur, urad, and moong. Despite advancements in agricultural technology, the sector remains vulnerable to climatic fluctuations such as delayed rains, uneven distribution, and extreme weather events. These challenges can adversely affect crop yields, farm incomes, and rural livelihoods.

To mitigate these risks, it is imperative to provide farmers with location-specific, research-backed guidance. Agro-advisories play a pivotal role by offering timely, region-specific, science-based information on weather patterns, crop management, pest control, harvesting, and storage. These advisories integrate seasonal outlooks with crop calendars and state-wise sowing windows, enabling farmers to select appropriate crop varieties and sowing dates, optimize resource use, and prevent yield losses.

This advisory serves as a crucial tool for agricultural officers, Farmer Producer Organizations (FPOs), and NGOs involved in rural development. By bridging the information gap between research and practice, it empowers farmers with the knowledge needed to make informed decisions, thereby contributing to the vision of a self-reliant, prosperous, and inclusive India @ VIKSIT BHARAT 2047.

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Andaman & Nicobar Islands

The Andaman and Nicobar Islands have a warm, humid tropical climate with high annual rainfall and fertile loamy soils, making them well-suited for diverse agricultural activities. The climatic conditions are ideal for cultivating paddy along with plantation crops such as coconut and arecanut. Major fruit crops include banana, mango, sapota, papaya, pineapple, and citrus, while vegetables like brinjal, okra, chilli, cowpea and cucurbits, tuber crops- tapioca, sweet potato, dioscorea and elephant foot yam as well as spices-black pepper, cinnamon, turmeric and ginger are also widely grown.

CEREAL CROPS

Rice

Recommended varieties of medium duration are Dweep Dhan 1,2,3,6 and 7, Jaya, ANR-47, and Gayatri whereas long duration varieties are Dweep Dhan 4, 5 and ANR 40. Soak paddy seeds in normal water for 12-24 hours, discard the floating seeds, and use only the fully submerged seeds for sowing. It is recommended to treat seeds with Bijamrut @ 300 ml/kg seed. About 1000 m^2 nursery area is adequate for one hectare of field. Apply FYM @ 10q or vermicompost @ 5 q along with along Azospirillum @ 2 kg/1000 m^2 at 2-3 days prior to sowing in nursery. For nursery, prepare beds of 10 m × 1.25 m; apply 20-30 kg FYM per bed. Maintain a 30 cm drainage channel between beds. Sow 650-1000 g of sprouted seed per bed. Maintain saturated condition of 2-3 cm standing water 2-3 days before uprooting seedlings. Before transplanting, root dipping of seedlings with Jeevamrit @ 50 ml/L may be followed for better establishment. In main field, spacing should be maintained by 20 cm x 20 cm in ICM and 25 cm x 25 cm for SRI methods. Apply either FYM@ 2.6 t/ha or vermicompost @2.5 t/ha in the main field. Cono-weeder can be used for weeding purpose. Ensure bunds are repaired and 20-30 cm high to retain water. Use neem-based formulations (@ 0.5% or 5 ml/L) 2-3 times for pest control.

FRUIT AND VEGETABLE CROPS

Coconut

To establish a new coconut orchard, plant 12 month-old, healthy, disease-free seedlings with vigorous growth at a spacing of 7.5 m × 7.5 m in 1 m^3 pits enriched with organic matter such as compost or farmyard manure. To rejuvenate old gardens, replace unproductive palms with high-yielding varieties like Andaman Ordinary Tall, Katchal Tall, Dweep Annapurna, Dweep Harita and Dweep Sona. For the management of rhinoceros beetles, place naphthalene balls (10 g/palm) in the leaf axils and use pheromone or bio-traps to attract and control the beetles. For diseases like bud rot or stem bleeding, spray a 1% Bordeaux mixture and improve drainage conditions. Fruit crops such as banana, papaya, and pineapple; spices like cinnamon, black pepper, clove, nutmeg, ginger, and turmeric; and tuber crops like elephant foot yam are suitable for cultivation in the Islands.

Arecanut

Recommended varieties are Samrudhi and Mangala. Seedlings aged 12-18 months with five or more leaves are preferred for transplanting in the main field. Regularly remove dried leaves and maintain clean basins around the plants. Intercropping with legumes, spices, or vegetables is encouraged in young plantations to enhance income and improve soil fertility.

Select well-drained, loamy soil and prepare raised beds or ridges to prevent water stagnation due to high rainfall during the kharif season. For fruit crops, ensure planting in high and well-drained locations; use trench or pit method. Apply well-decomposed FYM @ 10-15 kg/pit before planting and mulch with organic material to retain moisture and control weeds. For vegetable crops, treat seeds with *Trichoderma viride* or *Pseudomonas fluorescens* @ 10 g/kg to avoid soil-borne diseases. Use raised nursery beds with good drainage to avoid waterlogging. Grow legumes such as cowpea or sunhemp as cover crops and incorporate them into the soil to fix atmospheric nitrogen. Ensure timely weeding and earthing-up. Use organic mulching or black polythene to conserve soil moisture and suppress weed growth. For vegetable crops, use FYM@10 t/ha, neem cake @ 100 kg/ha and vermicompost @ 5t/ha to supply proper nutrients. Monitor regularly for pests like fruit borers, whiteflies and sucking and for control use neem oil @ 5 ml/L or install pheromone and sticky traps. For fungal diseases, use copper oxychloride as per symptoms. Ensure proper drainage, especially in low-lying fields. During dry spells, provide life-saving irrigation. Harvest fruits and vegetables at proper maturity to avoid post-harvest losses and use shade nets for temporary storage.

SPICES

Black Pepper

Apply 10 kg FYM, 500 g neem cake, 500 g wood ash and 2 kg vermicompost per vine annually. Also apply biofertilizers- *Azospirillum* and phosphorus-solubilizing bacteria 20 g each per vine. Use biocontrol agents like *Trichoderma* (50 g) and *Pseudomonas fluorescens* (50 g) per vine disease control. For foliar diseases, apply 1% Bordeaux mixture and neem oil (5 ml/L of water). Incorporate coir pith compost at 1.25 t/ha to enhance soil fertility.

Cinnamon

Transfer six months old seedlings to polythene bags when they attain a height of 15 cm. Employ air layering techniques during the first week of July, using coir pith compost as a rooting medium. Apply 10 kg of FYM/plant/year and mulch with leaves to retain soil moisture. Utilize neem-based products and *Trichoderma* formulations to manage common pests and diseases.

Ginger

Prefer well-drained, loamy soils rich in organic matter for planting. Prepare raised beds of 15 cm height and 1 m width, ensuring proper drainage. Incorporate organic manures like FYM at 25-30 t/ha during bed preparation. Use healthy and disease-free rhizome for planting. Treat seed rhizomes with *Trichoderma harzianum* before planting to prevent fungal diseases. Apply neem cake at 2 t/ha and vermicompost at 5 t/ha. Also incorporate biofertilizers like *Azospirillum* and phosphate-solubilizing bacteria to enhance nutrient availability. Adopt crop rotation with legumes to break pest cycles. Use neem-based products and *Trichoderma* formulations to manage common pests and diseases.

Turmeric

Use healthy rhizomes (2000-2500 kg/ha) for planting and maintain spacing at 40 cm × 40 cm. Use *Trichoderma* for seed treatment and to control rhizome rot. Apply 20-25 t/ha of compost. Also mulch with locally available dry leaves to retain moisture and suppress weeds. Irrigate during dry spells but avoid waterlogging.

Root and Tuber Crops

Use raised beds or ridges for better drainage. Treat planting materials with Trichoderma to prevent rots. Use high-yielding varieties for sweet potato- CIARI Swarna, CIARI Aparna and Bhu Sona; for Cassava- Sree Vijaya and Sree Jaya; for elephant foot yam- Gajendra; for Taro- Mega Taro -2, Sree Kiran, Sree Pallavi and Sree Rashmi; and for dioscorea- Nicobari Alu (Traditional variety). Apply compost (10-15 t/ha) and biofertilizers like *Azospirillum* and PSB. Install pheromone traps- one trap/100 m^2 area to control sweet potato weevil.

LIVESTOCK

Follow strict bio-security measures-i) sprinkling of disinfectant solution (phenyl solution, bleaching powder and fumigation with $KMnO_4$ and formalin), ii) use of foot bath/tray at the entry of livestock/poultry shed with $KMnO_4$/phenyl/savlon at the farm. Deworm livestock/poultry and practice dipping with proper medicines suggested by the Veterinarians to prevent them from internal and external parasites infestations. Vaccinate livestock/ poultry to prevent them from diseases. Protect livestock/poultry from heavy rain and provide well ventilated shelter. Artificial heat along with dry floor space should be ensured for neonates to avoid neonatal mortality. Wound should be treated immediately with proper medication including topical application of fly repellent ointment or spray to avoid development of myiasis (maggot wound). Trimming of hooves should be done in cattle to prevent foot-rots and other complications. Provide balanced feed for livestock/poultry preferably with home-made low-cost locally available feed ingredients viz. broken rice, rice

bran, coconut cake, chunni (pulse), till cake, azolla, noni fruits, dry fish, hatchery waste etc. Store feed in a dry and cool place in order to prevent from fungus. Supplementation of Mineral mixture (@ 50g cattle) should be provided for better productivity and reproductive performance in livestock. Cultivate fodder viz. para grass, guinea grass, hybrid napier (CO-5), supper napier, sorghum etc. for ensuring proper nutrition around the year. Fodder trees like jackfruits, noni, gliricidia, moringa, sesbania etc. may be planted for higher survivability during monsoon. For poultry, litter materials should be frequently turned and mixed with lime powder and fresh saw-dust to prevent dampening and cake formation leading fungal growth. Artificial brooding should be provided to the chick's up to 4-6 weeks for healthy growth and to reduce mortality.

FISHERIES

Pre-stocking management (Pond preparation)

Prior to the onset of monsoon rains (April-May), it is advisable to desilt the fish ponds and apply agricultural lime ($CaCO_3$) to maintain water pH between 7.0 and 8.5. Adequate drainage systems should be in place to prevent overflow or contamination from runoff, and inlet-outlet structures must be fitted with screens to prevent the entry of predators or wild fish during rains.

Species selection and stocking of fingerlings

Stocking of fish fingerlings should be planned early in the kharif season (June-July) to take advantage of rising water levels. For composite fish culture, IMC (Katla, Rohu, and Mrigal) is recommended. Side by side, consider species like GIFT Tilapia, Pangasius or Magur based on the market demand. A stocking density of 4000-6000 fingerlings per ha is recommended, depending on the level of management and availability of inputs.

Post stocking management

Feeding during the monsoon should be balanced and regular. Use either commercial feed with 24-28%CP or a mixture of rice bran and oilcake. Organic manures like cow dung (500 kg/ha/month) and poultry dropping may be applied to enhance pond fertility and plankton production. Water colour should be monitored regularly, as deep green or blackish water may indicate harmful algal blooms, which can be fatal to fish. Be vigilant for symptoms of common fish diseases like bacterial gill rot, EUS, and fungal infections. Diseased fish should be isolated immediately, and disinfectants like $KMnO_4$ and salt treatment may be used under expert guidance. Harvest fish during last week of September.

Seed production

For the production of quality fish seed, healthy and disease-free broodstock aged 2-3 years should be selected and provided with a protein-rich diet (25-30% CP). Induce breeding between June to August using synthetic hormones like Ovaprim or WOVA-FH. The recommended male-to-female ratio for breeding in hapas is between 1:1 to 2:1.

CEREAL CROPS

Paddy

Varieties

North Coastal Zone: Pushkala, Srisatya, Cotton Dora Sannalu, Tarangini, Nellore Masoori, Nellore Dhanyarashi, NLR Rice 3238.

Southern Zone: Sweta, Bharani, Somasila, Nellore Masoori, Nellore Dhanyarashi, Nellore Sugandha, NLR 3238, Cotton Dora Sannalu, Tarangini, Chandra.

HAT Zone: Cotton Dora Sannalu, Tarangini, Chandra, Pushkala, Srisatya, NLR 3238.

Krishna Zone: Swarna, Indra, Amara, Krishnaveni, Varam, MTU Rice 1318, MTU 1232, Panduranga, MCM Rice 103, Samba Masoori, Akshaya, Bhavapuri Sannalu, Bapatla Masoori, Nellore Siri, Teja, Bhavathi, Sasya, BPT Rice 2841 & 2846, Maruteru Samba, Maruteru Masoori, MTU Rice 1271 & 1278, Nellore Sona, Nellore Siri, NLR 3238.

Late Nursery Transplanting: Swarna, Indra, Amara, Maruteru Masoori, MTU Rice 1318, Bapatla Masoori, Bhavapuri Sannalu, Teja, Panduranga, MCM Rice 103. BPH (Brown Plant Hopper) Infestation-Prone Areas: Krishnaveni, Indra, Amara, Maruteru Samba & Masoori, MTU 1271, Bhavapuri Sannalu, Teja, Sasya, BPT Rice 2846, Nellore Siri.

Flood-Prone Areas: Amara, Indra, Bhima, MTU Rice 1232 & 1318. *Saline Soils:* Indra, Panduranga, MCM Rice 103.

Late Planting: Cotton Dora Sannalu, Tarangini, MTU 1293, Nellore Sona, Nellore Masoori, Nellore Siri, NLR 3238.

Drought-Prone Areas: Cotton Dora Sannalu, Vijetha, Tarangini, Chandar, MTU 1293, NLR 3238.

Godavari Zone: Swarna, Indra, Amara, Bhima, Pushyami, Ksheera, Sravani, Maruteru Samba & Masoori, MTU 1212, 1280, 1281, 1293, 1310, 1321, 1318, 1232,

1271, 1275, Samba Masoori, Teja, Bhavathi, Bapatla Masoori, BPT 2841, MCM Rice 103.

Late Nursery Transplanting: Swarna, Indra, Amara, MTU 1318, Maruteru Masoori, Srikakulam Sannalu.

BPH-Prone: Krishnaveni, Indra, Amara, Pushyami, Maruteru Samba, MTU 1271, BPT 2846.

Flood-Prone Areas: Amara, Indra, Bhima, MTU 1232, 1318.

Saline Soils: Indra, Panduranga, MCM Rice 103.

Late Planting: Cotton Dora Sannalu, Tarangini, MTU 1293, Nellore Siri, NLR 3238.

Drought-Prone Areas: Cotton Dora Sannalu, Vijetha, Tarangini, Chandra, Maruteru Samba, MTU 1293, NLR 3238.

North Coastal Region: Swarna, Indra, Amara, Bhima, Pushyami, Ksheera, Sravani, Maruteru Samba, Masoori, MTU 1310, 1318, 1232, 1271, 1275, Samba Masoori, Teja, Bhavathi, Bapatla Masoori, BPT 2841, 2846, MCM Rice 103.

Late Nursery Planting: Swarna, MTU 1318, Maruteru Masoori, Srikakulam Sannalu.

BPH-Prone Areas: Vijetha, Amara, Indra, Sujatha, Pushyami, Maruteru Samba & Masoori, MTU 1271, Bapatla Masoori, BPT 2646, Nellore Siri.

Flood-Prone Areas: Srikakulam Sannalu, Indra, Bapatla Masoori, Bhima, Amara, Ksheera, MTU 1318, 1232.

Saline Soils: Indra, Panduranga, MCM Rice 103. Late Planting: Vasundhara, Cotton Dora Sannalu, Tarangini, Sridhruti, Chandra, MTU 1293, NLR 3238.

Drought-Prone Areas: Sona Masoori, Swarna, Cotton Dora Sannalu, Vijetha, Chandra, Tarangini, Sujatha, Maruteru Samba, MTU 1293.

Southern Region: Nellore Sona, Nellore Masoori, Nellore Dhanyarashi, Nellore Siri, Somasila, Bharani, Sweta, NLR 3238, Samba Masoori, Bapatla Masoori, Teja, Bhavathi, Sasya, BPT Rice-2841, BPT Rice-2846, Varam, Maruteru Samba & Maruteru Masoori, MTU Rice-1232, MTU Rice-1271, MCM Rice-103, Nandyala Sona.

Late Nursery Planting: Parthiva, Bapatla Masoori, Teja, Bhavapuri Sannalu, Maruteru Masoori.

BPH-Prone Areas: Maruteru Samba & Maruteru Masoori, MTU 1271, Bapatla Masoori, BPT 2846, Parthiva.

Saline Soils: Nellore Masoori, Panduranga, MCM Rice 103.

Late Planting: MTU 1293, NLR 3238, Nellore Masoori, Cotton Dora Sannalu, Chandara.

Scarce Rainfall Zone: Nellore Sona, Masoori, Siri, NLR 3238, Samba Masoori, BPT 2841, 2846, Varam, Maruteru Samba & Maruteru Masoori, MTU 1271, MCM Rice 103, Nandyala Sona.

Late Nursery Planting: Bapatla Masoori, Bhavapuri Sannalu, Maruteru Masoori.

BPH-Prone Areas: Maruteru Samba & Masoori, MTU Rice -1271, Bapatla Masoori, BPT Rice- 2846, Parthiva, Nandyala Sona.

Late Planting: Samba Masoori, Nandyala Sannalu, MTU Rice-1293, NLR Rice -3238, Nellore Masoori, Cotton Dora Sannalu, Chandra.

Fertilizer Application: Grow green manure crops (Dhaincha, Sunhemp, Pillipesara and Cowpea) as preceding crop to Paddy and apply soil test-based fertilizers. The entire dose of phosphorus fertilizer should be applied during the final puddling stage. In heavy soils, the full dose of potash fertilizer should be applied at the final puddling. In light soils, half the dose should be applied during puddling and the remaining half at the panicle initiation stage.

Weed Control: In wet direct-seeded rice fields, within 3-5 days of sowing, apply Pyrazosulfuron-ethyl 10% WP @ 250 g/ha or use Pretilachlor + Safener 37% EW @ 1500 ml/ha mixed with 50 kg of dry sand and broadcast evenly over the field. In transplanted paddy fields, within 3-5 days of planting, when the field has shallow standing water, apply either Pyrazosulfuron-ethyl 10% WP @ 200 g/ha mixed with 50 kg sand, or Butachlor 50% EC @ 2.5-3.12 litres/ha, or Pretilachlor 50% EC 1000 ml/ha. If the field has a heavy infestation of grassy, sedge and broadleaf weeds, use Bensulfuron Methyl 0.6% + Pretilachlor 6.0% Granules @ 10 kg/ha mixed with 50 kg sand and broadcast evenly. At 20 days after transplanting, for grassy weed control, apply Cyhalofop-P-butyl 10% EC @ 1000 ml/ha. If weed infestation is high, apply Bispyribac Sodium 10% SL @ 250 ml/ha or Triafamone + Ethoxysulfuron 30% WG at 225 g/ha in 500 liters of water.

False smut: Spraying of propiconazole@ 200ml/acre two times at booting stage and at 50% panicle emergence stage. At severe incidence of diseases spray tebuconazole + trifloxystrobin 75WG@80g/acre.

Bacterial leaf blight: Affected stubbles are to be destroyed by burning or through ploughing, judicious use of nitrogenous fertilizers, avoid clipping of tip of seedling at the time of transplanting. Avoid flooded conditions or drying of the field (not at the time of flowering). Application of potassium two time @ 15 kg/acre at planting time and 20 kg/acre at panicle initiation stage.

Trap Barrier System (TBS): Erect 2 ft height polythene sheet barrier around the crop at 15 days after transplanting. The polythene barrier is provided with 3 inch radius holes above the water level at 15-30 m distance and wonder traps are arranged firmly inside the crop, their entry mouths matching the holes made in the polythene sheet. Arrange a soil moat before the entry hole to facilitate the animal to enter easily inside the trap. Maintain water around the TBS and collect the successful traps every day and replace with new / emptied traps.

Precautions during natural calamities: If the crop is submerged in water for more than 1 to 2 days in the boot leaf or flowering stage, the panicle exertion may be incomplete. Water accumulation in the spikelets, would also result in reduced fertilization and formation of chaffy seeds. Spraying with Carbendiazim @ 1g/L or Carbendiazim + Mancozeb @ 2g/L or Propiconazole @1ml/L is recommended to avoid discoloration of grains. If the harvested sheaves in the field are drenched, 5% salt solution should be sprayed on the sheaves to prevent seed germination. The sheaves should be turned over, dried and threshed after cessation of the rains. In

case of stormy weather conditions, while heaping of incompletely dried paddy sheaves, 25 kg of salt per acre of paddy sheaves may be sprinkled and heaped to avoid damage.

Maize

In normal conditions, rainfed crop should be sown between June 15 and July 15. In the Kharif season, under rainfed conditions, maize should be sown only after a substantial rainfall (more than 50 mm). Seed rate is 17.5-20 kg/ha for normal hybrids, 7.5-10 kg/ha for sweetcorn, 12.5 kg/ha for popcorn and 25 kg/ha for baby corn. Within two to three days after sowing the crop, spray Atrazine herbicide @ 2 kg/ha in light soils and 3 kg/ha in heavy soils mixed with 500 liters of water when there is sufficient moisture which helps in controlling broadleaved and some grassy weeds for about 30 DAS. To control broadleaved and grassy weeds in normal and zero tillage maize crop at 15-18 DAS or 4 leaf weed stage, Tembotrione 34.4% SC @ 287.5 ml/ha + Atrazine 50% WP @ 1000 g/ha or Topramezone 33.6% SC 75 ml + Atrazine 50% WP @ 1000 g/ha should be sprayed. If the problem of *Cyperus spp.* is more, spray Halosulfuron methyl @ 100 g/ha mixed with 500 L of water.

Fall army worm: Summer ploughing, collection & destruction of egg masses, installation of pheromone traps (*S. frugiperda*) @ 4/acre sowing of border crop with grain sorghum & inter crop with cowpea (few rows) spraying of Azadirachtin 10000 ppm @ 2ml/l (10 to 15 DAS), EPN or Bt spray @ 2 ml/l (15 to 21 DAS). First insecticide spray - Emamectin Benzoate 5SG @ 0.4g/l (or) Spinosad 480SC @ 0.5 ml/l (21-28 DAS). Metarhizium anisopliae spray (1x107) @ 2 ml/l (30 -35DAS). Second Insecticide spray - Flubendiamide 480SC @ 0.3 ml/l (or) Chlorontriliniprole 18.5SC @ 0.3ml/l or Spinetoram 11.7 SC @ 0.3 ml/l (36 - 42 DAS). Poison Baiting - 45-65 DAS using Thiodicarb 75WP (250 g thiodicardb + 25kg rice bran + 5 kg jaggery / ha).

OILSEED CROPS

Groundnut

Farmers are advised to take up summer ploughing and also suggested to select high yielding varieties like TCGS 1694, K-Chitravathi, K-Lepakshi. The suitable time for sowing of rainfed groundnut is July to first week of August. Farmers are advised to adopt intercropping with redgram at 7:1/11:1/15:1 ratio as per their convenience and availability of sowing equipment. Use fertilizer cum seed drill instead of manual labour for sowing behind the country plough. Formation of conservation furrows every 3.6m interval at sowing/20-30 days after sowing will help in soil moisture conservation.

Farmers are also suggested to follow seed treatment with imidacloprid 600 FS @ 1ml per kg seed and followed by tebuconazole 2 DS @ 1g or mancozeb @ 3 g/kg or *Trichoderma viride* @ 10g/kg seed. Take up sowing of bajra/jowar (4-8 rows) as border crops all around the field to avoid transmission of vectors like thrips which spread PSND/PBND diseases. Spray KNO_3 @ 0.5% or 19:19:19 immediately after dry spell. Provide supplemental irrigation 20mm at flowering and peg penetration stage. Install sticky traps (10/acre) and pheromone traps (4/acre) in field to monitor

sucking and leaf eating pests. Intensity of infestation to spray imidacloprid 17.8 SL @ 0.3 ml/l of water for the control of sucking pests at ETL. Install bird perches (4/acre for collection and destruction of egg, larval populations by nesting birds). Spray quinalphos @ 2.0 ml and neem oil @ 5 ml/L of water at initial stages and at later stages. Spray emamectin benzoate 5% SG @ 0.4 g/l of water. Spray 2 g Chlorothalonil or 2 ml. Hexaconazole or 1 ml. Tebuconazole per liter of water for control of Tikka leaf spot and spray twice at an interval of 15 days. Spray Monocrotophos 1.6 ml or Fipronil 2 ml or Dimethoate 2 ml/L of water for control of peanut bud necrosis virus. To prevent this pest, treat the seeds with 2 ml imidacloprid 600 FS per kg of seed for the next crop.

Castor

Select high yielding varieties such as Haritha, Kiran, Jwala, Pragathi and hybrids i.e DCH. 117, PCH-111, GCH.8, ICH.66 and ICH 5. Optimum sowing time for castor is June 15th to July 31st Seed rate of castor is 2-2.5 kg/acre and to fallow spacing 90 cm x 60 cm and suggested to take up thinning and remove excess population @ 10-15 DAS by retaining one seedling per hill and maintaining the optimum plant population. Farmers are advised to utilizing the available soil moisture and take up top dressing of urea @13 kg /acre at 30 to 35, 60 to 65 and for hybrids apply additional dose of urea @ 13 kg/acre at 90 to 95 days under sufficient soil moisture condition.

Sesamum

Farmers are advised to take up sowings during II FN of May and high yielding varieties like Sarada, Goutham, Varaha, Madhavi, and Gowri can be taken up. 2 kg of seeds per acre should be sown in rows mixed with sand or sawdust in equal proportions. Farmers are advised to do treat sesame seeds with 3 g of Carbendazim/Mancozeb per kg of seed. This will prevent leaf spot, root rot and stem rot. Sesame farmers should apply fertilizers that supply 16 kg of nitrogen, 8 kg of phosphorus, and 8 kg of potash per acre. Farmers are advised to spray Pendimethalin 30% @ 4-5 ml per litre of water to control weeds immediately after sowing in sesamum.

Sunflower

Farmers are advised to choose high-yielding hybrid sunflower such as NDSH-1012, LSFH-171, DRSH-1 and KBSH-44. Farmers are advised to take up intercrops such as groundnut and redgram (Sunflower: Groundnut-2:4 ratio) (Sunflower: redgram- 2:1 ratio). Farmers are advised to treat the seed with Iprodione 25% + Carbendazim 25%) or Fluxapyroxad FS @ 1.5 g/kg or Saaf (Carbendazim 12% + Mancozeb 63%) @ 2 g/kg for controlling alternaria leaf spot. In areas prone to necrosis virus in sunflower, treat seeds with Thiamethoxam (Cruiser) @ 4 g/kg or Imidacloprid (Gaucho) @ 5 g/kg. Farmers are advised to apply (26 kg urea) at sowing, 13 kg at 30 days during the bud stage, and 13 kg at 50 days during flowering. Apply the full dose of phosphorus (150 kg SSP) and potash (20 kg MOP) during the final ploughing. In sulphur-deficient soils, apply 10 kg sulphur per acre in gypsum form (55 kg/acre) to improve oil content and yield. If boron deficiency is noticed in sunflower, spray 2 g of borax per litre of water using 200 litre per acre.

PULSE CROPS

Pigeonpea

High yielding varieties: Laxmi, LRG-41, WRG-27, WRG-53, LRG-105, LRG-133-33

Sow early maturing varieties in first fortnight of June while medium & late maturing varieties should be sown in second fortnight of June in lines by seed drill or desi plough or by dibbling on the ridge and beds. The seeding rate of pigeon pea depends on the desired plant density for a genotype (early, medium or late), cropping system (pure crop, mixed crop, or inter crop), germination rate of seed and mass of seed. Early maturing varieties: 20-25 kg/ha (Row to Row-45-60 cm & Plant to Plant-10-15 cm). Medium/Late maturing varieties:15-20 kg/ha (Row to Row- 60-75 & Plant to Plant-15-20 cm). Treat the seeds with imidacloprid @ 8 ml/Thioethyl 10 ml/kg seed and *Rhizobium* 10 ml/kg seed. Use sterility mosaic tolerant variety like 1CPL 87119, BSMR 853, 736, TRG 59, LRG 105. Apply 25-30 kg N, 40-50 kg P_2O_5, 30 kg K_2O per ha area as Basal dose at the time of sowing. Being a deep-rooted crop, it can tolerate drought. But in case of prolonged drought there is need of three irrigations 1st at branching stage (30 DAS) 2nd one in flowering stage (70 DAS) and 3rd at the time of podding stage (110 DAS). Two mechanical weedings one at 20-25 days and another at 45-50 days after sowing but before flowering. Pre-emergence application of Pendimethalin @0.75-1 kg a.i./ha in 400-600 litre of water.

Bengalgram

Cultivate wilt resistant Bengal gram varieties Nandyala gram 776, Nandyala gram 857, 1267, Nandyala gram 452, Nandyala gram 119. Dates of Sowings from October 15th to 15th November during rabi season. Use of optimum seed rate: 85-90 kg/ha (desi); 100-110 kg/ha (kabuli); 130-150 kg/ha (Extra-large seed kabuli). Seed treatment with *Trichoderma* viride (8 g/kg) and captan or thiram 2.5 g or carbendazim 3 g or tebuconazole 1.5 g/kg seed. Basal application of fertilizers: 20 kg N, 50 kg P_2O_5, 40 kg S/ha. Timely weed control: manual weeding or inter culture operations or spray pendimethalin at 2.5 to 3.5 L/ha immediately after sowing or the next day to check the weed growth for the first 20-25 days. Irrigations: Light irrigation at 30-35 days after sowing will increase the yield. Foliar nutrition of KNO_3 @ 5 g/l twice during dry spells and also in saline soils. Adoption of Integrated pest disease management practices for *Helicoverpa* pod borer, wilt and dry root Rot.

Blackgram and Greengram

Cultivate YMV resistant/ tolerant greengram varieties LGG 607, LGG 630, LGG 460, LGG 450, WGG 42, IPM-2-19 and blackgram varieties LBG 884, LBG 932, LBG 904, TBG 104, PU 31, GBG 1, TBG 129. Optimum sowing time second fortnight of June to second fortnight of July subject to availability of moisture/rainfall. Seed rate 15-16 kg/ha for greengram and 18-20 kg/ha for blackgram. Treat the seeds with Carbendazim or Mancozeb @ 2.5 g/kg and Imidacloprid 600 FS @ 5 ml/kg or Thiamethoxam 70 WS @ 5 g/kg of seed 24 hours before sowing. Treat the seeds with biocontrol agents viz., *Trichoderma* viride @ 8-10 g/kg seed. Apply fertilizers basally before sowing. Rainfed: 8 kg N + 20 kg P_2O_5 + K_2O/Ac and Irrigated: 25 kg N + 50 kg P_2O_5 + 25 kg K_2O. Hand weeding at 20-25 days after sowing or keep the crop weed free up to 50 days after sowing. Flowering and pod formation stages are critical periods when irrigation is a

must. Avoid water stagnation at all stages. Apply KNO_3 or 19:19:19 @ 1.0 per cent as foliar spray to mitigate moisture stress. To correct iron deficiency, spray $FeSO_4$ @ 0.5 per cent twice at 7-10 days interval.

COMMERCIAL CROPS

Cotton

Sowing during June to mid-July in red soils and July to mid-August in black soils. Avoid light red soils without irrigation facilities. Sowing Non-*Bt* cotton/redgram around the Bt cotton as refugee crop to avoid build-up of resistance against bollworms. Use of pre-emergence herbicide Pendimethaline @ l L/acre immediately after sowing and post emergence herbicides Quizalofop-p ethyl 400ml+ Pyrthioback sodium 200 ml/acre at 25-30 DAS. Use mechanical weeders at early stages of crop. Adopt drip irrigation for higher yield and water saving. Spraying 10 g $MgSO_4$/l to manage Mg deficiency at 45 and 70 DAS. Spray 2 g of $ZnSO_4$/l 2-3 times at 5-6 days interval to manage Zn deficiency. Applying 20 kg $ZnSO_4$ per acre in soil once in three years. Spray 1-1.5 g borax/l at 60-90 DAS twice at weekly intervals to manage boron deficiency. Spray 2 % urea or 1 % 19:19:19 or 20:20:20 or 21:21:21 or 13-0-45 (KNO_3) to manage drought or stress conditions. Under submergence due to excess rains, drain the excess water at the earliest, apply 20+10 kg N and K/ha, loosen soil, spray 1 % KNO_3 or 19:19:19 or 20:20:20 or 21:21:21. Drenching of affected plants/rows with a mixture of Copper oxychloride 25 g + 200 g Urea in 10 liters of water immediately after occurrence of Parawilt within 48 h can revive the plants. Use yellow and blue sticky traps @ 10 /acre to control the sucking pests. Foliar application of Salicylic acid/ phytohormones - Salicylic acid improves photosynthetic capacity, promote root architecture and enhance plant defence mechanisms, stress tolerance, and overall growth. Using Drone: Spray Salicylic acid @ 6.9 g dissolved in 300 ml of ethyl alcohol and then added into 20 litres of water for spraying of one acre at 5 days after waterlogging. Three days after salicylic acid application, spray KNO_3 (13:0:45) @ 400 g of dissolved in 20 liters of water through drone. Knapsack sprayer: Spray Salicylic acid @ 6.9 g dissolved in 300 ml of ethyl alcohol and then added into 200 litres of water for spraying of one acre at 5 days after waterlogging followed by 2 % of KNO_3 (13:0:45) after three days of salicylic acid application.

Sugarcane

Varieties

Early maturing: 84A 125, 87A 298, 86V 96, 2003V 46, 93A 145, 97A 85, 2001 A63, 2003A 255, 2009V 127 (Ranga), 2005T 16, 2009A 107 and 2012A 319.

Mid-late maturing: CoT 8201, CoA 7602, Co 7805, 98 A 163, 2000 A 225 and 2009A252. Late maturing: Co 7219.

Moisture stress: Co T 8201, 87 A 298, 97 A 85, Co 7219, Co A 7602, 98A 163 and 2005T16.

Saline - Alkaline soils: CoT 8201, Co 7219, 97A 85, 93A 145, 99 V 30, 2005T 16, 2003V 46, 2009V 127, 2009A 107 and 2009A 252.

Water logging: CoT 8201, Co 7805, 87A 298, 93A 145, 2003V 46, 2009V 127, 2009A 107 and 2009A 252.

Seed rate and treatment: 16,000 three budded setts (4 t) per acre. Seed from short crop of 6-7 months age ensures good germination and improve cane yield by 2-3 t/acre. Dip the setts in carbendazim (0.5 g/L) or dimethoate (2ml/L) or imidacloprid 48% FS @ 1 ml/L for 15 minutes to eliminate pineapple disease and scale insect.

Spacing: 80 cm between rows for early varieties and 90 cm for mid-late varieties. Adopt paired row planting (60cm x 120/150 cm) to promote mechanization and drip irrigation.

Fertilizer management: Farm yard manure @ 10 tonnes or dry press mud cake @ 5.0 tonnes or vermicompost @ 1.0 t/acre is to be applied in the last ploughing. Apply Phosphorus @ 40 kg and Potassium @ 48 kg per acre are to be applied as basal at the time of planting. Nitrogen @ 67kg / acre (pocket application) is to be applied in two equal split doses at 45 and 90 days after planting. Spray Zinc sulphate (2 g/L) and Ferrous sulphate (10-20 g/L at 45-60 days after planting where zinc and iron deficiencies are observed. Apply biofertilizers like *Azatobactor* (4kg/acre), *Azospirillum* (4kg/acre) saves nitrogen to an extent of 25%. Use of phospho bacteria (4kg /acre) and VAM (5kg /acre) saves phosphorus to an extent of 20 to 25%, use of potassium releasing bacteria (4 kg/acre) saves K^20 to an extent of 25%.

Drip fertigation: Supply of recommended N&K fertilizers through drip fertigation in the form of Urea and muriate of potash (white potash) in 20 splits at weekly interval commencing from 30 DAP to 180 DAP is to be done to improve fertilizer use efficiency.

Weed management: Spray Atrazine @ 2 kg/acre or metribuzine @ 600 g/acre in 200 L of water on the third or fourth day after planting, depending on soil moisture.

Irrigation: Once in six days during summer and once in 15-21 days from November to harvest. During grand growth period, irrigation is to be provided when dry spell exceeds 15 days. If, only one irrigation is possible during formative phase, it is to be given at 30 days after planting and trash mulching is to be done three days after planting @ 1.25 t/acre. Treat the setts with propiconazole (1 ml/L) or hexaconazole (2ml/L) for 15 minutes before planting the susceptible varieties like 87A 298, Co 6907.

MILLETS

Jowar

Use high yielding varieties like N-15 and NTJ 5 with seed rate of 3-4 kg/acre. Treat the seeds with Thiomethoxam @ 3 g /kg of seed to control sorghum shoot fly. Follow 1:2 ratio of jowar+ redgram intercropping. Intercropping of sorghum reduces wilt incidence in pigeonpea. Hence, the pigeonpea growth bearing and productivity will be enhanced and the farmers realize the economic returns from red gram. Apply 32-40 kg nitrogen, 24 kg phosphorus and 16 kg potash/ acre under irrigated conditions. Apply 24-32 kg nitrogen, 16 kg phosphorus and 12 kg potash/ acre under rainfed conditions. Spray ammonium sulfate @ 50g/L or urea @ 200g/L or 2,4-D sodium salt @ 2g/L of water for against striga.

Bajra

Use high yielding varieties like A.B.V.04, I.C.M.V. 221, I.C.M.V. 155, Raj 171 and PC 612. The seed rate of bajra @1.6 kg/acre and follow spacing of 45 cm x 15 cm. The seed should be soaked in 2% salt water solution for ten minutes and remove the inert material that floats on top of the solution. After drying, treat the seed with metalaxyl @ 6g/kg seed. Farmers are suggested to take up intercropping of Bajra: Redgram/ Groundnut in 2:1 ratio.

Finger Millet

Cultivate blast tolerant varieties like Vegavathi, CFMV 4, Indravathi, Suvarnamuki and Gosthani. Take up intercropping of ragi and redgram 8:2 ratio and Ragi: field bean 8:1 ratio.

Foxtail millet

Crops like jowar, bajra, foxtail millet and pulses viz., greengram, balckgram, horsegram, cowpea, field bean are used as contingency corps after July month due to delay in monsoon if at all. In chickpea areas, farmers are advised to take up foxtail millet as a preceding crop to chickpea. Where foxtail millet is grown during Kharif and chickpea during Rabi. Farmers are advised to cultivate high yielding varieties of foxtail millet like SIA 3156, renadu, mahanandi and garuda. Short duration Foxtail millet variety like SIA 3222 (Garuda) may be sown as preceding crop in rainfed black soils instead of keeping fallow.

Little millet

Farmers are advised to cultivate varieties of little millet like BL 6, DHLM 36-3 and OLM 203 for higher productivity.

FRUIT & VEGETABLE CROPS

Cashew

Prune during June-July and ploughing in bearing orchards.

Coconut

Cultivate turmeric, ginger, yam, colacasia, seasonal vegetables, pulses and ground nut in young gardens of below 5 years age. Plant cocoa, banana, pepper, pineapple, papaya, heliconia as intercrops in old and bearing gardens.

Oilpalm

Cultivate vegetables, dwarf banana varieties, flower crops, chilli, ginger, turmeric, pineapple as intercrops in young garden and cocoa and pepper in old and bearing gardens. Use of harvesting poles can reduce labour use. Timely harvesting of matured bunches to avoid damage due to kharif rains.

Mango

Installation of pheromone traps @12 per hectare to manage fruit fly. Mango orchards should be irrigated and rest should be allowed for 50 days after harvest. Basins should be dusted with Methyl Parathion dust. Prune crisscross and dried branches and left over fruit stalks during June-July, followed by spray 1% Bordeaux mixture. Fertilisers should be applied as per the leaf analysis i.e. trees more than 10 years age and in full bearing should be applied with N P and K @1 kg each (2.2 kg Urea, 1.6 kg

MOP and 6 kg SSP) in basins 1.5 to 2 m distance from the main trunk. Micro nutrient deficiencies can be controlled by spraying 5 g Zinc Sulphate+2.5 g Ferrous Sulphate+ 2 g Borax+ 2 g Calcium Sulphate + 3 g Magnesium Sulphate 3 times per year in the months of June/July, September/October and December/January.

Acid lime

Sow green manure crops in the interspaces after receiving first rain and incorporate at 50% flowering. Spray micronutrient on newly emerged vegetative flush. Apply copper oxychloride @ 30g+Streptocycline@ 1g in 10 L of water to control citrus bacterial canker. Apply cartap hydrochloride@ 1g/L after emergence of new vegetative flush to control leaf miner damage and spray carbendazim@ 1g/L to control gummosis.

Banana

Procure healthy planting material from virus free fields, treat the sucker with Mancozeb (3g/l) and Dimethoate @ 2ml/L, apply *Trichoderma viride*@ (5 kg) + FYM @ 100 kg while planting. Green manure crops to be incorporated. Fertilizer application should be taken up after 40 days of planting in Grand Naine variety @ 110 g Urea and 80 g MOP per plant applied in 10 cm trench on both sides of the plant.

Tomato

Raise the nursery during May-June with hybrids Arka Abhed, Arka Samrat and Arka Rakshak in pro-tray to prevent damping off diseases. Seed rate for hybrids is 60-80 g/ acre and varieties is 200 g/acre. Treat the seed with Imidacloprid @ 5 g/kg to prevent sucking pests. Apply *Trichoderma viride* @ 5kg/ha and *Pseudomonas fluorescence* @ 5kg/ha in soil after curing with 225kg FYM and 25kg Neem cake to manage soil borne diseases and nematode. Install pheromone traps @ 25/ha to manage South American Pin worm.

Brinjal

Raise the nursery during May-June with varieties Arka Anand and VNR-51 in protray to prevent damping off diseases. Seed rate for hybrids is 120 g/ acre and for varieties 260 g/acre. Treat the seed with Imidacloprid @ 5 g/kg to prevent sucking pests. Apply *Trichoderma viride* @ 5kg/ha and *Pseudomonas fluorescence* @ 5kg/ha after curing with 225kg FYM and 25kg neem cake to manage soil borne disease and nematode. Install pheromone traps @ 25/ha to manage shoot and fruit borer. Apply Arka Microbial Consortium @ 12.5kg/ha along with 25 t FYM/ha and 75% RDF (75:45:100 kg N:P_2O_5:K_2O/ ha).

Turmeric and Yam

Treat the seed material with Mancozeb (3g/l) and Imidacloprid @ 1ml/l and grow on ridges to avoid rhizome rot/ collar rot. Apply *Trichoderma viride* (5 kg)+ FYM (100 kg) culture at the time of planting.

LIVESTOCK

Dairy Farming

Dairy Calves: Ensure timely colostrum feeding, adequate milk supply, and deworming to prevent neonatal mortality.

Heifers & Dairy Animals: Provide mineral supplementation, hormonal interventions for repeat breeding, and manage endometritis to improve reproductive efficiency.

Dairy Buffaloes: Promote clean milking practices, calcium supplementation to prevent milk fever, and strategies to avoid ketosis and ruminal acidosis.

Fodder Supply: Promote high-yielding fodder varieties, use crop residues, and implement silage making to combat fodder shortages. Provide green fodder during the day and roughages at night to manage heat stress.

Sheep Farming

Breeding Stock: Replace non-descriptive breeds with the Macherla breed, which is well-adapted to local conditions.

Young Lamb Management: Ensure colostrum feeding, deworming, and timely vaccinations to improve lamb health and reduce mortality.

Supplementary Feeding & Genetic Diversity: Provide supplementary feeding during pregnancy and exchange rams for improved genetic diversity.

Backyard Poultry Farming

Breed Improvement: Replace native low-productive breeds with high-performance breeds like Rajasri and Gramapriya.

Feeding Strategies: Promote Azolla cultivation as a cost-effective, high-protein feed supplement and use locally available feed ingredients to cut costs.

Health & Disease Control: Implement regular vaccination and deworming schedules and provide practical training on poultry health management.

Housing & Welfare: Use low-cost, secure enclosures for bird safety, and improve transportation practices to reduce stress.

Swine Farming

Breed Improvement: Replace non-descriptive breeds with the SVVU T-17 breed to enhance productivity.

Feeding Strategy: Avoid feeding swill and provide balanced concentrate feed to improve reproductive performance.

Stage-Based Feeding: Implement a feeding strategy based on the pig's life stages for optimal growth.

Health Management: Ensure regular deworming and vaccination schedules, and administer iron dextran injections to piglets to reduce mortality.

FARM MACHINERY & TOOLS

Agricultural Crops

Sub soiler results cutting soil strata up to a depth of 40 to 75 cm and creates more space for rain water entry and storage. In-situ water conservation and to sustain crop in prolonged dry spell. Easily operated by any 35 to 45 hp tractor. It is useful in dryland agricultural crops. Use Trampler for green manure mixing, it cuts and presses green manure leaves into the soil, helping them decompose efficiently and

enrich the soil. Tractor operated FYM Pulverizer cum spreader is useful for FYM application in the field without any labour. It covers up to 10 to 12 acres per day. Cost of the implement is Rs. 76000/-.

DSR with Seed cum fertilizer drill increases 14% higher yields compared to traditional transplanting. Crops matured 7-10 days earlier. Farmers saved on 12 men labour and 25 women labour per hectare leading to a 17 % reduction in cost of cultivation. Tractor drawn Ananta groundnut planter (8 rows) is used for groundnut sowing. The intercrops of redgram or castor can also be sown with this implement. It covers 6 to 7 ha per day. For small and marginal farmers, use Handpush seed drill in light soils for Maize, Castor, Redgram, Cowpea, field bean and other bold seeded crops and in heavy soils on ridges sowing should be done for better crop stand establishment. Motor-Operated Groundnut Sheller is capable of shelling 25 to 250 kg of pods per hour. The distance between the seed drum and the concave can be adjusted according to pod size for efficient shelling. Powered by a 1 or 2 HP motor/engine depending on size. Use cono weeders for Drum seeder/transplanted rice in wet conditions. Power weeders help in upland rice systems or DSR & Early-stage weeding (15 to 30 DAS) is crucial for effective control. Self-propelled Weeder in paddy fields is operated by a 3 to 5 HP diesel engine, it can cover 0.15-0.25 acres per hour at low speed. & with a 5 to 6.5 HP engine, it can cover up to 1 acre per hour. Cost of cultivation is Rs.52,000 to Rs.56,000/ ha.

Rain pipe irrigation system is effortless to install, reallocate and reduce the consumption of energy and water by more than 50 percent. These pipes are light weight, portable and flexible. Works on low water pressure. Expected life for 3 to 5 Years. Solar Fence system is used to control Wild boars a major problem in groundnut, paddy, maize and other crops. The solar fence cost varies from Rs. 15,000 to 25,000 by different companies like Pavani Solar systems, Nellore (Mobile numbers: 9848582332 & 9440171938) and Krupa Solar fence, Hyderabad. This unit protects 5 acres field. Use Acoustics (Sound emitting machinery) to repel the Birds, Wild boars, Monkeys etc., in crops like Groundnut, Sunflower, Maize, jowar etc. Use Bird scarer to repel the birds in the fields. The implement will create sound by rotating fan when natural air occurs. The cost is Rs.800/-. Straw Baling Machine is used to bundle paddy straw into either round or square/rectangular shapes for easy handling and transport. ANGRAU blade guntaka (Groundnut Digger) separates groundnut pods from the soil efficiently without wasting time. Built to dig up to 30 cm depth and can harvest up to 1 acre per hour.

Groundnut Digger, shaker cum Windower digs plants up to about 25 cm depth, shakes off the soil, and arranges the plants into windrows behind the machine. Cost: Rs.1,68,000/-. Groundnut Stripper separates pods from the plant by using a 1 to 3 HP motor. Requires two labour. Capacity: 100-125 kg per hour. Tractor operated pit digger for sugarcane planting will dig pits 250 to 300 holes per hour with a diameter of 90 cm. Cost is Rs.1,20,000. Cutting sugarcane sett with single bud by Sugarcane sett cutter. Capacity about 1500 setts per hour and Cost of the implement is Rs.5000/-. Damage is less when compared to manual cutting. Sugarcane detrasher can be used for detrashing. Easy for handling and detrashing, reduces the labour

requirement and Cost of the implement is Rs.1200/-. Cotton Picker mechanically plucks open cotton bolls from the plant without damaging the fiber. Used in large-scale operations.

Fruit Crops

Secateurs are used during June to August for pruning mango branches lesser than 1 inch thickness and for removing dry twigs. Cost of the falcon company implement is Rs. 450. Loppers are used during June to August for pruning mango branches and dry twigs less than 3 inches thickness. Cost of the falcon company implement is Rs. 1500. Mango harvester is used to harvest mangoes without damaging the fruits. Cost of the implement is Rs. 3150. Banana bunch cutter is used to harvest banana bunches. Coconut climbing cycles are used to easily climb coconut trees for harvesting coconuts and fronds and for pest and disease management. Cost of the implement is Rs. 3500/-. Coconut dehusker is used to remove the husk from coconut shells. Cost of the implement is Rs. 950. Oil palm harvester is used to harvest oil palm bunches, bring them down, and load them into a tractor.

Livestock

A milking machine is beneficial for farmers with more than 4-5 dairy cows as it extracts milk 3-4 times faster than manual milking and reduces physical labour. Farmers rearing more than 30-50 backyard poultry birds can use a vaccinator to administer the specified dose of vaccine in a very short time. When raising backyard poultry birds in large numbers, de-beaking with the help of a debeaker is a good management practice to reduce pecking. With the help of a duplex poultry shed, 10 - 15 chickens can be kept in a protective shelter providing with integrated feed and protection, and manage very easily at very low cost.

Drone Technology

Spraying of pesticides through Drones reduces time and cost of application and it is the Measure against labour scarcity. In Paddy, Maize, Jowar, Groundnut, Bengalgram, Chilli crops, this technology is already proved effective. An Acre can be sprayed with 10 litres capacity of Drone in 6-10 minutes.

ENTERPRISES

Adopt secondary agriculture through value addition to primary agriculture for enhancing farm income and sustainable rural livelihoods. Agripreneurship promotion through farm mechanization, crop diversification, processing, value addition, organic farming. Take up Agro based enterprises such as commercial horticulture, cultivation of high value crops, animal husbandry, fisheries, poultry, and Mushroom cultivation for doubling farm income. Setting up of Agro produce processing units like Mini dhal mills, Rice Mills and decorticating mills for promotion of agripreneuship among rural youth & women. Value addition of agriculture producing through Agro produce manufacturing units such as preparation of millet value added products, bakery products, ready to cook products, ready to eat products and nutraceuticals. Entrepreneurship by agro- input manufacturing units such as production of organic manures, fertilizers, agricultural inputs, vermin compost units, Bio fertilizers and agricultural implements. Establishments and

sunning of custom hiring centers, agro service centers, vegetable and fruit retail outlets. Organic certification for organic products and FSSAI Registration for value added products. Grading, packing, labeling for enhancing shelf life and marketing of value-added products. Marketing of products through FPOs, SHGs, and commodity interest Groups.

ICT TOOLS

ANGRAU ATARI CFLD: Mobile application provides complete information on Crop Production, Varietal, Crop Protection and Marketing information on Oilseed's and Pulse crops on Smartphone. In addition, it provides other useful in formation and useful apps in agriculture and allied sectors and connecting with experts.

ANGRAU Pashu Poshan: The ANGRAU Pashu Poshan application serves as a comprehensive resource for all aspects related to animal husbandry. This app is designed to provide farmers and livestock enthusiasts with valuable insights into various practices and techniques essential for the successful management and breeding of animals.

Fertilizer Calculator: This app covers complete nutrient management of major crops in agriculture and vegetable crops like chilli and onion. It totally covers 21 crops.

Meghdoot IMD: The app seamlessly aggregates contextualised district and crop wise advisories issued by Agro Met Field Units every Tuesday and Friday with the forecast and historic weather information to farmers in local vernacular.

Vyavasaya Vatavaranam: App designed to provide farmers with accurate and timely weather information to help them make informed decisions about their agricultural activities.

eNAM: The eNAM app is a mobile application that facilitates online trading of agricultural commodities, primarily for farmers and traders. It allows farmers to register and trade their produce directly through the app or via registered commission agents, connecting them with buyers on the eNAM platform. The application provides features like viewing lot information, confirming sale prices, tracking lot progress, and accessing various other APMC-related services.

Agri Central: Agri Central is the best Agriculture application for Indian farmers which helps them make critical decisions in their farming business to increase profitability.

IFFCO KISAN UDAY: It facilitates the booking, viewing, and management of drone-based sprayings of IFFCO nano fertilizers. The app also allows farmers to create profiles, save farm information, access product details, and scan QR codes on IFFCO nano products.

ITC Krishi Mitra/ITCMAARS: The app supports various aspects of farming, such as crop management, pest and disease control, soil health, water conservation, weather forecasting, market linkages, and government programmes.

DeHaat: Connects farmers to suppliers and buyers on a single platform. Online marketplace providing all the agricultural products and services to farmers.

CEREAL CROPS

Rice

Selection of Varieties: RCM-13, RCM-15, RCM-16, Ranjit Sub 1, Gitesh, Luit, Disang, Numoli

Nursery Management: During nursery seed bed preparation, well decomposed FYM should be applied 2-3 days before sowing @ 10 q/ 1000 m^2 or vermicompost can be used @ 500kg/1000 sq.m and *Azospirillum* may be applied @ 2 kg /1000 sq.m area. 1000 sq.m nursery area is sufficient for transplanting of one hectare land.

Transplanting: First ploughing should be given at least 21 days before transplanting. 2nd ploughing at 10-12 days before transplanting and final puddling should be done 4-5 days before transplanting.The rice transplanting for mid and high altitude should be completed by month of June and in low altitude it should be completed by first fortnight of July. Transplanting should be done with 3 seedlings per hill. Spacings should be 20 × 15 cm (33 hills /sq.m) for semi-dwarf and 20 × 20 cm (25 hills/sq.m) for tall traditional varieties.

Fertilizers application and interculture operation: Well-rotted FYM or compost has to be applied @ 10 t/ha. Fertilizers @40:20:20 kg N, P_2O_5 & K_2O per hectare respectively. Green manuring crop viz. dhaincha can be sown in the month of May and crop should be incorporated through ploughing (Trampling) 10-15 days prior to transplanting. Preferably, two weeding's at 20 and 40 days after transplanting should be done. Critical stages for weeding are 15-45 DAS. Weeding can be done by Cono weeder or manual weeding depending upon stage of crop.

Plant protection measure: Clipping of leaf tips during transplanting to remove egg masses laid by stem borer; Release of *Trichogramma* @50000/ha for 4 times to control stem borer; Formation of alleyways during transplanting (20cm); and application of *Pseudomonas fluorescens* @ 20 g/m^2 at the time of sowing are the common plant protection measure to be followed.

Maize

Maize Variety Megha maize 1

Variety selection: Recommended varieties are Megha Maize-1, Megha Maize-2, Ganga 5, Vivek Maize Hybrid 47, Vivek Maize Hybrid 53

Sowing: Seeds should be dibbled at a depth of 3-4 cm in rows to rows and plant to plant spacing of 65-75× 20-25 cm respectively. Depending upon the seed size, about 18-22.5 kg of seeds/ha (2.5-3 kg/ bigha) are required to ensure a high seed viability rate for optimal germination and establishment.

Fertilizer Application and interculture operation: Compost or FYM @ 10 t/ha should be applied. Fertilizer @ 60:40:40 kg N, P_2O_5 & K_2O per hectare is recommended. Light hoeing and earthing up should be done as and when necessary. For further and adequate control of weed, atrazine should be applied @ 1.0 kg a.i/ha in 1000 liters of water as pre-emergence spray.

Plant protection measures: When infestation of stem borer is noticed, spraying of 5% Neem Seed Kernel Extract (NSKE) or Azadiractin 1500 ppm @ 5ml/litre of water may be done. In an area where Fall Army Worm (FAW) has been noticed, FAW pheromone traps @ 12 nos./ha may be set up.

MILLETS

Finger millet

Finger millet cultivation in Arunachal Pradesh

Variety selection: Local varieties for organic condition are Kakhi, Hinnai, Chasa, Chalay and recommended high-yielding variety are VL-379, VL-380, VL-352.

Sowing: 4-5 kg/ha for transplanting and 10-15 kg/ha broadcasting. Treat the seed with Ridomil @2g/kg, carbendazim @ 2g/kg before sowing. Maintain a spacing of 25-30 cm (row to row), 8-10 cm (plant to plant). The seed should be planted 2-3 cm in depth.

Fertilizer Application and interculture operation: Apply compost or farmyard manure @ 5-10 tonnes/ha about a month before sowing. Generally, fertilizers recommended to get a good crop are 40 kg Nitrogen, 20 kg of P_2O_5 and 20 kg K_2O per ha. Apply, entire quantity of P_2O_5 and half of Nitrogen at the time of sowing and remaining half of Nitrogen at 30 days after sowing. Two inter-cultural operations and one hand weeding in line sown crop is recommended. Intercultural operation using a tyne-harrow when crop is 30 days old is also recommended. In broadcast crop 1st weeding after 15-20 days of emergence of seedling and 2nd weeding 15-20 days after 1st weeding is recommended.

Plant protection measures: To control the blast, spray carbendazim @ 0.1% or tricyclazole @ 0.05%. To control rust, spray mancozeb @ 0.2%.

PULSE CROPS

Black gram

The recommended varieties are SBC 40, SBC 47, AAU SHN Urd 02 (Lakhi). The land is to be ploughed 2-3 times followed by leveling. Sow black gram seeds @ 22.5 kg/ha or 3 kg/bigha by keeping the spacing of 30 × 10 cm. Compost or FYM @ 1 t/ha or 1.3 q/bigha should be applied. The recommended fertilizer dose for black gram is 15:35:15 kg N P_2O_5 K_2O/ha. One weeding at 20-25 days after sowing has to be done.The spread of yellow mosaic virus can be checked by placing yellow sticky traps (5 per acre) to attract and capture whiteflies. Also, spraying of 5% neem seed kernel extract or Azadiractin 1500 ppm @ 5ml/l of water is recommended. To control the leaf spot, spray copper oxychloride @ 0.3% (1.8-2.0 kg/ha in 600-700 liters of water) at an interval of 7-10 days.

OILSEED CROPS

Sesame

Farmers can select the variety like ST 1683, Punjab Til-1, AST-1. Sow the seeds @ 4 kg/ha for line sowing with spacing of 30 × 15 cm. *Trichoderma viridae* @ 4g/kg of seed, followed by soil application of *T. viridae* @ 2.5 kg/ha supplemented with farm yard manure (100kg/ha) and neem cake (250 kg/ha). Compost or FYM should be applied @ 10 t/ha and fertilizer @ 30:20:20 kg N P_2O_5 K_2O/ha. One weeding should be done at 20 days after sowing by khurpi or hoe. Five (5) *Apis cerena* colonies/ha (1 colony/ bigha) should be installed for effective pollination of sesame and optimization of productivity. In *phytophthora* blight endemic areas, sesamum is to be rotated with cereals at every two years. In the case of *phyllody* disease, the infected plants should be rogued out.

VEGETABLE CROPS

Recommended variety of pumpkin are Arka Suryamukhi, Arka Chandan and selected local cultivars with a seed rate of 1.7 kg/ha (250 g/bigha). The sowing time for pumkin is January - April (For summer harvest) and September - October (For spring harvest). The recommended spacing is 2.5-3.0 m x 0.9-1.0 m (Spring), 2.5-3.0 m x 1.0-1.5 m (Summer). For better growth and yield of pumpkin, it is advised to use FYM @ 20-25 t, N 75 kg, P_2O_5 80 kg & K_2O 80 kg, CaO 30 kg/ha as basal application. To control fruit fly in pumpkin, soil application of neem cake @ 100kg/acre immediately after germination and repeat at flowering followed by spraying of 5% Neem Seed Kernel Extract or Azadiractin 1500 ppm @ 5ml/litre of water.

Tomato cultivating farmers are advised to grow disease resistant varieties viz. Arka Raksak, Arka Abhed, Arka Samrat with a seed rate of 200-250 gm/acre. The seeds can be mixed with *Trichoderma viride* and (@ 5 gm/100 gm of seeds. This will help in the control of early blight and other pathogens.To control the different pest of tomato, farmers can use garlic chilli extract spray in the evening and also advised to install pheromone traps @ 5/acre for monitoring adult moths activity. Replace the lures with fresh lures after every 2-3 weeks.

Tomato cultivation by using black polythene as a mulching material

Cultivation of king chilli under low cost polyhouse conditions

In case of brinjal, farmers can grow long variety such as Pusa Purple Cluster, Borbengena, JC-1, Kuchia and BWR-34; round variety Pusa Purple Round, Pusa Vairab, BWR-12 with a seed rate of 700-800 g/ha. The ideal spacing for brinjal cultivation is 75 cm × 60 cm (row to row and plant to plant).

Farmers are advised to use low-cost rain shelters for raising the vegetable seedlings. Seeds of King chilly and other hard seed coat seeds should be treated with *Pseudomonas*. Sowing of cucurbit seeds should be done in nursery plug system or in thermocol or paper cups in order to protect from climatic hazards.

Biodegradable plastic mulching should be used in king chilly and brinjal crops for soil conservation and weed management.

The Ginger/Turmeric field should be well prepared having drainage facility to prevent the water stagnation causing rhizome rot. Farmers are advised to spray neem-based formulation @ 3-5 ml/l of water or *Bacillus thuringinsis* @ 2g/L or *Metarhiziumanisopliae* @ 5ml/L for insects and pests and copper oxychloride @ 0.25% diseases management.

To control the white fly in king chilly neem oil (1500 ppm) spray during initial stage of infestation is recommended. If the infestation of white fly is more than ETL, Buprofezin @ 1 ml/l should be spray at weekly interval.

LIVESTOCK

Piggery

Farmers can rear the pig breed like Large white Yorkshire, HDK-75. Wash and disinfect the pens at regular basis and avoid dampness. Administer iron dextran in newly born piglets to prevent anemia. Ensure vaccination of pig against swine fever at the age of 3 months old pig and repeat annually. Deworm at regular interval with fenbendazole @ 3mg/kg body weight, followed by liver tonic. Repeat deworming once in 3 months. Ensure

Shelter management of crossbreed pig

adequate fodder storage and clean water during wet seasons. Exposure to wet and cold conditions can lead to stress, reduced feed intake, and increased risk of diseases like foot rot and respiratory infections. Regularly monitor for signs of illness to ensure timely treatment. If any sign of illness is suspected, the pig should be isolated and treated.

Poultry

For better income of the farmers, it is advised to rear dual purpose poultry breed like Vanaraja, Kalinga brown, BV 380. Facilitate one-day old chicks with artificial brooding in a confined area and check backup power for brooding. Provide dry and sufficient litter to keep them warm in the brooding area. Provide adequate clean drinking water with electrolyte and ad libitum feeding. Ensure proper vaccination of birds against Ranikhet disease within the age of 5-7days old. Repeat the same when chicks become 28 days old. Deworm the birds with fenbendazole @ 30-40ml/100 birds in drinking water. Repeat the same after 21 days. Multivitamins may be added in drinking water every once-twice in a week. Provide warm, dry and mold free feed. Wet and humid conditions may increase the risk of coccidiosis and respiratory disorders. Strict biosecurity should be maintained, and visit of outsiders should be avoided. If any disease outbreak occurs, maintain 45days of interval between the next batches.

CEREAL CROPS

Sali rice

Selection of varieties: The Semi dwarf varieties are: AAU-TTB-Dhan 44 (Prachur), AAU-TTB-Dhan 43(Shatabdi), AAU-TTB-Dhan 42 (Patkai). Farmers interested in multiple cropping situation can select the medium duration varieties like Numoli, Dholi, Shraboni. For staggered planting in sali season suitable varieties are Prafulla and Gitesh. Farmers of flood prone district can take submergence tolerant rice varieties for flash-flood situation: Ranjit Sub1, Bahadur Sub1, Jalashree, Jalkunwari, Dholi. In case of late planting in flood-affected area/direct seeded late Sali are Luit, Kapilee, Dishang.

Seed treatment: Put the seeds in normal water, stirred well, sunken seeds are selected and the floated ones are rejected. For wet method, selected seeds should be soaked directly in fungicidal suspensions of carboxin @ 2.0 g/l of water for 24 hours. One liter of fungicide solution is required to treat one kg of seed. In case of dry method, put the seeds in a container and add carboxin @ 2.0 g/kg seed and mixed thoroughly by agitating them for five minutes.

Nursery management: Land is thoroughly puddled and seedbeds of 10 m length and 1.25 m breadth are prepared with 30 cm gap in between the beds. The length of the bed may vary according to convenience. In each seedbed 20-30 kg cow dung/compost, 80 g urea, 80g SSP and 40g MOP are to be applied and mixed well with the soil. Well germinated seeds are to be sown @ 650 g to 1 kg per bed depending on grain size. Requirement of seed for transplanting one hectare of main field is 40-45 kg. Irrigation water should be applied in furrows to maintain saturated condition in the surface soil of the nursery bed. However, standing water to a depth of 2-3 cm should be maintained at least 2-3 days before uprooting. As soon as one or two blast spots are seen, ediphenphos @ 1 ml/l of water is to be sprayed. For management of root knot nematode, apply, *Pseudomonas fluorescens* @ 20 g /sq. m at the time of sowing.

Transplanting: One ploughing should be given at least 21 days prior to transplanting. An irrigation for land soaking should be applied before preparatory tillage. The final puddling should be done 4-5 days prior to transplanting. One irrigation should be applied before final puddling. 25 days old seedlings of short and medium duration varieties should be transplanted by maintaining a row-to-row and plant-to-plant spacing of 20 cm × 15 cm. In case of long duration varieties, 35-40 days old seedlings are to be transplanted at 25 cm × 15 cm spacing. It is advised to plant 2-3 seedlings per hill, at a depth of 4-5 cm, for all varieties.

Nutrient management: Well rotten FYM or compost @ 10 t/ha has to be applied during field preparation. In addition, for semidwarf varieties, 60 kg N/ha, 20 kg P_2O_5/ha and 40 kg K_2O/ha and for tall varieties, 20 kg N/ha, 10 kg P_2O_5/ha and 10 kg K_2O/ are to be applied in areas with moderate fertility level. In case of poor soil, the rates of fertilizers may be required to increase to the extent of 60:30:30 kg/ha N, P_2O_5 and K_2O respectively. Half of urea and whole of super phosphate and muriate of potash should be applied at the time of final puddling. Of the remaining part of urea, half at tillering stage i.e. 20-30 days after transplanting and other half at panicle initiation stage should be applied. Two weedings should be given with paddy weeder or hoe at 20 and 40 days after transplanting. For weed control, pretilachlor @ 0.75 kg/ha or anilofos is to be applied @ 0.4 kg/ha at 3 days after transplanting. In sali rice, application of 5 cm irrigation water 3 days after disappearance of ponding water is recommended in medium and heavy soils. In rainfed kharif rice, height of bunds should be 30 cm to retain rainwater.

Plant protection measures: To control the rice stem borer, whorl maggot, gall midge and leaf folder, spray fipronil 5SC @1.5-2 ml/l of water. To control thrips and plant hopper, spray imidacloprid 70 WG @0.3 g/l of water or thiamethoxam 25 WG@0.03 g/l of water. Against Rice Hispa, spray lamda-cyhalothrin 5 EC @ 12.5g /per ha. To control rice pests, erect 50 'T'-perches per ha 2 ft (60 cm) above crop canopy as roosting site for insectivorous birds, which are to be removed before flowering in order to prevent activity of granivorous birds. To prevent rice blast, spray hexaconazole 5EC @ 2g/l of water at tillering stage (40-55 days after sowing) and subsequently give two more sprays of ediphenphos @ 1ml/l of water, one at panicle initiation stage and the other when the tip of the panicle just comes out.

Management of direct seeded late Sali: Field should be prepared just after recession of flood by ploughing, cross ploughing and laddering to bring it to a puddle

Seedlings of Flood Tolerant Rice variety-Ranjit sub-1 during flood

Installation of T Perch in Rice Field

condition. Sprouted seeds should be sown in lines 20 cm apart with a seed rate of 75 kg/ha should be maintained. Need based fertilizer application is advocated. Pre-emergence herbicide pretilachlor @ 0.75 kg a.i./ha should be applied 2-3 days after sowing. Wherever, water management is possible, two irrigations at panicle initiation and flowering stages are recommended.

Maize

Maize Variety Bio 9544

Selection of varieties: Recommended hybrid variety are Ganga 5, Vivek Maize Hybrid 47, Vivek Maize Hybrid 53, Bio 9544 and composite variety are Dhawal, Navjot

Land preparation & sowing: Any well drained soil is suitable for maize. Sandy and sandy loam fertile soils are preferable. It requires a deep fine and firm tilth. Depending upon the seed size, about 18-22.5 kg of seeds/ha (2.5-3 kg/ bigha) are required. Seeds should be dressed with carboxin @ 2 g/kg of seed. Seeds should be dibbled at a depth of 3-4 cm in rows 65-75 cm apart and at a distance of 20-25 cm from seed to seed within the rows. Two seeds per hill are to be sown followed by thinning10 days after germination retaining one seedling/ hill.

Nutrient management and intercultural operation: A combination of organic and inorganic fertilizer gives better results than inorganic fertilizer alone. Compost or FYM @ 5 t/ha should be applied. In addition, 60 kg N/ha, 40 kg P_2O_5/ha and 40 kg K_2O/ha should be applied. For Hills Zone, a dose of 90 kg N/ha, 40 kg P_2O_5/ha and 40 kg K_2O/ha are recommended under rainfed condition. FYM or compost should be applied during land preparation. The entire quantity of phosphorus and potash and half of the total urea is to be applied in furrows (8-10 cm deep) and covered with 4-5cm of soil. Sowing of seed should be done at least 2 days after fertilizer application. Light hoeing and earthing up should be done as and when necessary. For further adequate control of weed, simazine should be applied @ 0.5-1.0 kg a.i/ha in 1000 liters of water a pre-emergence spray.

Plant protection: When infestation of stem borer is noticed, fipronil 5 SC @ 1.0 kg/ha in 200-250 liters of water should be sprayed with power sprayer or in 700-800 liters of water with hand sprayer. To control the fall army worm apply emamectin benzoate3% WG+ thiamethoxam 12% WG @ 0.1 % followed by application of chlorantraniliprole 18.5 % Sc @ 0.025% at 7 days interval.

OILSEED CROPS

Sesamum

Selection of varieties: Varieties like ST 1683, AST-1, SP 1181 (Madhavi), Gouri, Vinayak are suitable for Assam condition. Well drained sandy loam soils are preferable. Land should be prepared to a fine tilth by 3-4 ploughings followed by laddering. Sow the seeds from July to first fortnight of August@ 4 kg/ha for both

broadcasting and line sowing and maintain the spacing 30 cm between rows 15 cm between plants

Nutrient management and intercultural operation: Compost or FYM should be applied @ 10 t/ha. Fertilizer @ 30 kg N/ha, 20 kg P_2O_5/ha and 20 kg K_2O/ha should also be applied at the time of sowing. One weeding should be done at 20 days after owing by khurpi or hoe. The crop should be thinned out simultaneously to maintain the required spacing within the rows.

Plant protection: Seeds should be treated with metalaxyl or carboxin @2 g /kg of seed against stem rot as well as *phytophthora* blight. Alternatively, seeds should be treated with a commercial formulation of *Trichoderma* spp. @5 g/kg of seeds against stem rot and *phytophthora* blight. In *phytophthora* blight endemic areas, sesamum is to be rotated with cereals at every two years. In the case of *phyllody* disease, the infected plants should be rouged out. Seed treatment with imidacloprid 70 WG @6 g/kg of seed followed by three sprays of thiomethoxam 25WG @ 2 g/10 liters of water at 20, 35 and 50 days after germination of sesame seeds.

PULSE CROPS

Blackgram

Selection of varieties: For normal sowing, Pant U 19, SBC 40, SBC 47, AAU SHN Urd 02 (Lakhi), PU-31, Manas. In case of late sowing Beki (SB 27-3), Kolong (SB 25-19), Sonkush (SB 23-5).

Land preparation & sowing: The land is to be ploughed 2-3 times followed by leveling. Surface drains should be provided to facilitate quick removal of excess water from the field. Requisite amount of lime is to be applied after soil test to bring soil pH around 6.0. For seed inoculation with *Rhizobium* cultures of Shillongani, Ahatguri, Kamalabari or any other suitable strains should be used. Seeds are inoculated with 50 g/kg of seeds. Also inoculate seeds with *PSB* @ 50 g/kg seed along with *rhizobium.* Sow black gram seeds @ 22.5 kg/ha or 3 kg/bigha with a spacing of 30 cm row to row and 10 cm plant to plant.

Nutrient management and intercultural operation: Compost or FYM @ 1 t/ha or1.3 q/bigha should be applied. Recommended fertilizer dose is 15 kg N/ha, 35 kg P_2O_5/ha and 15 kg K_2O/ha. The quantity of N is to be reduced proportionately to the quantity of N added in the form of FYM or compost. One weeding at 20-25 days after sowing is to be done. Apply propaquizafop 2.5% + imazethapyr 3.75% (ready mix) @ 125 g /ha (commercial product @ 2 l / ha) at 15-20 DAS as post emergence.

Plant protection: For control of leaf spot, spray copper oxychloride @0.3% (1.8- 2.0 kg/ha in 600-700 liters of water) at an interval of 7-10 days. Alternatively, tebuconazole 25 EC @ 600-700 ml (0.1%) mixed with 600- 700 liter of water/ha (80-90 ml in 80 - 90 liters of water/bigha) should be applied. For web blight, spray tebuconazole 25 EC @ 0.1% (600 ml -700 ml mixed with 600-700 liters of water/ha) three times starting from the appearance of the disease at 10 - 15 days interval. Against aphids, jassids, flea beetle, pod borers, pod bug sand leaf folder, spray chlorantraniliprole 18.5 SC @ 20 g a.i./ha in 500-700 liters of water. The spread of yellow mosaic virus (YVM) can be checked by controlling white fly by applying thaimethoxam 25 WG @ 0.3g/l.

Greengram

Selection of varieties: Recommended variety are K 851, SG 1 (Pratap), SG 21-5, SGC 16, SGC 20, Sonai (SG 21-5), AAU SHN Mung 02.

Land preparation & sowing: The land is to be ploughed 2-3 times followed by leveling. Surface drains should be provided to facilitate quick removal of excess water from the field. Requisite amount of lime is to be applied after soil test to bring soil pH around 6.0. Sow the seeds @ 20 kg/ha or 2.75 kg /bigha with the spacing of 30 cm row to row and 10 cm plant to plant. For seed inoculation with *rhizobium* culture, either Majuli 10 or any other suitable strains may be used. Seeds should be inoculated with 150 g/3-4 kg seeds. Also inoculate seeds with *PSB* @ 50 g/ kg seeds along with *Rhizobium*.

Nutrient management and intercultural operation: Compost or FYM @ 1 t/ha or1.3 q/bigha should be applied. Recommended fertilizer dose is 15 kg N/ha, 35 kg P_2O_5/ha and 15 kg K_2O/ha. The quantity of N is to be reduced proportionately to the quantity of N added in the form of FYM or compost.One weeding at 20-25 days after sowing is to be done.

Plant protection: For control of leaf spot, spray copper oxychloride @ 0.3% (1.8-2.0 kg in 600-700 liters of water/ha) at an interval of 7-10 days. Alternatively, after appearance of *Cercospora* leaf spot, tebuconazole 25EC @ 600-700 ml (0.1%) mixed with 600 -700 liters of water/ha (80-90 ml in 80 - 90 liters of water/bigha) should be applied. Spraying of spiromesifen 22.9 SC@1.25 ml/l of water at vegetative and reproductive stages of mung bean is effective against sucking pests. Against flea beetle, pod borers, and leaf folder, spray chlorantraniliprole 18.50 SC @ 20 g a.i. /ha ha or lamda-cyhalothrin 5 EC@ 150 -250 ml/ha in 500-700 liters of water. The attack by yellow mosaic virus can be checked by controlling white fly as follows: 2-3 sprayings of fipronil 5 SC @ 1.5-2 ml/l of water ha or lamda-cyhalothrin 5 EC@ 150 -250 ml/ha is to be given.

FRUIT CROPS

Banana

Selection of varieties: The suitable dwarf variety is Jahaji (Dwarf Cavendish); medium tall varieties are Chenichampa, Malbhog, Bar Jahaji and tall varieties are Pura Kal (Kach Kal), Manohar, Jati, Bhimkal. It is propagated by sword suckers. Select healthy sword suckers and uproot with corm. Trim all the roots without damaging the buds. Give a slanting cut to the pseudostem 30cm above the base of the sucker. Weight of such planting materials should be around 1.5 kg to 2.0 kg.

Pitcher Drip Irrigation System in Banana.

Planting: Time of Planting is March - May. Double planting (2 plants/pit) with a spacing of 1.8 m x 1.8 m for Jahaji gives higher yield. For High density Planting, 3

suckers per pit at 2m x 3m (5001 plants/ha) spacing should be planted. Pits should be filled up with 18 kg FYM along with top soil. Planting should be done 30 cm apart in the pit. The Size of every pit is 45 cm x 45 cm x 45 cm and $1m^3$ for high density planting.

Nutrient management and intercultural operation: 12 kg FYM/plant, 110 g N/plant, 33 g P_2O_5/plant and 330 g K_2O/plant. For Integrated Nutrient Management of banana 12 kg FYM/plant, 55 g N/plant, 33 g P_2O5/plant, 330 g K_2O/plant and 25g each of *Azospirillium* and *Phosphate Soluble Bacteria* (*PSB*) per plant should be applied. For High Density Planting 18 kg FYM, 165 g N, 50 g P_2O_5, and 495 g K_2O should be applied for 3 plants in each pit. 3 irrigations per month during dry periods. Remove weeds as and when required. Diuron @ 3 kg/ha or gramoxone @ 1.5 kg/ha should be applied to check weed growth.

Plant Protection: To control *Pseudostem borer* spray 0.1% malathion 50 EC (1 ml in 1 litre of water). Apply carbofuran 3 g granules in soil @ 10 g per stool. For leaf & fruit scarring beetle use 0.1% malathion 50 EC (1 ml in 1 litre of water) on the bunches immediately after emergence or application of 0.05% monocrotophos @ 30 ml/plant. Baggings of bunch with muslin cloth or blue polyethylene before fruit set and remove after 60 days of fruit setting. To prevent the bunchy top disease the aphid vector should be controlled by spraying dimethoate or phosphamidon @ 1 ml/l. (3 l/25 plants) Uproot and bury the infected plants. Soil drenching with 1.0% bordeaux mixture or 0.05% carbendazim (0.5g in 1 litre of water) is effective against panama wilt of banana.

Assam lemon

Cultivar: Assam Lemon (Local)

Planting material: Stem cutting is a popular method of planting preparation. The size of cutting is 18 to 20 cm in length with a thickness of lead pencil. The upper cut is made 1 cm above the node and lower cut close below the node in a slanting manner. The cuttings are planted with a spacing of 30 cm x 30 cm in a slanting position in the nursery bed measuring 30 cm x 1 m x 10 m. The best time for Stem cutting is March-April. Stem cutting may be raised in polyethylene bags under partial shade as the best nursery techniques.

Planting: Before monsoon, pits of 0.5m x 0.5m size with a spacing of 3m x 3m are prepared and refilled with soil-manure mixture (1:1) and then allowed to settle. The time of planting is May to August. In the nursery stage, pruning should begin soon after the seedlings start sprouting from the stem cutting or leaf bud cutting or air layering. After planting in the main field, up to 50-60 cm from the ground level all side branches should be removed keeping only single main trunk. Above 50-60 cm, pruning is confined to the training to develop. Mechanically strong trees with well-spaced scaffold limbs before the onset of fruit setting. At the bearing stage, during winter when bearing of tree is low, the branches touching the ground should be cut close to the laterals without leaving any stub. All diseased, injured, cris-cross branches and water sprout should be removed.

Nutrient management and intercultural operation: In 1^{st} year the farmers of plain zone of Assam should use the 5 kg FYM, 150 g N, 100 g P_2O_5, 145 g K_2O per plant per year and

farmers of hill zone should use 10 kg FYM 100 g N, 100 g P_2O_5, 100 g K_2O per plant per year. Weeding should be done frequently at monthly intervals. Paddy straw or black polyethylene can also be used as mulch for controlling weeds. Three irrigations at 15 days interval @ 15 L/plant combined with black polythene (50 micron) mulching 1st week of November is effective in producing off-season crop (1st week of March).

Silage preparation

LIVESTOCK

Dairy cattle

The local breed Lakhimi and crossbreed Jersey is well suited for Assam. Ensure raised, dry and well-ventilated sheds to avoid hoof infections and mastitis due to wet floors. Supplement green fodder with regular supplementation of mineral mixture @ 50gm/day/adult animal; silage or fodder banks can help during flooding. Deworm all adult cattle using Albendazole before monsoon onset. Vaccinate against Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS) and Black Quarter (BQ) before or at the onset of monsoon. Calves are need to be dewormed as early as 21 days with Piperazine @ 200 mg/kg body weight. Ensure deworming with Fenbendazole @ 7.5 mg/kg body weight in adults. Regular deworming of animal should be done every 3 months interval. Ensure clean drinking water and footbath for preventing foot rot.

Goat

Assam Hill Goat, Black Bengal Goat and Crossbred Beetal perfomed well in Assam. Keep sheds elevated to prevent water stagnation and avoid overcrowding and maintain dry bedding. Provide dry feed and avoid grazing in waterlogged or parasite infested field. Offer tree leaves (Jackfruit, Bamboo) and concentrate mix. Vaccinate against Peste des Petits (PPR), Enterotoxaemia (ET) and Foot and Mouth Disease (FMD). Ensure deworming of goat with Fenbendazole @ 7.5 mg/kg body weight. Deworming schedule: Pre-monsoon (May), Mid-monsoon (July).

Pigs

For meat purpose pig rerarer can select Doom, Rani, Asha and for piglet purpose Ghungroo, HDK-75. Keep sheds cleaned and ventilated. Prevent water logging near piggery sty to prevent mosquito breeding which is a carrier of Japanese encephalitis. Provide balanced ration with access to clean water. Supplement mineral mixture daily @20gm/pig with feed. Vaccinate the pigs against Swine Fever and Foot and Mouth Disease (FMD). Deworming should be done with Fenbendazole @ 5 mg/kg body weight (at three months interval)

Poultry & Duck

Recommended poultry breeds are Kamrupa, Sonali, Vanaraja, Vanashree, BV380, Rainbow rooster and duck breed are Khaki campbell, Pati duck. Keep sheds cleaned and well ventilated. Overcrowding should be avoided. Maintain at least 1.5 sqft/bird.

For duck it is advised to provide semi-confined shed near water body. Provide clean water and balanced feed. Add electrolytes and vitamin supplements during hot humid spells. Vaccinate against Ranikhet disease, IBD, Fowl pox in chicken and Duck plague in duck. Deworming should be done with Albendazole @ 5gm/100 birds.

Special considerations for flood prone areas of Assam

Grow high-yielding fodder varieties: Hybrid Napier CO-3, red napier, Hybrid Sorghum. Maintain staggered planting for regular supply. For optimum yield use FYM + 40:40:20 NPK kg/ha. After each cutting apply urea @ 65 kg/ha (8.67kg/Bigha). Arrangement for silage preparation for feeding livestock during floods and storing minimum required quantity of hay and concentrates per animals in farmer / keepers' house / shed for feeding animals during floods.

Fishery

During kharif season post stocking management of fish is generally practiced in the state of Assam. During the period following measures need to be taken care for better growth and successful culture operation. Maintenance of proper pH of water body. Congenial pH for fish culture is 6.5-7.8. If pH goes down apply lime (quick lime/ Agri lime whichever is available) as per recommended dose. Sufficient sun light exposure in the culture pond. Apply supplementary feed according to the feeding habit of the culture fish. The rate of feed application may be @3-5% of body weight. Periodic monitoring of water quality parameters like Dissolved Oxygen, Alkalinity, Hardness, Ammonia, Transparency etc. Trial netting in stocking pond fortnightly to check the fish growth and health management. Flood mitigation measures need to be taken care well in advance.

CEREAL CROPS

Paddy

Under low land area farmers are advised for selection of paddy varieties of long duration like Swarna sub-1, Rajendra Mahsuri, Rajendra Bhagwati, Rajendra Rajshree, Rajendra Neelum, Swarna Samridhi, Sabour Deep, Sabour Sampan and for medium duration varieties like Rajendra Sweta, Sonam, SS-1, DRR Dhan 44 DBW-187, Swarn Shakti, BPT-5204, Arize -6444, Rupali, MTU-1001, MTU-1001, Sabour Harshit. Farmers. Under upland condition the short duration paddy varieties like Sabour Ardhjal, Sahbhagi, CR Dhaan-40, Turanta, Sabour Sri, Shushk Samrat, Swarn Shreya etc. can be selected and sown directly through DSR method. Raise nursery sowing 25 May to 10 June and transplanting during 15 June to 20 June is advised. Seedling age at transplanting is 20-25 days and spacing is 20 x 15 cm (line transplanting preferred).

Farmers must treat their seed before sowing of seedling through carbendazim-2.5 g/kg plus Streptocycline@1.0g per 3kg seed. Application of Mancozeb+Carbendazim (2g/kg seed) or *Trichoderma viride* (10g/kg seed) can also use for seed treatment. Prepare slurry and coat thoroughly for fungal suppression. For nutrient management (kg/ha) of short-duration varieties consists of basal dose of 44 N (neem-coated urea), 190 P_2O_5(SSP), 34 K_2O (MOP) and topdressing is 44 N + 17 K_2O at 25 DAP; 44 N at 45 DAP and for long duration varieties basal dose is 58 N + 250 P_2O_5+ 45 K_2O and top dressing: 58 N + 23 K_2O at 30 DAP; 58 N at 50 DAP is advised. For weed control in paddy nursery, application of N: P: K 1:1:1 kg for (100 m^2) area and Pyrazosulfuron Ethyl 10 WP @6g/Kattha (1365 sq. feet or 151 m^2) before 12 hours of sowing is advised. Soil fertility can be enhanced with incorporation with Dhaincha (Sesbania aculeata) as a green manure 60-70 days pre-transplanting, ploughed under 15-20 days before transplanting.

Nursey raising for transplantation in paddy

Effective management of yellow stem borer (*Tryporyza incertulus*) and leaf folder (*Cnaphalocrocis medinalis*) in paddy can be achieved by clipping terminal shoots prior to transplanting, followed by the application of Cartap Hydrochloride @2.0 g/L of water. A second application at the same concentration should be administered 20 days after the first treatment. To protect paddy nursery and other crops from grasshopper by spraying of cypermethrin 25% EC @1ml/L water or cypermethrin 10% EC @2.5 ml/L water or Deltamethrin 2.8% EC @1.5 ml/L of water is advised. After 2-3 days spray Neem oil @5ml/L of water.

Maize

For successful maize cultivation, farmers are advised to begin land preparation in May and incorporate 3-4 quintals of lime per hectare. Sowing should be carried out in the first week of June or with the onset of the monsoon. During land preparation, the application of 100-150 quintals of well-decomposed cow dung compost is recommended to enrich soil fertility. Preferred maize varieties include PMH-3, Orange Flint, HQPM-1, and HQPM-5 short to medium duration hybrids: HQPM-1, Rajendra Shankar Makka-3, Vivek-27. Bio 9681, All Rounder and P-3522 are the Long-duration hybrids. A seed rate of 20 kg per hectare with a spacing of 60 cm × 20 cm is advised for optimal plant growth. Additionally, proper drainage systems must be established to prevent water stagnation in the field.

For effective management of Fall Armyworm (*Spodoptera frugiperda*) in maize, application of sand should be carried out at the whorl formation stage and upon the

Management of fall army wall

appearance of 5% damage symptoms. This should be followed by a spray of Emamectin Benzoate 5 SG at 0.4 g per litre of water, five days after sand application. Subsequently, a second spray using a combination formulation of Thiamethoxam 12.6% + Lambda-Cyhalothrin 9.5% @0.5 ml per litre of water should be administered 15 days after the first insecticidal application.

PULSE CROPS

Diagnostic visit in pulse field

Farmers are advised to select recommended varieties for cultivation of pulse crops are as follows: Pigeonpea/Arhar: Medium (150-160 days) UPAS-120, Bahar, Pusa9, Pusa-992, Asha and for long duration 170-180 days T-21, IPA-203, C-11. Birsa Arhar-1, Bahar, UPAS, IPA-203, Narendra Arhar-1, Narendra Arhar-2. Black Gram: Birsa Urad-1, WBU-09, Pant U-31. Green Gram: SML-668, IPM-2,3, HUM-16. Horse gram: Birsa Kulthi-1, Indira Kulthi-1, VLG-19. Farmers are advised to select and sow pigeon pea in upland area where good water drainage facility is available. Use variety Narendra Arhar-1, Malviya Arhar (MAL-13) for drought tolerant area. Farmer are advice to harvest the crop when 80-85% pods turn brown but delay in harvesting may lead to pod shattering and yield loss. For effective management of Wilt (*Fusarium spp.*) farmers are advised to use resistant varieties (e.g., Bahar); practice crop rotation. For Podborer (*Helicoverpa armigera*) spray Spinosad 45 SC @0.3 ml/L or Emamectin Benzoate 5 SG @0.5 g/L at flowering and pod formation stages and Sterility Mosaic Virus can be controlled by removing infected plants; control whitefly/vector using Imidacloprid 17.8 SL @0.5 ml/L.

OILSEED CROPS

Farmers are advice to select recommended varieties for cultivation of oil seed crops are as follows: Groundnut: K-1812, K-6, Dharni, Birsa Mungfali-3, Birsa Mungfali-4, Birsa Bold, Niger: Birsa Niger-1, Birsa Niger-3, Sesame: RT-351, Krishna, Kanke Safed, Shekhar, Soyabean: Birsa Safed Soyabean-2, JS-2098, Sunflower: DCS-107. Groundnut is a promising oilseed crop for the kharif season in the rainfed uplands and medium lands of Bihar Zones IIIA and IIIB. The optimal sowing period is between 15th June to 5th July, in line with monsoon onset. Avoid delay beyond mid-July to reduce risk of wilt and pod borer incidence. Seed rate: 12-15 kg/ha with Spacing: 60 cm (row to row) × 20 cm (plant to plant) is practice. Recommended varieties include TG-37A, JL-24, ICGV-91114, ICGS-44, and Girnar-2, which are early to medium maturing and resistant to foliar diseases. Groundnut seeds should be treated with Carbendazim or Mancozeb (2 g/kg) and inoculated with Rhizobium and PSB cultures to enhance nitrogen fixation and phosphorus uptake. Use a seed rate of 80-100 kg/ha and maintain 30 x 10 cm spacing for optimal plant population.

Weed management can be done and first intercultural operation 20-25 days after sowing and Second operation can be done 40-45 days after sowing. Apply Pendimethalin 1.0 kg a.i./ha as pre-emergence herbicide (within 2 days of sowing).

Field preparation

Nutrient management involves basal application of 20:40:30 kg/ha N:P_2O_5: K_2O (through urea, SSP, and MOP), with an additional 250 kg/ha gypsum at flowering for better pod development. In zinc-deficient soils, apply 25 kg $ZnSO_4$/ha. Provide life-saving irrigation at flowering and pod development stages if monsoon rains are erratic. Proper soil moisture during pegging is crucial for good pod formation. Major pests and diseases include leaf spot, collar rot, aphids and bud necrosis virus. Leaf spots can be managed by spraying Mancozeb 75 WP @2.5 g/L while sucking pests should be controlled using Imidacloprid 17.8 SL 0.3 ml/L. Harvest should be done when most leaves yellow and pods mature internally (dark shell markings). Avoid delay in harvesting to prevent aflatoxin contamination. Under recommended practices, yields of 15-18 q/ha can be achieved with potential to exceed 25 q/ha under favourable conditions. Storing of oilseed in new bags after proper sun drying and treatments. Farmers are advised to purchase the inputs like seed, fertilizers and fungicide for seed treatment well in advance.

FRUIT & VEGETABLE CROPS

Farmers are advised to grow fruit crops like Mango, Litchi, Guava, Papaya and Citrus fruit. Irrigate mango and litchi plants at weekly interval for proper fruit growth and development. To control premature fruit dropping in mango and litchi, farmers are advised to spray Planofix@4ml/10 L of water at an interval of 10-12 days. Fruit cracking is major problem in Litchi, it can be prevented with regular irrigation, mulching and fresh water spraying during dry spells. For better fruit development farmers are advice to apply n-triacontanol (Miraculan) @0.5 ml/L and moisture conservation can be done by the practice of basin mulching using straw/grasses. For control of mango mealy bug spraying of Dimethoate 30EC @1.0 ml/L or Neem oil @5ml/L twice at 10-12 days interval followed by 2 spray of Planofix @4 ml/10 L water at 10-12 interval to check fruit drop.

For fruit borer in mango, spray chlorpyriphos 50 % EC+Cypermethrin 5% EC @2.5 ml/L water or Lamda-cyhalothrin 5% EC @0.5 ml /L water or Indoxacarb 14.5 SC @0.5 -1 ml /L water. For fruit fly control, spray Deltamethrin 2.8 EC @1 ml/L water or Spinoza 45 SC @1 ml/water at 15 days internal. For setting of pheromone traps in mango orchards, 10 traps per ha is advised in Mango orchards. For Mango hopper, spray with Imidacloprid 17.8 SL @0.5- 1 ml/L water at 15 days internal. To control

Anthracnose in mango and papaya use Carbendazim 50% WP@1 g/L spray during flowering and fruit set stage however it is also sprayed during rainy season if spots appear. To control Mealybug in papaya, use Chlorpyrifos 20% EC @2.5 ml/L which is sprayed on base and crown after rains. To control scale insect in guava, apply Buprofezin 25% SC @1 ml/L and spray on affected trees twice at 15-day interval. For stem borer, clean the hole then soak cotton bolls in chlorpyriphos @5 ml/L water or Dichlorvos @5 ml/L water and place in it and then seal the hole with mud. In citrus fruit, use Imidacloprid 17.8% SL @0.3 ml/L spray at new flush stage for Leaf Miner.

In Kharif season farmers are advised to grow vegetables like Okra, Brinjal, Tomato, Cucurbits. Ridge and furrow method of cultivation is recommended for vegetable cultivation along with proper drainage of water. Farmers are advised to sow okra seeds at a depth of 1-2 cm, with row-to-row spacing of 45 cm and plant-to-plant distance of 15-20 cm. Recommended varieties for okra cultivation are Kashi Kranti, Kashi Satdhari, and Kashi Chaman. For tomato cultivation, ensure planting on raised beds and provide staking using metal wires, nylon ropes, or bamboo supports, especially when cultivating indeterminate varieties such as Arka Rakshak, Arka Samrat, Swarna Anmol, and Swarna Samridhi. Determinate varieties like Swarna Sampada and Swarna Prakash should also be included for a balanced and productive harvest. Suitable varieties of cucurbits such as bottle gourd, bitter gourd, cucumber, sponge gourd, ridge gourd, snake gourd, and spine gourd should be sown with appropriate spacing and the recommended dose of fertilizers to ensure healthy growth.

To support vigorous vine development, a sturdy trellis structure made of bamboo and wire should be constructed which helps in allowing the plants to spread efficiently and enhance air circulation and fruit quality. To control Yellow Vein Mosaic Disease in okra, farmers should remove and destroy affected plants as soon as symptoms appear. After that, spray Thiamethoxam 25 WG at 100 g per hectare for effective disease management. Wilting in brinjal and tomato plants can be controlled by spraying of 1g Streptocycline+30 g copper oxychloride in 30 litre of water in the root zone of the plants. To control red pumpkin beetle in cucurbitaceous crops, apply chlorpyriphos 2% dust @20 kg/ha near the root zone and mix them properly.

COMMERCIAL CROPS

Sugarcane

From June onwards, sugarcane enters its early vegetative and grand growth phase, especially for spring-planted (February-March) crops, while late planting (autumn planting) can still be done until early July where irrigation or pre-monsoon rains are available. Ensure earthing-up of spring-planted crops by mid-June to promote root growth, prevent lodging and enhance moisture conservation. This is also the right time for trash mulching to suppress weeds, conserve soil moisture, and support beneficial microbial activity. Any gap filling should be completed early in June using healthy setts to maintain a uniform crop stand. Nutrient management during this period is crucial. For previously applied basal dose followed by the second split of nitrogen (around 60-75 kg N/ha) using urea before rains or irrigation. Intercropping

with short-duration pulses (e.g., moong, urd) is recommended during the early monsoon to improve soil fertility and farmer income.

Timely weeding and hoeing should be completed by July to avoid competition during the peak growth phase. For zinc-deficient fields, apply 25 kg zinc sulphate per hectare or spray 0.5% $ZnSO_4$ solution on standing crop. Pest and disease surveillance is essential from June onwards. Top borer infestation is common during this period; apply Chlorantraniliprole 0.4% GR @10 kg/ha in leaf whorls during early July. For pyrilla, release of Epiricania melanoleuca parasitoids or spraying Acephate 75 SP @1g/litre can be effective. Monitoring for red rot and wilt, especially in susceptible varieties; promptly remove and destroy infected clumps. Maintain proper drainage to prevent water stagnation during heavy rains. With good management, the crop can achieve 60-80 t/ha yield by harvesting in January-February.

OTHER CROPS

Farmer are advised to use varieties such as A-404, BM-2, BM-3, JPU-28, JPU-67, VL-379 for Finger Millet cultivation. In case of Turmeric and Ginger, prepare the field for sowing of. Apply 25-30 t FYM/ha at final ploughing of field and complete sowing by middle of May. Leguminous fodder crops like Cowpea & Guar bean can be cultivated during Kharif season. Farmers are encouraged to practice cultivation of milky, oyster and paddy straw mushrooms for additional income. Seed sowing of Mahogni and Gamhar is to be started in prepared bed or in polytube.

Mulching in crop field

LIVESTOCK

The onset of the monsoon in June increases humidity and causes a spike in vector-borne and waterborne diseases in livestock. Farmers are advised to ensure clean housing and proper drainage to avoid water stagnation around sheds. Ensure adequate drinking water and shade (thatched or tree-based) in animal sheds. Clean water should be provided to the animals three times a day. Milk utensils and other equipment should be frequently cleaned. Maintain strict biosecurity and avoid overcrowding in livestock and poultry farm. Sufficient space should be maintained to avoid overcrowding. The floor of the animal shed should be cleaned regularly to avoid disease infestations. Sanitize the vehicle/cart used by infected animals, premises, shed and other equipment properly by solution of 2% red potash. Dusting of bleaching powder or lime in the vicinity.

For poultry, ensure dry bedding with rice husk or sawdust, and use potassium permanganate or lime powder around sheds to reduce microbial load. Avoid overgrazing during monsoon as it increases the risk of parasitic infections. Regular deworming should be done before the rainy season especially in young calves and kids using albendazole or fenbendazole under veterinary guidance. Deworming of birds with Piperazin hydrochloride @5ml per 10 birds is recommended. Proper

vaccination schedule should be followed before the onset of rainy season for prevention of Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS), Black Quarter (BQ) in cattle and buffaloes, and Peste des Petits Ruminants (PPR) in goats. Poultry must be protected from Ranikhet and fowl pox.

To increase the feed intake in high yielding dairy animal during heat stress, farmers should practice urea treatment of dry straw (4 kg urea in 40 litres water per 100 kg straw) to enhance its digestibility. Supplement animal diets with mineral mixture and common salt, and in lactating animals, give bypass protein and calcium supplements to maintain milk production. Ensure availability of green fodder during this season. Cultivate fodder crops like Maize, Sorghum, Cowpea and Napier to provide fresh and nutritious feed. In goats and sheep, provide bamboo slat flooring or dry raised platforms to prevent foot rot during wet months. Clean water should be provided to the animals three times a day. Farmers are advised to administer Electrol Powder 2g and Vimeral 5 ml per 5 litre water for adults. In case of disease outbreak in animals, wash the infected animal tongue, mouth, feet and nose by 1% red potash or 2% baking soda 2-3 times in a day. For adult birds, mix 2 g of Electrol powder and 5 ml of Vimeral in 5 litres of water. If the chick shows symptoms like drowsiness, cough and distorted feet appearing or change in colour of excreta then immediately consult the nearest Veterinarian.

Fisheries

Fisherman are advised to prepare their own feed from locally available materials like oil cake, undecomposed grains, rice bran, mineral salt etc. (To prepare 100 kg fish feed there is need of 40 kg oil cake, 19 kg undecomposed grain (floor), 40 kg rice bran and 1 kg mineral mixture). In order to maintain the water colour light green, fill the pond with fresh water as and when needed. Also to maintain the proper water quality, apply lime @250 kg/ha and Potassium permagnate 500g/ha. Harvest only that much quantity which can be sold locally. Beware of gathering of fish while catching and selling the fish and at any cost maintain the social distancing.

Diagnostic visit to pond

CEREAL CROPS

Rice

Field preparation: Cleaning of the field and bund management should be done before the monsoon, and summer ploughing to done which helps to destroy pathogens and weed seeds.

Seed rate: Paddy seeds should be treated with a 17% salt solution before raising the nursery or direct seeding. Use the recommended seed rate: for line sowing, 80-90 kg/ha; for the Biasi and broadcast methods, 100-120 kg/ha. For the transplanting method, prepare the nursery in approximately $1/10^{th}$ of the total field area. Use 50 kg/ha of seed for thick-grained varieties and 40 kg/ha for thin-grained varieties.

Varieties: Farmers are advised to grow high-yielding varieties rice varieties for sowing in the Kharif season, such as Vikram-TCR, Durgeshwari, Chhattisgarh Sugandhit Bhog, Indira Aerobic-1, CG-1919, MTU-1318, CG Devbhog. Paddy Seeds should be treated with *Azospirillum* and *PSB* @ 5-10 g/kg of seed before sowing. Line sowing method should be adopted in paddy cultivation and a pre-emergence herbicide to be sprayed three days after sowing. Line sowing can be done using a seed-cum-fertilizer drill in a well-pulverized field. In leveled fields, sowing should be carried out at a row spacing of 20 cm using implements such as a tractor-drawn seed drill, Indira seed drill, Nari plough, or Bhoramdev seed drill. The seeding depth should not exceed 3-4 cm. Proper calibration of the seed drill is essential to maintain the recommended seed rate accurately.

Soil testing: Farmers are advised to get their soil tested. For this, they should contact the local agricultural officer or nearby Krishi Vigyan Kendra. Based on the soil test results, balanced fertilizers should be applied accordingly.

Weed management: Paddy should be sown in line and pre-emergence herbicide like Pretilachlor 50% EC @1500 ml/ha or Pyrazosulfuron 10% WP@ 200 ml/ha

should be applied within 3 days after sowing. Followed by post emergence application of Bispyribac sodium (10%) @ 250 ml/ha.

Pest and disease management: If symptoms of sheath blight disease are observed in paddy field, spray Hexaconazole @ 1000 ml/ha. Bacterial Leaf Blight in rice fields can be controlled by draining excess water and spraying a mixture of Validamycin @ 1250 ml, Streptomycin @ 30 g, and Potash @ 37.5 kg per ha. It is recommended not to apply/spray urea during this period. For the management of panicle mite, spray Diafethiuron 50% WP @ 1.2 g/L water along with Propiconazole @ 1ml/L at late tillering stage. If adult insects of Yellow Stem Borer are observed in the rice crop, destroy the egg masses immediately. Remove 'dead hearts' (dried central shoots) from the plants. Install pheromone traps @ 5 traps/ha to monitor stem borer activity in the rice field. For control, spray Fipronil 5% SC @ 1000 ml/ha. For control of leaf folder and army worm caterpillars, observe the population of larvae if it >1 per leaf, take up a spray of Fipronil 5% SC 1000 ml/ha.

Utera

When the rice crop is approaching maturity and the field retains some moisture, farmers can opt for relay cropping (utera) with linseed or lathyrus. Before sowing Kharif crops, farmers should arrange for necessary agricultural tools and equipment, carry out any required repairs, and perform deep ploughing using a MB plough. Cover the fields with polythene can help destroy weeds, soil-borne diseases, and insect eggs. If green algae appear in paddy fields, drain the water. Place a pouch of copper sulfate (blue vitriol) where water enters the field.

Maize

Use of high-yielding varieties such as Vivek Hy-17, Vivek Hy-43, Pusa Vivek QPM-9, VLQPM-45, Hybrid Maize-1, HQPM-1, Vivek Makka Hy-51, Pusa HM-4, DMRH-1308, IMH 230, and IMH 231. A germination test is essential to ensure an optimum number of healthy plants in the field. This should be followed by bio-priming or seed treatment using Carbendazim 50% WP @ 2 g/kg seed, Imidacloprid 600 FS @ 2 g/kg seed, *Trichoderma* @ 10 g/kg seed, and *Azotobacter* @ 10 g/kg seed to enhance productivity. The optimum sowing time is from June 15 to June 30, with a spacing of 60 x 25 cm (row x plant). Apply balanced fertilizers, including zinc-based fertilizers, for better crop growth.

For weed control, apply Topramezone 33.6% SC @ 30 ml per acre as a post-emergence spray at 20-25 days after sowing. The pupae of Fall Armyworm and stem borer, as well as the spores of *Rhizoctonia solani* (the causal agent of sheath blight), remain in the soil. Therefore, deep summer ploughing is crucial to reduce the inoculum potential. The infestation of Fall Armyworm can be significantly minimized by dry sowing or sowing at the onset of the monsoon, practicing crop rotation, and alternating maize with other crops that are not affected by Fall Armyworm. Additionally, apply a basal dose of nutrients and use the ridge and furrow method of bed preparation. These practices should be completed by the last week of May or the first week of June. Monitor regularly to prevent Fall Armyworm infestations. If necessary, spray Spinetoram 11.7 SC @ 350 ml/ha or Emamectin Benzoate 5 SG @ 200 g/ha. To control leaf blight disease, take up spray of Mancozeb 75 WP @ 1000 g/ha.

MILLET CROPS

Nutri cereals such as Kodo, Kutki (little millet), and Ragi (finger millet) are grown extensively in the Bastar plateau and Northern hills of Chhattisgarh, due to the favorable agro-climate for these minor millets. For optimal production, sowing of minor millets should be completed by the end of July.

The following varieties of minor millet crops are well-suited for cultivation in Chhattisgarh: Kodo: J.K.-41, J.K.-48, G.P.U.K.-3, Indira Kodo-1, Chhattisgarh Kodo-2. Ragi: P.R.-202(Godavari), V.L.-149, B.R.-708(Champavati), GPU-28, Indira Ragi-1, Chhattisgarh Ragi-2. Kutki: J.K.-8, B.G.-1, Chhattisgarh Kutki-1and Chhattisgarh Kutki-2. Farmers can select any one of the above-mentioned varieties as per the availability and requirement. Weeding can be done using a plough or harrow in row-sown crops. For post-emergence weed control, apply Chlorimuron-p-ethyl 10% WP + Metasulfuron-methyl 10% WP @ 20 g/ha.

PULSE CROPS

Pegion Pea

Deep summer ploughing should be carried out two months before sowing of pulses. Apply FYM and compost at 8-10 t/ha and mix them well. Pigeon pea and other pulse crops should be sown by treating the seeds with *Rhizobium* culture and *PSB* each at 10 g/kg seed. Improved Varieties for Early duration: ICPL-88039, Pusa Arhar 16 and medium duration: Asha, Rajeev Lochan (suitable for Chhattisgarh), LRG-41 to be used. Pigeon pea seeds should be treated with Carbendazim 50% WP at 3 g/kg of seed, as preventive measure against soil borne diseases. Sowing of pigeon pea should be completed by the end of June, with rows spaced 60-90 cm apart and 15-20 cm between plants with seed rate @ 12-15 kg/ha. The fertilizer dose should be scheduled based on soil test results. In general, a basal dose of 20-25 kg of nitrogen, 45-50 kg of phosphorus, 15-20 kg of potassium, and 20 kg of sulfur should be applied.

Improved varieties such as Chhattisgarh Arhar-1, Chhattisgarh-2, Rajeev Lochan, and TJT-501 should be sown. Pulse crops should be sown with proper drainage system in the field. Before sowing, seeds should be treated with *Rhizobium* culture + *PSB* @ 10 g/kg seed. Pod borer (*Helicoverpa*) can be managed by spraying Spinosad 45 SC @ 250 ml/ha, and aphids/jassids can be controlled by spraying Imidacloprid 17.8 SL @ 250 ml/ha. It is recommended to use wilt-resistant varieties; also treat the seeds with *Trichoderma viride* @ 10 g/kg seed.

For *Phytophthora* blight management, ensure proper drainage, followed by spray of Metalaxyl 4% + Mancozeb 64% WP @ 500 g/ha. When the pulse crop reaches 20-25 days, control the weeds by post emergence application of Quazalofop ethyl 5% E.C. at 50 g a.i./ha. Use of improved blackgram varieties such as Indira Urd Pratam, KU 96-3 and RBU-38. In green gram, use of high-yielding varieties such as IPM 410-3 (Shikha), IPM 205-7 (Virat), HUM-16. Before sowing, apply 2.5 kg *Trichoderma* with 100 kg FYM and incorporate it into the soil, to control soil borne diseases. For sowing, use improved green gram varieties with a seed rate of 20-25 kg/ha. To control yellow mosaic virus, treat the seeds with Imidacloprid 48% FS at 2 ml/kg of seed.

Soybean

Use improved high yielding soybean varieties such as JS 20-69, RVS 2002-4, JS 20-98, JS 20-116, Indore Soya 142, NRC 150, NRC 152, JS 2172, RVSM 2011-35 and Indore Soya 130. To eradicate the pest propagules, including the pupae of major pests and the spore structures of major pathogens that remain on farms, such as on threshing floors and in the soil, it is essential to minimize the initial pest/pathogen load. Sanitation of threshing floors, deep ploughing of fields, and cleaning of bunds are necessary. Farmers should also collect all crop debris and bury it in a compost pit. Seed materials should be carefully processed to remove physically damaged, discolored, or undersized seeds. Only clean, healthy, pest- and disease-free material should be stored as seed. Also treat the seeds with Carbendazim 25% + Mancozeb 50% WS @ 3 g/kg seed + biological fungicide *Trichoderma viride* @ 8-10 g/kg seed, Brady *rhizobium* culture and *Phosphate Solubilizing Bacteria* @ 10 g/kg seed each to get higher yields.

For the control of stem fly in soybean, treat seeds with the Thiamethoxam 30 FS @ 10 ml/kg seed before sowing. Ensure that soybean is sown on raised bed and Broad Bed and Furrow methods, to conserve moisture. For early maturing and short-statured varieties, maintain 30 cm row spacing. For long-duration and tall varieties, maintain 45 cm spacing between rows and 10 cm between plants. Apply fertilizers based on soil test recommendations. Generally, N: P^2O^5: K_2O at 25:60:40 kg/ha along with 20 kg/ha bentonite sulphur is recommended.

COMMERCIAL CROPS

Sugarcane

Both the nymphs and adults of whitefly suck the sap from the leaves, leading to stunted growth and a decrease in sugar content. To control this insect, spray Fenitrothion 50 EC at 2000 ml/ha at 15-day intervals. For control of leaf hopper, spray Chlorpyrifos 20% EC @ 1500 ml/ha or Dichlorvos 76% EC @ 375 ml/ha or Monocrotophos 36% SL @ 1000 ml/ha.

VEGETABLE CROPS

The current weather is favorable for onion cultivation. Before sowing, treat the seeds with Captan 75 WS @ 2.5 g/kg seed. In transplanted onion, dip the onion roots in a solution of Carbendazim 12% + Mancozeb 63% @ 2.5 g/L of water prior to transplanting. Raise the onion nursery with high-yielding varieties such as Agrifound Dark Red, Pusa Ridhi, N-53, Bhima Super, Bhima Raj, and Bhima Dark Red @ 12-15 kg seeds/ha. Considering the current temperature, farmers can begin garlic sowing. Ensure that the soil has adequate moisture before sowing. Recommended improved varieties to be sown such as G-1, G-41, G-50, and G-282.

During field preparation, apply the recommended dose of farmyard manure along with phosphorus fertilizer. Top dressing of nitrogen @ 20-25 kg/ha for cucurbit crops and 30-40 kg/ha for tomato, brinjal, and chili to be done for getting higher yield. For better fruit setting in tomato, brinjal, and chili, spray NAA @ 125 ml/ha. To prevent fruit cracking in tomatoes, spray 0.1% of borax at fruit setting stage.

For management of early blight and fruit rot of totmato, spray Copper Oxychloride @ 3 g/L or Metalaxyl 4% + Mancozeb 64% WP @ 1.5 g/L. For control of fruit and shoot borer

in brinjal, tomato, okra; erect pheromone traps @ 10 no./ha and spray Beauveria bassiana or Metarhizium anisopliae @ 1.5 L/ha or Lambda Cyhalothrin 10 WP @ 1.25 g/L or Emamectin Benzoate 5% SG @ 150-200 g/ha. In cucurbit crops, install 25 fruit fly traps per hectare during May to reduce the fruit fly damage. For control of leaf spot disease in chilli, spray Chlorothalonil 75% WP @ 2 g/L of water every 15 days. Keep monitoring regularly for mites, jassids, and leaf hoppers in vegetable crops, considering the prevailing temperatures. Light irrigation at short intervals is recommended in this weather. Neem oil @ 5.0 ml/L should be used in all vegetables for control of sucking pests at regular intervals. To control shoot borer in ginger and turmeric, spray Emamectin Benzoate 5% SG @ 150-200 g/ha. In case of leaf spot symptoms, spray Carbendazim 12% + Mancozeb 63% @ 2.5 g per liter of water at 15 days interval.

Transplant 25-30 days old brinjal and tomato seedlings. Before transplanting, treat the seedlings with a solution of Carbendazim 50% WP @ 20 grams and Streptocycline @ 1 gram in 10 liters of water. Use wilt resistant variety like arka samrat or grafted tomato is recommended for higher yields. Two or three deep cultivations in summer, followed by two harrowings, are necessary practices before planting tuber crops in the Kharif season. Farmers who want to grow bottle gourd and bitter gourd in the Kharif season should prepare ridges at a spacing of 1.5 meters before the monsoon, and set up bamboo or wooden stick staking at 2.5 meters along each ridge. Plant the prepared seedlings of rainy season vegetable crops, including vine crops like pumpkin, gourd, and bitter gourd, in the garden. Provide support for the vines to climb. Drainage channels should be repaired and maintained in good condition. Mulching should be applied to ginger, turmeric, elephant yam, and taro root crops. Introduce improved varieties of vegetables and spices, such as Turmeric (Suranjana), Arbi (Indira Arbi-1), and Elephant Foot Yam (Gajendra).

FRUIT CROPS

During field preparation, mix well decomposed farmyard manure @ 25-30 tonnes/ha into the soil. Begin pit digging with a proper layout plan for establishing new orchards. Prepare pits (1x1x1 m size) in summer season for establishment of new orchards, purchase fruit plants seedlings like mango, guava, sapota, jackfruit, Aonla etc., from reliable sources. Establish the plants with the onset of the monsoon after filling the pits with a mixture of FYM, soil, and sand in ideal proportions. Apply macro and micronutrients based on soil test values and recommended dose of fertilizers into consideration, along with dusting of 1.5% chlorpyrifos. In established plantations, training and pruning should be done before onset of monsoon. Grow fruits crops like Papaya, Lemon, Banana as intercrop in established plantations for additional income.

LIVESTOCK

Livestock management during summer

When ambient temperatures exceed the upper limits (24°-26°C for exotic and crossbred cows, 33°C for indigenous cows, and 36°C for buffaloes), the animals' bodies struggle to regulate temperature through sweating and panting. High temperatures can lead to reduced milk production, decreased fertility, and in severe cases, even death. Reproductive performance is adversely affected-such as difficulty in detecting estrus in female animals, lower conception rates, extended service periods, and longer dry spells. Indigenous breeds can tolerate heat better, but exotic

and crossbred animals are more susceptible to heat stress. Buffaloes are particularly vulnerable due to their dark skin and fewer sweat glands.

Animals experiencing heat stress or other health issues may exhibit rapid breathing, characterized by panting, fast and shallow breaths, and mouth breathing. Their skin often becomes dry and rough, while the eyes may appear red and watery. A noticeable reduction in feed and water intake is common, accompanied by digestive disturbances such as acidity, loose stools, and slowed gut movement. Urine output tends to decrease, indicating impaired hydration or kidney function. Affected animals may also display lethargy or weakness, often sitting or lying down frequently. Additionally, an increased heart rate is typically observed, often linked to heavy or labored breathing.

Housing and Environment: Keep animals in the shade and protect them from direct sunlight. Ensure adequate space in the shed, as overcrowding increases heat. Plant trees around the animal shelter to keep the surroundings cool. Construct well-ventilated sheds that allow hot air to exit and cool air to enter. Keep the shed roof high for better airflow. Paint the roof white to reduce heat absorption. Place mulch or wet jute sacks on the roof to lower the temperature.

Cooling: Install fans, foggers, and water sprinklers. Hang wet gunny sacks or soaked sheets around the animal shed. Ensure a constant supply of cool, clean water in cement tanks.

Feed and Water Management: Provide animals with continuous access to cool and clean drinking water. Feed them in the morning and evening to avoid generating excess body heat. Give enough salt or electrolytes to maintain the body's mineral balance.

Vaccination and treatment: If an animal shows signs of heat stress, consult a veterinarian immediately. Meanwhile, move the animal to a cool place, bathe it with cold water or wrap it in a wet cloth, and use a fan to cool it down. Some animal diseases can spread to humans (zoonotic diseases). Vaccination helps prevent the transmission of such diseases from animals to humans and from one animal to another. Never vaccinate animals that are sick, weak, or under stress. Treat them first and vaccinate only after recovery. Follow the prescribed vaccination schedule for livestock and get them vaccinated regularly through government or veterinary centers. Timely vaccinate to animals through FMD and H.S. Vaccination should be administered to prevent brucellosis (infectious abortion) in female calves aged 4 to 8 months.

Artificial Insemination (AI) should be continued in consultation with veterinary officer on door-to-door basis rather than direct visit to the dispensaries. To maintain productivity and improve immune status of animals, it is suggested for regular supplementation of mineral-60g/ day in adult dairy animals and 20-30g in small ruminants. Also, administer deworming medication. Offer clean and cool water three times a day. In case of injury in lactating cows, apply Himex ointment. In case of temporary shortage of availability of green fodder or concentrate feed farmers can prepare home-made feed by using grain like wheat, maize, wheat bran, oilcakes and salt. They can also prepare silage for their adult dairy animals. Due to increased maximum temperatures, goats should be kept in shaded areas and given clean, fresh water three times daily. Vaccinate goats against PPR (Peste des Petits Ruminants), Contagious Pneumonia, and ETV (Enterotoxaemia). Also, implement control measures for ticks and lice. To control ectoparasites, apply Butox or Cleaner @ 2 ml/L of water over the animal's body, ensuring the mouth is covered during application. Use smoke in animal shelters to keep away mosquitoes and other insects.

Poultry

During this hot summer provide good ventilation, maintain proper shed temperature and make availability of ample cold drinking water to maintain body temperature of birds. Use anti-stress vitamins such as vimeral to increase immunity and to reduce climate stress. Local poultry farmers are advised to feed concentrate mix with local available grain in ratio of 2:1 in the diet to maintain the health and growth of poultry birds during the scarcity of quality feed. The moisture and quality of the litter materials in poultry shed need to be maintain to prevent coccidiosis infestation. All the equipment in the shed should be disinfected using hot water and with any other proper disinfectant. Disinfect the premises of poultry houses with 1% sodium hypochlorite and inhibit the entry of outsider to the poultry houses and premises. Poultry farmers are advised to vaccinate the chicks at the age of 5-7 days against Ranikhet disease. Ensure vaccination of chicks against Ranikhet disease, if not done earlier.

Deworm the birds using piperazine before onset of monsoon season. After removing adult birds from the previous flock, thoroughly clean and disinfect the poultry shed. Maintain a 3 to 4-week gap between two flocks to ensure floor and environment sanitation (known as downtime). Use a brooder guard to create a circular space about 5 feet in diameter; this is sufficient for about 200 to 250 chicks. Place a heat source (such as infrared bulb, regular bulb, or gas brooder) in the center of the circle. Spread a 2-inch thick layer of straw or wood shavings inside the circle and cover it with old newspaper. Arrange feeders and drinkers in a circular pattern like the spokes of a wheel.

FOOD AND NUTRITION

During the summer, farmers and farm women should prioritize staying hydrated, consuming seasonal fruits and vegetables, and maintaining a balanced diet rich in protein and fiber. It is important to remain vigilant about food safety during the hot season and focus on nutrient-rich, easily digestible meals. Heat can cause dehydration, so drink water frequently throughout the day, not just when you feel thirsty. Avoid sugary drinks, they can lead to dehydration and other health issues. Summer offers a variety of nutritious options like watermelon, mangoes, cucumbers, and tomatoes. Always choose local produce, it is often fresher and more affordable. Include protein rich foods like lentils, beans, chickpeas, and paneer are excellent sources of protein. Eat fiber-rich foods like whole grains, vegetables, and fruits support digestion and help prevent constipation. Prefer light and refreshing foods, salads and curd can be easier to digest during summer. Avoid heavy, fried, or processed foods. These can be hard to digest and may contribute to dehydration.

Pit for planting of fruit sapling

Vaccination of animals

Goa's tropical monsoon climate, with high humidity and heavy rainfall, supports Kharif crops like paddy (the staple), pulses, groundnut, and vegetables. The region's lateritic and alluvial soils, ample rain, and moderate temperatures favor crop growth. To optimize yields and manage risks such as pest outbreaks and waterlogging, timely and location-specific practices are essential. This advisory provides key guidelines on land preparation, crop choice, pest and nutrient management, and sustainable farming for the Kharif season in Goa.

Prepare land for Kharif paddy and new orchards. Begin nursery sowing of Kharif rice Crop-wise Advisory.

CEREAL CROPS

Paddy

Sowing of Kharif rice in nursery can be done. Procure good quality seeds, fertilizers and other inputs. As the Rainy season is approaching, all the farmers are advised to repair the bunds of rice fields and keep bunds weed free. While pudding the field, green leaf manures or biomass could be added and incorporated @5t/ha. When the intensity of rainfall is low, apply 1 kg urea per 100 m^2 to the rice nursery. Control the crabs in the rice field by collecting during night time.

FRUIT CROPS

Banana

Clear drainage; avoid waterlogging. Provide staking support to young plants

Mango

Harvest stage: Remove fallen fruits; orchard hygiene. Fruit rot risk: Hot water treat fruits (48°C, 1 hr). Anthracnose: Spray Carbendazim @2g/L on seedlings. New planting: Space 5×5m; fill pits with FYM, neem cake, rock phosphate

Cashew nut

Apply first fertilizer split early June. Prune damaged branches; apply Bordeaux paste. CSRB: Apply Fipronil/Imidacloprid on trunk/roots. Remove grubs, apply Chlorpyrifos or Neem oil/neem cake. Clear drainage, provide staking. New planting: Space 7×7m (normal), 5×5m (high density).

Diagnostic visit on cashew

Coconut

Neem-garlic spray for mites, starch for whitefly. Use sticky traps; fill axils with neem cake + sand. Mulch basins; irrigate. New planting: Pit size 1.2×1.2×1.2m; spacing 7.5×7.5m

Arecanut

Apply fertilizer in early June. Remove dried/diseased leaves. Fruit rot: Spray 1% Bordeaux. Prepare pits with FYM before planting. Ensure drainage; staking for young plants.

LIVESTOCK

To protect animals from lightning, ensure shelters are dry and provide a gunny bag on the body of the animal for insulation. Identify high-ground sites for building shelters to prevent flooding. Implement mass vaccination programs for Foot and Mouth Disease (FMD), Hemorrhagic Septicemia (HS), and Black Quarter (BQ) to safeguard animal health. Regular veterinary visits should be ensured for proper care, and proper carcass disposal must be followed. Store dry fodder in a well-ventilated area to avoid mouldy feed, which can be harmful to animals. Grow Hybrid Napier CO-5 for green fodder to provide a nutritious feed source. To control tick infestations, spray Deltamethrin and flame the shed every 10-15 days to maintain hygiene and prevent diseases.

Poultry

To maintain optimal conditions for poultry during the monsoon season, it is crucial to prevent litter wetness by using fresh litter or applying lime to absorb excess moisture. Clean the waterers and feeders daily to avoid contamination and ensure the birds have access to clean drinking water. Adding 5% fat to the feed during rains can help maintain energy levels and support egg production. Use artificial lighting to maintain consistent egg production during shorter daylight hours. Adhere to the vaccination schedule to prevent diseases like Fowl Pox and Infectious Bursal Disease (IBD). Ensure the poultry house is well-

Back yard poultry rearing by
Woman farmer with KVK scientist

maintained with a functional drainage system before the monsoon begins, and keep the doors closed with curtains to prevent rainwater from entering the shed. In areas with heavy rainfall, such as Goa, it is recommended to raise the floor and install a generous roof overhang (4-5 feet) over the entrance to protect the birds. If the litter material becomes excessively wet, replenish it with fresh material or treat it with slaked lime at 1 kg per 10 square meters. Always check for mould growth in feeders and waterers, and provide clean drinking water or use chlorinated water by adding 2 g of bleaching powder per 1000 liters of water. The feed storage should be regularly checked for moulds and fungus infection. Toxin binder may be provided in feed formulation especially in duck feed.

- High energy source such as fat @ 5% may be added in feed
- Reduction in day length hamper egg production in layers. Hence, florescence light may be provided which mimic the daylight
- Vaccination should be done strictly as per vaccination schedule for poultry
- Hence, adequate hygiene and biosecurity measures should be strictly followed to curb the outbreak of any disease.

Gujarat provides region-specific, science-based recommendations to help farmers improve productivity and resilience during the monsoon season. With climate variability and resource constraints in mind, it promotes integrated crop management, timely pest-disease control, efficient water-nutrient use, and adoption of improved seed varieties. Tailored to the state's varied soils and rainfall patterns, this guidance aims to support sustainable farming and secure farmer livelihoods across Gujarat.

SOUTH SAURASHTRA

This region includes Amreli, Bhavnagar, Botad, Devbhumi-Dwarka, Gir-Somnath, Jamnagar, Junagadh, Morbi, Porbandar, Rajkot, and Surendranagar, SAU: Junagarh Agricultural University, Junagarh (Gujarat). They have an average rainfall of 400-1000 mm. Soils are shallow to medium black soils, often affected by salinity and alkalinity.

Groundnut

Groundnut cultivation begins with deep ploughing the field 2-3 times to achieve a fine tilth up to 25-30 cm depth. Incorporating 5-7 t/ha of well-decomposed farmyard manure (FYM) before sowing improves soil fertility. Sowing is generally done during June-July. Recommended semi-spreading varieties include GJG-22, GG-20, and Girnar-4, while erect types include GJG-32, GJG-17, and KDG-128. For optimal plant spacing, maintain 60 × 10 cm for semi-spreading types and 45 × 10 cm for erect ones. Seeds should be treated with Vitavax and *Rhizobium* at 375-500 g/ha to promote healthy germination and nitrogen fixation. Weed control involves pre-emergence application of Pendimethalin at 1.0 kg/ha, followed by two hand weedings at 20 and 40 days after sowing (DAS), or alternatively, post-emergence application of Quizalofop-P-ethyl at 50 g/ha. Timely irrigation is crucial, especially during flowering, pegging, and pod development stages in case of dry spells.

Groundnut Demo Plot

Nutrient management includes application of potassium at 50 kg/ha along with recommended nitrogen and phosphorus doses, and in saline soils, gypsum should be applied at 5 t/ha. To enhance crop nutrition, foliar spray of 0.2% boric acid or nano boron should be applied at 30, 45, and 60 DAS. For plant protection, collar and stem rot can be managed with a spray of Mancozeb or neem extract around 75 DAS. White grub infestation can be controlled through seed treatment with Chlorpyriphos or Imidacloprid, and soil application of Metarhizium anisopliae or Carbofuran. Sucking pests should be managed through seed treatment with Imidacloprid or foliar spray with Thiamethoxam, while defoliators can be controlled using Quinalphos, Chlorpyriphos, or Flubendiamide. Harvesting should be done at 120-125 DAS using a blade harrow, followed by threshing to separate the pods.

Soybean

Soybean grows best in well-drained loamy soils and should be avoided in saline or alkaline conditions. Deep ploughing and the application of farmyard manure (FYM) are essential for soil preparation. Recommended varieties include JS 335, GJS-3, and GS-4. Sowing is done in June-July with a spacing of 45×5 cm and a depth of 3-5 cm, using a seed rate of 70-80 kg/ha. Seeds should be treated with Carbendazim or Thiram along with *Rhizobium* and phosphate-solubilizing bacteria (PSB) to enhance germination and nutrient uptake.

For weed management, Pendimethalin is applied pre-emergence and Imazethapyr post-emergence, along with hand weeding at 20 and 40 days after sowing (DAS). To manage sucking pests, seed treatment with Imidacloprid is effective, while collar rot can be controlled by treating seeds with Fluxapyroxad or a combination of Carboxin and Thiram. In case of defoliator infestation, spraying Indoxacarb, Lambda-cyhalothrin, or a Novaluron mixture is recommended. For rust and leaf spot diseases, fungicides like Hexaconazole or Pyraclostrobin should be applied. Additionally, 75% of the recommended dose of fertilizers (RDF) should be supplemented with 25 kg/ha of Mycorrhiza and *Rhizobium* seed treatment to enhance soil health and crop productivity.

Cotton (*Bt* & Desi)

Cotton cultivation thrives best in well-drained loamy to sandy loam soils. Prior to sowing, deep ploughing is essential along with the incorporation of 10-15 t/ha of farmyard manure (FYM) to enhance soil fertility. Sowing is typically carried out in June-July under rainfed conditions and during April-May for irrigated crops. Recommended spacing for normal planting is 90-120 × 30-45 cm, while under high-density planting (HDP) systems, 60 × 30 cm spacing is advised. Suitable varieties include *Bt* hybrids like G. Cot. Hy. 24 and 26, and desi types such as GADC-3 and GADC-4. The seed rate varies by type, with 1.5-2 kg/ha for *Bt* varieties and 10-12 kg/ha for desi types.

Weed management includes pre-emergence application of Pendimethalin, followed by post-emergence herbicides like Quizalofop or Pyrithiobac, along with 2-3 timely hoeings. For growth regulation, Mepiquat Chloride is recommended at 45 and 75 days after sowing (DAS) to control excessive vegetative growth. Pink bollworm should be monitored from the flowering stage onwards, and if the economic threshold level (ETL) is crossed, Thiodicarb or Quinalphos should be sprayed. Jassid infestations can be effectively managed with sprays of Flonicamid or Dinotefuran. To manage leaf spot diseases, fungicidal sprays of Propiconazole, Pyraclostrobin, or Azoxystrobin are recommended. For soil-borne diseases like wilt and root rot, seed treatment with beneficial microbes such as *Pseudomonas fluorescens* or chemical treatments using Carboxin and Thiram is effective. Nutrient management should include the application of zinc sulfate at 50 kg/ha and potassium at 150 kg/ha. Additionally, a 1% multi-micronutrient foliar spray should be applied at 45, 60, 75, and 90 DAS to support optimal crop growth and yield.

Sugarcane

Sugarcane cultivation begins with deep ploughing and the application of 10 FYM t/ha followed by field preparation by November. Planting is typically done from December to January using Eksali planting method, with recommended varieties including Co 2005, Co 5071, Co 0238, and GNS-10/11/12. The recommended spacing for planting is 75×20 cm, using top setts, preferably with a planter for efficient planting. For weed control, apply Atrazine at 2 kg/ha as a pre-emergence treatment, along with two hand weeding sessions at 40 and 60 days after sowing (DAS). Interculturing should be done at 60 DAS, and earthing up should be performed at 100 DAS. Adequate irrigation is crucial throughout the crop's growth cycle, especially during critical stages such as germination and tillering, to ensure optimal growth and yield.

Bajra (Pearl Millet)

Cultivation of Bajra

For successful bajra cultivation, the field should be ploughed 2-3 times to achieve a fine tilth, and 5 t/ha of farmyard manure (FYM) should be applied per hectare. Sowing is recommended from late June to mid-July, using improved varieties such as GHB 905, 1129, 1225, and 1231. Maintain a spacing of 45×10 cm with a seed rate of 4 kg/ha. Seeds should be treated with Vitavax before sowing. Thinning and gap filling should be done around 20 days after sowing (DAS), along with two hand weedings at 20 and 40 DAS. For weed control, Atrazine can be applied post-emergence at 1 kg/ha. Irrigation should be provided during critical growth stages like tillering, panicle initiation, and flowering, especially during dry spells.

Pigeon Pea

Pigeon pea (tur) cultivation involves selecting appropriate varieties based on maturity duration. Early maturing varieties include GT-1, GT-100, 101, 102, 103, and

Vaishali, while late maturing ones are BDN-2, Anand Grain Tur 2, and IPCL-87119. Sowing should begin as soon as sufficient rainfall is received in June-July. Land preparation involves applying 8-10 t/ha manure followed by light deep ploughing and 1-2 harrowings to ensure uniform and level soil. Spacing for early maturing varieties should be 45-60 × 15-20 cm, while for late maturing types, wider spacing of 90-120 × 25-30 cm is recommended. Fertilizer application should follow a dose of 25:50:00 kg/ha of N:P:K. Gap filling and thinning should be carried out 10-15 days after sowing (DAS).

For managing *Helicoverpa armigera*, planting yellow marigold around and between rows is effective. Sterility mosaic disease, which is mite-transmitted, can be controlled by spraying Propargite, Fenazaquin, or Fenpyroximate at 10 ml per 10 liters of water. To manage powdery mildew, spray soluble sulfur (80% WP) at 30 gm or Carbendazim, Hexaconazole, or Dinocap at 10 ml per 10 liters of water.

Coconut

For hybrid (D × T) palms, apply 270 g of urea/plant/month through drip irrigation. The drip schedule should be adjusted seasonally, with 1.5 hours of irrigation/day from October to February and 2.5 hours per day from March onward. Each palm should be equipped with four drippers, each delivering 8 liters/hour, positioned approximately 1 m away from the trunk to ensure even and efficient water and nutrient distribution.

SOUTH GUJARAT

This region of Gujarat includes Surat, Navsari, Valsad, Tapi, Bharuch and Narmada, SAU: Navsari Agricultural University, Navsari (Gujarat). These area experiences rainfall ranging from 400 to 900 mm annually. The soil is predominantly deep black cotton soil, which is known for its fertility and suitability for various agricultural activities.

Paddy

Select high-yielding or hybrid varieties suitable for South Gujarat such as GNR-3, GR-11, GR-7, IR-28, and hybrid PRH-10. Prefer puddled lowland fields with good water retention and proper bunding for transplanting. Raise healthy nursery on well-prepared land; sow 20-25 kg seed/ha for varieties and 10-12 kg/ha for hybrids. Treat seeds with *Trichoderma viride* or Bavistin to prevent seed-borne diseases. Apply FYM @ 5-10 t/ha and basal NPK @ 100:50:50 kg/ha depending on soil test recommendations.

Transplant 21-25 days old seedlings, using 2-3 seedlings per hill at a spacing of 20×15 cm. Maintain 2-5 cm standing water in field for 15-20 days post-transplanting, then adopt alternate wetting and drying. Apply pre-emergence herbicide Butachlor @ 1.5 L/ha 3 days after transplanting; do hand weeding at 30 and 45 DAT. Apply top dressing of nitrogen in 2-3 splits (at tillering, panicle initiation, and flowering stages). Monitor for stem borer, leaf folder, and gall midge; use chlorantraniliprole or fipronil as needed. For sheath blight and blast, apply tricyclazole or validamycin at recommended doses. Maintain field sanitation; drain excess water to reduce disease and pest incidence.

Stop irrigation 10-12 days before harvesting; harvest when 80-85% grains in the panicle are matured. Dry harvested grains properly to maintain quality and reduce post-harvest losses.

Groundnut

Use improved groundnut varieties like GJG-32 and GJG-22 with a seed rate of 100-120 kg/ha. Treat seeds with *Rhizobium* culture and appropriate insecticides to prevent white grub infestation. After the first rainfall, spray surrounding trees to control grub sources and minimize field infestation.

Sesame

For effective cultivation, land preparation should focus on creating well-drained, loamy soil through 1-2 ploughings followed by levelling. The ideal sowing period is from the last week of June to mid-July, immediately after the onset of the monsoon. Recommended varieties include Gujarat Til 1, Gujarat Til 2, and Gujarat Til 3. The seed rate should be 5-6 kg per hectare, with a recommended spacing of 30 cm × 10 cm (row × plant) to ensure optimal growth. Seeds should be treated with either *Trichoderma viride* at 4 g/kg seed or Carbendazim at 2 g/kg seed to prevent seed-borne diseases.

For fertilizer application, a basal dose of 40 kg N and 20 kg P_2O_5 per hectare should be applied at the time of sowing. Weed management can be achieved through interculture or hand weeding, which should be done twice-once at 15-20 days after sowing (DAS) and again at 30-35 DAS. Pest management for leaf roller or capsule borer involves spraying Neem oil at 2% or Spinosad 45 SC at 0.3 ml/L. To manage diseases like Alternaria leaf spot or Phyllody, infected plants should be removed and, if necessary, Mancozeb 0.2% should be applied. Water management is primarily rainfed, but light irrigation should be provided if there is a dry spell lasting more than 10 days, particularly during the flowering or pod-filling stages.

Cotton

For *Bt* cotton cultivation, select recommended hybrids suited to the region, such as GCHH 245, GCHH 177, RCH 2 BG-II, and JKCH 1947. The ideal sowing period is from mid-June to early July, coinciding with the onset of the monsoon. Land preparation should involve deep ploughing followed by harrowing to achieve good tilth. Before sowing, treat the seeds with Carbendazim or Thiram at 2 g/kg to prevent seed-borne diseases. The recommended spacing for *Bt* cotton hybrids is 120 cm × 60 cm, ensuring a proper plant population of approximately 13,000-15,000 plants per hectare. Fertilizer application should include 240 kg of nitrogen, 60 kg of phosphorus, and 60 kg of potassium per hectare. Apply 25% of the nitrogen, along with the full dose of phosphorus and potassium, as the basal dose, and split the remaining nitrogen into 2-3 applications during the growing

Pest Surveillance in Cotton

season. Weed management should start with a pre-emergence spray of Pendimethalin at 1 kg a.i./ha immediately after sowing, followed by manual weeding at 20 and 40 days after sowing (DAS).

Intercropping with green gram, black gram, or cowpea during the early growth stages can provide additional income and improve soil health. For plant protection, monitor for sucking pests like aphids, jassids, and whiteflies, and spray Thiamethoxam at 0.3 g/l or Imidacloprid at 0.3 ml/l if necessary. Bollworm control can be managed using pheromone traps, and sprays of Spinosad, Emamectin benzoate, or Flubendiamide should be applied when pests reach threshold levels. Biocontrol agents like *Trichogramma* can be used where feasible. To prevent fungal diseases such as Alternaria and anthracnose, spray a combination of Carbendazim and Mancozeb. Ensure clean cultivation practices and remove infected plants to prevent the spread of disease. Avoid waterlogging during the monsoon, and provide protective irrigation during dry spells, especially during boll formation. Growth regulation can be enhanced by spraying 2% DAP or 1% KNO_3 at flowering to improve boll retention.

Sugarcane

For sugarcane cultivation, it is important to select region-specific, high-yielding, and disease-resistant varieties such as Co 86032, CoN 05071, CoN 09072, and Co 99004. The ideal planting time is from mid-June to July, especially under rainfed conditions. Land preparation involves deep ploughing followed by harrowing, levelling the fields, and ensuring good drainage to prevent water stagnation. Use 3-budded setts from healthy, disease-free canes, and treat them with fungicides like Carbendazim 0.1% and insecticides such as Chlorpyriphos 0.1% before planting. The recommended row-to-row spacing is 120 cm, with a sett-to-sett spacing of 30 cm to ensure proper aeration and sunlight. Use 300 kg of nitrogen, 75 kg of phosphorus, and 75 kg of potassium (K_2O) per hectare. Apply the full dose of phosphorus and potassium, along with one-third of the nitrogen, at planting. The remaining nitrogen should be applied in two equal splits, one at 45 days and the other at 90 days after planting.

Weed management can be achieved using pre-emergence herbicides such as Atrazine at 1 kg/ha or Metribuzin at 1.25 kg/ha. During dry spells, provide light irrigation, particularly at the formative and grand growth stages, to maintain adequate moisture for proper tillering. Earthing up should be carried out at 45-60 days after planting (DAP) for partial earthing and at 90-120 DAP for full earthing to promote root growth and prevent lodging. Release *Trichogramma chilonis* at 50,000/ha/week to control early shoot borers, and apply Chlorpyriphos at 2.5 L/ha with irrigation to manage white grubs. In case of top shoot borers, spray Chlorantraniliprole or Spinosad when pests reach threshold levels. To prevent red rot and smut, use disease-free setts and rotate with non-host crops such as rice or legumes, and promptly remove and destroy infected clumps. Intercropping with crops like green gram, black gram, cowpea, or groundnut during the early growth stages can enhance income and improve soil fertility. Additionally, retaining sugarcane trash in the inter-row spaces helps conserve moisture and suppress weeds.

MILLETS

Finger Millet, Little Millet and Foxtail Millet

For millet cultivation use high-yielding, region-appropriate varieties such as GPU 28, CO 13, and PR 202 for finger millet; OLM 203 and OLM 205 for little millet; and SiA 3085 and SiA 3156 for foxtail millet. The best sowing window is from mid-June to mid-July, coinciding with the onset of the monsoon. Land preparation involves ploughing 2-3 times to achieve a fine tilth, followed by levelling the field to ensure proper drainage. The recommended seed rate for line sowing is 8-10 kg per hectare, with row spacing of 22.5-30 cm and plant-to-plant spacing of 8-10 cm. Use Thiram or Carbendazim at 2 g/kg for seed treatment and to protect against seed-borne diseases. Fertilizer application should include 40 kg of nitrogen, 20 kg of phosphorus, and 20 kg of potassium per hectare. Apply full dose of phosphorus and potassium, along with half of the nitrogen, at sowing, and the remaining nitrogen at 30 days after sowing (DAS). Weed management can be achieved with the first weeding at 15-20 DAS and the second at 30-35 DAS, using inter-cultivation or a pre-emergence herbicide like Pendimethalin at 1.0 kg/ha.

Millets are mostly rainfed, but supplemental irrigation may be necessary during flowering and grain filling if rainfall is insufficient. For plant protection, control shoot fly by applying Carbofuran at 10 kg/ha in furrows at sowing. To manage blast or leaf spot diseases, spray Mancozeb at 2 g/L at the onset of symptoms. Crop rotation and field hygiene are also important practices for disease management. Harvesting should occur when the grains are mature and hard, typically 90-110 days after sowing, depending on the species. Ensure the grains are well-dried before threshing and storage to prevent mold. Additionally, millets can be intercropped with pulses such as green gram and black gram, or with oilseeds like sesame, to improve returns and enhance soil fertility.

FRUIT & VEGETABLE CROPS

Banana

The ideal planting time for bananas is during June-July, coinciding with the onset of the monsoon. Recommended varieties include Grand Naine (G9), Dwarf Cavendish, Basrai, Shrimanti, and BRS-1, depending on local suitability. For land preparation, deep ploughing and leveling are necessary, followed by digging pits of 60 x 60 x 60 cm. These pits should be filled with 10-15 kg of farmyard manure (FYM) and soil before planting. Spacing for G9 plants should be maintained at 1.8 m x 1.5 m or 2 m x 2 m, depending on the irrigation method and variety. Planting material should consist of tissue-cultured plants or healthy sword suckers that are disease-free. Apply FYM at 50 kg per plant per year. The recommended fertilizer dose per plant annually includes 200-250 g of N, 60-80 g of P_2O_5, and 200-300 g of K_2O, applied in 4-5 splits, with the first dose applied after planting and subsequent doses at two-month intervals. Irrigation management should focus on water efficiency, ideally through drip irrigation.

During the monsoon, ensure good drainage to prevent water stagnation. Intercultural operations should include keeping the field weed-free and mulching around the base of

the plants with dry leaves or straw. Propping is necessary during the monsoon to prevent lodging of the plants due to wind and rain. For plant protection, control pseudostem borers by removing dried leaves and applying Chlorpyriphos in the leaf axils. To manage Sigatoka leaf spot, spray Carbendazim or Mancozeb at 2 g/L alternately every 15-20 days. To prevent Panama wilt, avoid waterlogging and use disease-free planting material. Desuckering is also important to remove unwanted suckers and retain 1-2 healthy followers per mother plant. For bunch management, cover banana bunches with sleeves or perforated polythene bags to protect them from sunscald and pest attacks.

Mango

The ideal time for planting grafted mango saplings is during June-July. It is important to maintain a spacing of 10 x 10 meters between plants and provide support to the young plants to prevent wind damage. Proper drainage in the orchards is essential to avoid waterlogging and root rot, particularly during heavy rains. The basins around the plants should be kept weed-free, and applying organic mulch such as dry leaves or straw can help conserve soil moisture and suppress weed growth. For nutrient management, it is recommended to apply 50-100 kg of well-rotted farmyard manure (FYM) per tree at the onset of the monsoon. In addition, apply 1-2 kg of urea, 2-3 kg of single super phosphate (SSP), and 1-1.5 kg of muriate of potash (MOP) per tree in split doses once in July and again in September. Fertilizers should be mixed into the soil around the basin, avoiding direct contact with the trunk.

For plant protection, regularly monitor for pests like leaf hoppers, mealy bugs, and stem borers. If these pests are detected, spray Dimethoate 30 EC at 10 ml or Chlorpyriphos 20 EC at 20 ml per 10 litre of water. Additionally, applying lime paste to the tree trunks can help deter stem borers. Post-monsoon humidity can lead to diseases like anthracnose and powdery mildew, so it is advisable to spray Carbendazim 0.1% or Copper oxychloride 0.3% at the first signs of infection. Training and pruning are crucial for the healthy growth of mango trees. After the rains, remove diseased, overlapping, or inward-growing branches to improve air circulation and light penetration. In young orchards, intercropping with legumes such as cowpea or green gram can enhance soil fertility and provide additional income.

For brinjal cultivation, the recommended varieties include Gujarat Anand Oblong Brinjal 2, Gujarat Anand Brinjal Hybrid 3, Gujarat Anand Brinjal 6, Gujarat Round Brinjal 8, and Gujarat Green Brinjal 9. The seed rate should be between 250-300 g/ha, with approximately 20,000 seedlings required per hectare. The ideal planting spacing is 90 x 60 cm. Water should be applied as needed using a watering cane. Treat seeds with the biological fungicide *Trichoderma viride* 1% W.P, 5 g/kg of seed. Seedlings should be grown when sufficient, typically in the month of July, with spacing of 90 cm x 60 cm or 90 cm x 75 cm. For basal fertilization, apply 50:50:50 NPK (nitrogen, phosphorus, and potassium) at 50 kg per hectare. Additionally, to manage pests, use pheromone traps as part of integrated pest management strategies.

To ensure the well-being of livestock, provide adequate shade, cool water, and a mineral mix for proper nutrition. Regularly shower animals to help keep them cool. Vaccinate for Hemorrhagic Septicemia (HS) and Black Quarter (BQ), and deworm young animals to maintain their health. For tick control, use Deltamethrin. Additionally, use sanitizers in the sheds to reduce the presence of flies and mosquitoes, promoting a clean and hygienic environment for the animals.

CENTRAL GUJARAT

This region of Gujarat includes Ahmedabad, Anand, Kheda, Vadodara, Panchmahal, Mahisagar, and Dahod. They receive 600-900 mm of rainfall annually. The region has shallow to medium-depth black and red soils, which are typically low in fertility and organic carbon.

Maize

For sowing in Central Gujarat, use improved varieties like Narmda Moti, GM-2, GM-4, and GM-6, and hybrids such as GAYMH-1 and GAWMH-2. The ideal sowing time is from June 15th to July 15th. Prepare the land with 1-2 harrowings and 1 planking, applying manure before sowing. For spacing, use 60x20 cm for improved varieties and 75x20 cm for hybrids. The seed rate is 20-25 kg/ha for improved varieties and 25-30 kg/ha for hybrids. Fertilizer application should be 100:50:00 (N:P:K) kg/ha for improved varieties and 120:60:00 (N:P:K) kg/ha for hybrids. For plant protection against Fall Armyworm, use light traps, pheromone traps, and Neem seed powder/oil spray.

Rice

For transplanted rice cultivation, use 20-25 days old seedlings, with 2-3 plants per hill. Treat seedlings with *Azotobacter* and PSB liquid before transplanting. Irrigate with 5-7 cm of stagnant water. For top dressing, apply 40-48 kg N/ha at the tillering stage. For plant protection, control stemborer with light traps and spray Flubendiamide or Indoxacarb. Manage Leaf Blight with Streptocycline + Copper Oxychloride, and control Blast with Tricyclazole spray.

Soybean

Use recommended varieties: NRC-37, JS-335, KDS 726, Gujarat Soybean-2, and JS-9305. The ideal sowing time is from June to mid-July, with early sowing if conditions permit. Land preparation involves applying 10-15 tonnes of manure, followed by ploughing and harrowing. For spacing, use 45x7.5 cm or 30x5 cm, with a seed rate of 70-80 kg/ha. Fertilizer application should be 45:60:00 (N:P:K) kg/ha before sowing. Weeding can be done manually or with a Propaquizafop + Imazethapyr spray. For plant protection, control Bihar Hairy Caterpillar with Neem powder or pesticide spray, and manage Girdle Beetle with Novaluron or Quinalphos spray.

Pigeon Pea

For pigeon pea cultivation, early varieties include GT-1 and Vaishali, while late varieties are BDN-2 and IPCL-87119. The ideal sowing time is June-July, after rainfall. Land preparation involves applying 8-10 tonnes of manure, followed by ploughing and harrowing. For spacing, use 45-60 x 15-20 cm for early varieties and 90-120 x 25-30 cm for late varieties. Fertilizer application should be 25:50:00 (N:P:K) kg/ha.

For plant protection, control Heliothis with marigold planting, manage Sterility Mosaic with Propargite spray, and control Powdery Mildew with Sulfur or Carbendazim spray.

Tomato

For tomato cultivation, recommended varieties include Gujarat Tomato-2, Gujarat Tomato-5, and Anand Tomato-8. The seed rate is 200-250 g/ha, and the ideal spacing is 90x75 cm or 70x60 cm. For nursery management, apply Metalaxil MZ to prevent root rot and use micro-nutrient sprays. For plant protection, control Leaf Miner with Neem powder/oil spray, and use Spinosad for severe infestations. Manage Early Blight with Mancozeb or Chlorothalonil spray.

Chilli

For chili cultivation, recommended varieties include GVC-101, Anand Jwala, and hybrid varieties. The seed rate is 750 g/ha, with spacing of 60x60 cm. Apply a basal fertilizer of 50:50:50 (NPK) kg/ha. For plant protection, control Thrips with Neem powder/oil spray and use Spinosad for severe infestations. Manage Leaf Curl virus with Pyriproxyfen or Fenprofethin spray.

Brinjal

For brinjal cultivation, use recommended varieties: Gujarat Anand Oblong Brinjal 2 and hybrid varieties. The seed rate is 250-300 g/ha, with spacing of 90x60 cm. For nursery management, use *Trichoderma virdi* and water as needed. For plant protection, control Whitefly with Neem powder/oil spray, and manage Little Leaf by removing affected plants and applying Pyriproxyfen spray.

To improve milk yield in lactating animals, formulate a proper feed rich in essential nutrients. Consider using *Azolla* as a green fodder replacement to enhance protein intake. During rainy seasons, keep livestock indoors and ensure proper fodder storage. Vaccinate animals against FMD (Foot and Mouth Disease) and Brucellosis, along with other necessary vaccines. Maintain clean and hygienic animal sheds to prevent mastitis. Deworm animals with Fenbendazole, and control ectoparasites using Deltamethrin or Amitraz.

NORTH GUJARAT-KUTCHH

This region of the state includes the regions of Banaskantha, Patan, Mehsana, Sabarkantha, Aravalli, and Gandhinagar. The local agricultural university is Sardarkrushinagar Dantiwara Agricultural University (S.K.Nagar, Banaskantha). The region receives rainfall between 700-1000 mm annually and is characterized by loamy sand soil.

Groundnut

For groundnut cultivation, the latest improved variety GG 37 (Bunchy type) is recommended. The ideal sowing period is from June 15th to July 10th, with a seed rate of 100-120 kg/ha and a row spacing of 45 cm. Employ the FIR approach (Fungicide, Insecticide, Rhizobium) for seed treatment, using Mancozeb @ 2.5 g, Quinalphos 25 ml, and *Rhizobium* 10 ml/kg of seed to manage white grub and collar rot. Apply a fertilizer dose of 12.5:25:0 NPK kg/ha, along with 8-10 t/ha of FYM. Supplement with secondary nutrient sulfur at 20 kg/ha. For collar rot management, apply

Trichoderma viridi @ 2.5 kg/ha. To address iron chlorosis, use a foliar spray of ferrous sulfate @ 0.5%. For Heliothis and leaf-eating caterpillars, apply a foliar spray of Neem seed extract 5%, Chlorpyriphos 20 EC 20 ml, Spinosad 45 SC 3 ml, Flubendiamide 48 SC 3 ml, or Novaluron 10 EC 20 ml per 10 litres of water.

Pearl Millet

For optimal growth, sow the latest improved hybrid seed with a seed treatment of Azotobacter (5 ml per kg of seed). The recommended seed rate is 4 kg/ha, with a spacing of 45 cm × 10 cm. Apply a fertilizer dose of 80:40:0 NPK (kg/ha) along with 10 tons of FYM per hectare to ensure healthy plant development.

Castor

For castor cultivation, use the latest improved hybrids, GCH 7 and GCH 8, which are wilt-tolerant. The ideal sowing time is after 15th August, with recommended spacing of 150 cm × 120 cm. Apply a fertilizer dose of 135:37.5:0 NPK (kg/ha) along with 8-10 t/ha of FYM Additionally, use sulfur as a secondary nutrient at 20 kg/ha. To manage semi looper infestations, ensure proper sowing time, field sanitation to remove plant debris, and remove infected leaves from plants. For pest control, use a foliar spray of Emamectin benzoate 5% SG (3 g), Spinosad 45 SC (3 ml), or Flubendiamide 39.35 SC (10 ml) per 10 litres of water.

Green Gram

For greengram cultivation, use the latest improved varieties such as GM 4, GAM 5, and GM 6. Sow at the onset of the monsoon using a seed rate of 17.5 kg/ha with a spacing of 45 cm × 10 cm. Treat seeds with a fungicide @ 2 g/kg, followed by PSB and *Rhizobium* inoculation @ 5 ml/kg. Apply fertilizers at 20:40:0 NPK kg/ha along with 5 t/ha of FYM. To manage pod borer, practice deep summer ploughing and maintain proper field sanitation by removing plant debris and infected plants. Install light or pheromone traps, and apply a foliar spray of Neem oil (30 ml), Emamectin benzoate 5% SG (3 g), or Spinosad 45 SC (3 ml) per 10 litres of water.

Black Gram

For black gram cultivation, use improved varieties like GU 1, GU 2, and GU 3. Sow at the onset of the monsoon with a seed rate of 17.5 kg/ha and spacing of 45 cm × 10 cm. Treat seeds with a fungicide @ 2 g/kg, followed by PSB and *Rhizobium* @ 5 ml/kg. Apply fertilizers at 20:40:0 NPK kg/ha along with 5 t/ha of FYM. For pod borer management, conduct deep summer ploughing, maintain field sanitation by removing debris and infected plants, and use light or pheromone traps. Spray Neem oil (30 ml), Emamectin benzoate 5% SG (3 g), or Spinosad 45 SC (3 ml) per 10 liters of water for effective control.

Pomegranate

For new pomegranate plantations, use varieties like Bhagwa and Solapur Red, planting in June-July at a spacing of 4 × 3 m using 60 × 60 × 60 cm pits. In old orchards, practice bahar management by withholding irrigation for up to 30 days. After leaf drop, apply the recommended dose of fertilizers (RDF) and manure in the pits. Spray Ethaphon @ 2 ml/litre of water + 5 g of 0:52:34 fertilizer to aid flowering. Provide light irrigation via drip. For disease management, spray Copper Oxychloride @ 3 g/litre or a combination of Carbendazim 12% + Mancozeb 63% WP @ 2 g/litre.

Tomato

Use high-yielding tomato varieties like GAT-8, Arka Rakshak, and other hybrids. Transplant pro-tray raised seedlings onto raised beds with silver-black plastic mulch at 90 × 60 cm spacing. Apply a fertilizer dose of 100:50:50 NPK kg/ha along with 10 tons of FYM/ha. Spray micronutrient mixture during flowering and fruiting for better yield. For early blight and fruit rot, apply Copper Oxychloride @ 3 g/L or Carbendazim 12% + Mancozeb 63% WP @ 2 g/L as symptoms appear. To control fruit borer, spray Spinosad 45 SC @ 3 ml per 10 litres of water.

LIVESTOCK

Vaccinate livestock against HS and FMD. Protect animals from heat stress by providing shade, clean water, and cooling measures. Maintain hygiene by cleaning udders and controlling ectoparasites with Butox or Taktic (avoid spraying in mangers). Deworm calves older than 3 months and adult livestock regularly. Feed a balanced ration with 30 g salt and 50 g mineral mix daily, ensuring adequate Vitamin A supplementation.

CEREAL CROPS

Rice

Improved Varieties: Medium duration: HKR-127, HKR-126, HKR-120, HSD-1, Jaya, PR-106. Mid to early duration: HKR-47, IR-64, HKR 46, HKR 128, Pusa-1509, Pusa-1121. Early duration: HKR-48, Govind.

Nursery sowing: For early duration varieties: 15 May to 31 June. Medium, mid-early and hybrid rice: 15 May to 31 May.

Seed selection: Select bold and disease-free seed for better results. Treatment of seed with 10 % salt solution should be done to get bold seeds.

Seed rate & seed treatment: 20-25 kg/ha seed is sufficient for transplanting. Soaking of 1 ha seed (20-30 kg seed) in 25 litre water solution with 25 g bavistin and 2.5 g streptocycline is done for 24 hrs. Treated seed should be covered with wet gunny bags for 24-36 hrs for getting germination of seeds.

Nursery raising: Apply 15 to 20 tonnes of FYM per hectare in the nursery field before sowing of the nursery. Apply 25 kg N, 25 kg P and 25 kg $ZnSO_4$ per hectare for raising the nursery. Apply second doze of 25 kg N/ha at two weeks after sowing of nursery. If deficiency symptoms of iron appear in the nursery, foliar application of 0.5% $FeSo_4$ should be done. For managements of weeds in the nursery, apply 1.5 kg Pretilachlore 30 EC or 3 litre Butachlore or Thiobencarb at 1-3 days after sowing of the nursery. For management of broad leaf and grassy weeds, apply 250 ml Bispyribak sodium 10 SL at 15 days after sowing of nursery.

Transplanting: Manually transplant 2-3 seedlings per hill in lines. Maintain spacing of 15 x 15 cm and depth of should not be more than 2-3 cm. Mechanical transplanting is done by paddy transplanter in puddled and un-puddled conditions. Raising of mat type nursery is required for mechanical transplanting.

Manure and fertilizer management: Application of 15 tonnes of FYM/ha before transplanting of the crop is useful for obtaining good productivity of rice-wheat system continuously. In medium, mid-early and hybrids of rice: Apply 150 kg N, 60 kg P_2O_5, 60 kg K_2O and 25 kg $ZnSO_4$ per hectare. In early duration varieties: Apply 120 kg, 60 kg P_2O_5, 60 kg K_2O and 25 kg/ha $ZnSO_4$. Apply 1/3rd N and full P, K and zinc at the time of puddling. Remaining N fertilizers should be applied in two equal splits at 3 and 6 weeks after transplanting.

Weed management: Several grassy weeds, broad leaf weeds and sedges infest paddy crop. Weeds can be managed effectively by chemical method. Apply 30 kg butachlor or 15 kg thiobencarb granuls/ ha in 4-5 cm deep water at 2-3 days after transplanting. Apply 3 litre butachlor 50 EC or thiobencarb EC or 1325 ml Anilphose 30 EC or 2 litre Pretilachlor 50 EC or 125 g oxydiazeril 80 % WP after mixing with 150 kg sand and broadcast in standing water at 2-5 days after transplanting. Apply 20 g ready mix of metsulphuron and chlorimuron or 125 g ethoxysulphuron 15 % WG or 1 kg 2,4-D ester at 20-25 DAT against broad leaf weeds. Apply 93.75 ml/ha in 500 liters of water phenoxulam 24 % SC at 8-12 DAT for control of broad leaf weeds. Apply 250 ml bispyribac sodium 10 % SL/ha in 500 litres of water at 15-25 DAT for the control of mix weeds flora in rice.

Plant protection: Coragen (Chlorantraniliprole) 18.5 SC @150 ml/ha, Fame (flubendiamide) 480 SC@ 50 ml/ha for rice stem borer and leaf folder. Ulala (flonicamid) 50 WG @ 150 g/ha and Osheen (Dinotefuran) 20 SG @ 200 g/ha for plant hoppers. Nativo (trifloxystrobin+ tebuconazole) 75 WG @200 g/ha in 500 litre of water for BLB. Awancer Glow (azoxystrobin 8.3 % + mancozeb 66.7 %) 75 WG @ 1.5 kg/ha for sheath blight Amistar Top (azoxystrobin + difenoconazole) 325 SC @ 500 ml in 500 L water per ha for blast.

Bajra

Sowing Time: The appropriate sowing time is July 1-15 but can be sown at the onset of the monsoon, even in whole month of June, if good rainfall is there.

Seed Treatment: Treat seed with biomix (*Azotobactor+ Azospirillum* + PSB) @ 250 g for per ha seed.

Seed Rate and sowing: Use about 4-5 kg of seed per hectare to get around 175000 plants population per ha. Sowing should be done in lines at the spacing of 45 cm, at depth not more than 2.0 cm.

Recommended varieties: HHB 50, HHB 60, HHB 67, HHB 94, HHB 117, HHB 146, HHB 197, HHB 216, HHB 223, HHB 226, HHB 234, HHB 272, HHB 299, HHB 311, HHB 67 (improved 2), HC 10, and HC 20.

Nutrient Management: For hybrid varieties in irrigated condition apply 160 kg N/ha + 62.5 kg P_2O_5/ha. For short duration varieties apply 40 kg N/ha + 20 kg P_2O_5/ha. Apply full phosphorus and half of the Nitrogen at the time of the sowing, remaining nitrogen may be applied in two splits, first at thinking and second at ear formation stage.

Water Management: If irrigation is available, apply water during critical growth stages: at tillering, flowering, and grain filling. This is especially important under extended dry periods to avoid moisture stress.

Weed Management: Two hand weeding (hoeing) at 20 and 35 days after sowing (DAS). This removes competing weeds and helps conserve soil moisture. Otherwise, apply Atrazine 50% WP at 0.5 kg/ha as a pre-emergence herbicide, and follow with one hand-weeding later.

Pest and Disease Management:

White Grubs: Apply 0.05% quinalphos 25EC on the trees in and around the field after first, second and third rainfall of the season to control the adult.

Downy Mildew: Treat seeds with Metalaxyl 35% @ 6 g/kg seed before planting to prevent seed-borne infection.

Smut: Treat seeds with Thiram at 4 g/kg to prevent kernel smut.

Jowar

Time of Sowing: Optimum period of sowing is mid-June to mid-July; Early green fodder- 2nd fortnight of March- 1st fortnight of April.

Improved Varieties: HC-136, HC-171, HC-308, HG-541, HJ-513; Fodder purpose: SSG 59-3

Seed Rate & Spacing: Grain purpose: 12-15 kg/ha at 45 cm line spacing, Fodder Purpose: 35-40 kg/ha at 25-30 cm line spacing.

Fertilizer Application: Rainfed or low rainfall condition, drill 50 kg of N and 20 kg P_2O_5 per hectare in rows at sowing. Irrigated condition, apply 50 kg of N and 20 kg P_2O_5 per hectare at the time of sowing and another 50 kg N per hectare about one month later.

Plant protection: Seed treatment with Slayer (thiamethoxam) 30 FS @10 ml/kg seed for the control of shoot fly. Seed treatment with Sulphur dust @ 4 g/kg seed for grain smut.

PULSE CROPS

Arhar

Time of Sowing: Under irrigated conditions, sowing of crop should be done in the month of June and under rainfed conditions sowing should be done at the onset of monsoon.

Seed treatment: Inoculation of Arhar seed with Rhizobium and PSB biofertilizers are essential for getting better yield of the crop.

Improved Varieties: Manak, Paras, Pant Arhar-291, Pant Arhar-16, Rajiv lochan, Pant Arhar-6.

Seed rate & spacing: A seed rate of 12.5 to 15 kg/ha is required. Maintain spacing (RxP) of 40x15 cm.

Fertilizer management: Incorporation of 20 kg/ha N, 60 kg/ha P as basal application with sowing and 5 t/ha FYM. Treat seeds with *Rhizobium* and PSB. For better yield, apply 60 kg/ha sulphur and 25 kg/ha zinc sulphate heptahydrate (21% Zn) or 15 kg/ha monohydrate (33% Zn) in deficient soils.

Weed Management: For effective weed control, apply Pendimethalin @ 0.75 kg a.i./ha pre-emergence. Perform manual weeding at 20-25 and 45-50 days after sowing. Use Imazethapyr @ 100 g a.i./ha post-emergence at 20-25 days to control broadleaf and grassy weeds.

Plant protections: For the management of pod borer application of chlorantraniliprole 18.5 SC @ 150 ml/ha followed by flubendiamide 480 SC @ 125 ml/ha is advised to minimize the larval population or Spinosad (150 mL/ha) at flowering and pod initiation. In incidence of blister beetles deep ploughing, field sanitation, light traps, and neem-based products (NSKE 5% or Azadirachtin 0.03% WSP @ 2500-5000 g/ha) can be used.

Disease management: Sterility mosaic virus can be controlled by using resistant varieties and removing infected plants early to limit virus spread. For vector control, spray Neem oil (5 ml/litre) or NSKE 5% every 15 days. Seed treatment with Imidacloprid 70 WS (5 g/kg seed) helps protect seedlings. Alternaria blight can be managed by spraying Mancozeb (2.5 g/litre) or Carbendazim (1 g/litre), planting on raised beds for better drainage, and using resistant cultivars. Phytophthora blight can be controlled by seed treatment with Metalaxyl (8g/kg), maintaining good drainage, minimizing stem injury, and using resistant genotypes.

Summer moong

If infestation of Jassid and white fly is observed, apply 1.0 litre malathion 50 EC or 625 dimethioate 30 EC per hectare in 625 litres of water. Harvest the crop at ripening of 70-80 percent pods to allow timely sowing of the kharif crop.

OILSEED CROPS

Groundnut

Improved Varieties: MH-4, HNG-69, GJG-19.

Time of sowing: Optimum time of sowing of groundnut is month of June. Under irrigated conditions, sowing should be completed by second fortnight of June, whereas under rainfed conditions sowing at the onset of monsoon should be done. Sowing of crop after 15 July should be avoided.

Seed rate: The seed rate depends on the size of kernels of the varieties. However, for medium size kernels varieties, seed rate of 80 kg per hectare is required.

Method of sowing: Sowing should be done preferably in rows at a spacing of 30 cm and maintaining plant to plant spacing of 15 cm.

Seed treatment: Treatment of seed with Thiram or Captan or Emisan 3 g/kg seed is essential for management of seed and soil borne diseases. For management of termites and white grub treat the seed with 15 ml Chloropyriphos 20 EC/kg seed.

Fertilizer use: Application of 15 kg N, 50 kg P_2O_5, 25 kg K_2O and 25 kg Zinc sulphate per hectare is required for obtaining good crop yield. It will be desirable to apply doses of all the nutrients before sowing. Use of gypsum as sulphur source has been found beneficial in groundnut crop.

COMMERCIAL CROP

Cotton

Time of sowing: Sowing of the crop is done from April to first fortnight of June. However, in case of American cotton optimum time of sowing is May. Delay in sowing

results in yield reduction. For all desi cotton varieties/hybrids, best sowing time is mid-April to 1st week of May. The mortality of seedling is very high during May & June.

Varieties and hybrids: Improved American cotton varieties: HS-6, H-1117, H-1126, H-1098 Improved, H-1236, H-1300. Recommended improved hybrids- HHH-223, HHH-287. Desi Cotton varieties- HD-123, HD-324, HD-432. Desi Cotton hybrid - AAH-1

Seed treatment and seed soaking: Before sowing, seed should be dipped in water up to 5-6 hours for better germination. Treat the seed with 5 gm Emisan, 1 gm streptocyclin and 1 gm succinic acid in 10 litres of water. In termite affected areas treat the seed with 10 ml chlorpyriphos apart from above mentioned chemicals. Seed treatment with carbendazim @ 2 gm/kg in the root rot affected areas is essential. Seed treatment with Imidacloprid @ 7.5 gm/kg seed to escape the crops from sucking pests up to 40-60 days.

Seed rate: Use 15-20 kg delinted seed of improved American cotton varieties for sowing in one ha area. 12.5 kg of seed/ha is required for Desi cotton varieties. Seed rate of 3-3.750 kg /ha is required for American cotton hybrids and desi cotton hybrids. Seed rate of 2.125 kg/ha is required for *Bt* Cotton hybrids.

Method of Sowing: Sow the crop in lines 67.5 cm apart with a cotton sowing drill or cotton planter and plant to plant spacing of 60 cm or row to row spacing of 100cm and plant to plant spacing of 45 cm. Sowing should be done at a depth of 4-5 cm.

Fertilizer use: Apply 80-100 Kg N per ha for American Cotton and 50 kg N for desi cotton along with 30 kg P_2O_5/ha. In case of hybrid cotton, 150 kg N, 60 kg P_2O_5, 60 kg K_2O and 25 kg $ZnSo_4$ per ha has been recommended. Apply 1/3 dose of N, full dose of P_2O_5, full dose of potash and full dose of $ZnSo_4$ at time of sowing. Remaining dose of N should be applied in two equal splits at square formation and flowering stage. In sandy soil the research results have revealed that 90 per cent dose of fertilizer through soil application and 10 per cent through foliar spray at the boll development stage gave the highest seed cotton yield. Inoculation of cotton seed with C2, M4 and *Azospirillum* culture resulted into saving of 25-27 kg N/ha.

Plant protection: Leaf sucking pest & Leaf Curl Virus disease: seed should be treated with 4 g Thiamethaxom 70 WS/kg seed before sowing. Close monitoring on white fly host plants like vegetables, flower plants, weeds & unwanted plants. These host plants must be uprooted & burnt from time to time. Some vegetables like Ladies Finger, Brinjal, Tomato & Chilli also act as host plants for whitefly, accordingly, as per need these must be sprayed with Thiamethaxom 25 WG @ 0.5g/litre water. Bacterial blight: seed should be treated with soaking in 1 g Streptomycin or 10 g Plantomycin/10 litre water before sowing. Spray Thiamethaxom 25 WG @ 100g/ha and Profenophos 50 EC @1250 ml/ha for sucking pest. Proclaim (emamectin benzoate) 5 SG @250g/ha for pink, spotted and American bollworm.

FRUIT & VEGETABLE CROPS

Mango

In horticultural crops at fruiting stage such as mango, while carrying out field operations related to nutrient sprays and crop protection adequate precautions in handling of inputs,

mixing, delivery and washing of equipment is to be undertaken. For management of fruit drop in mango spray 2% urea and 0.5 % $ZnSO_4$ or 20 ppm 2, 4-D (2 g 2,4-D in 100 litre of water) in month of April-May. For management of black tip in mango apply 0.6% borax. For management of mango Jassid, spray 1250 ml malathion 50 EC in 1250 litre water per hectare. Manage irrigation in mango, citrus, and other fruit crops.

Citrus

In Citrus plants of seven years or more age, apply 750 g of urea per plant followed by inter-culture and irrigation. To control pre-harvest fruit drop in citrus, apply 6 g 2, 4-D, 3 Kg Zinc Sulphate, 12g Aureofungin and 1.5 kg lime in 550 litres of water per acre. In case of intercropping with sunflower and cotton do not spray 2, 4-D. In this case application of 20 ppm NAA is recommended.

Ber

In case of Ber plants last week April month to May month is best time for pruning because plants are in dormant condition.

Keeping in view of forecasted high temperature, farmers are advised for harvesting of mature vegetables at morning and evening hours and keep harvested crops in shadow. Optimum moisture level should be maintained in cucurbitaceous crops by light and frequent irrigation as dry conditions may lead to poor pollination and thus drop in yield of the crop. After harvesting of mature okra application of urea @ 5-10 kg/ acre should be done. Constant monitoring of crop against attack of mite is advised. If population is above ETL then, spraying of Ethion @ 1.5-2 ml/litre of water is advised. Due to prevailing high temperature, light irrigation at short interval is advised. To control shoot and fruit borer in brinjal and tomato crops, infested fruits and shoots should be collected and buried inside the soil. If pest population is high, spraying of Spinosad 48 EC @ 1 ml /4 litres of water is advised. In tomato, brinjal, chillies, bhendi, and other vegetables, apply hoeing and irrigation as needed and give the required amount of nitrogen fertilizer. Farmers are also advised to take short duration vegetable crops during this summer and the public to grow vegetable in their kitchen garden.

Cluster bean

Time of Sowing: Under rainfed conditions, sowing should coincide with the onset of the monsoon, ideally within the first two weeks of July.

Seed rate & spacing: Seed rate of 15 kg/ha is recommended with spacing of 30 cm x 15 cm, prior to sowing treat seeds with *Rhizobium* culture. Also treat seed with streptocycline @ 6 g/kg seed in 6 L of water.

Improved varieties: HG 365, HG 563, HG 870, HG 2-20

Fertilizer management: Apply 40 kg phosphorus and 20 kg Nitrogen at the time of sowing.

Water management: It is mainly grown as a rainfed crop; lifesaving irrigation at pod formation is critical.

Weed management: Two manual weeding at 25 and 45 DAS are usually sufficient. To control weed Basaline @2.0 litre per ha in 650 litre of water at pre-sowing can also be applied.

Plant protection: Application of Malathion 50 EC @ 0.75-1.25 ml/L of water effectively controls sucking pests like jassids, aphids, and whitefly.

Disease management: To manage bacterial blight effectively two sprays with Streptocycline @ 75g and copper oxychloride @ 500g in 500L water per ha at initiation stage of disease or at 55-60 days after sowing is beneficial.

GREEN MANURING PRACTICES

The period between harvesting of wheat crop and transplanting of rice crop (May-June) can be utilized for growing of green manure crops. Dhaincha (*Sesbania sesban*) is very suitable cover crop which can be grown for green manuring. Sowing of dhaincha @30 kg seed/ ha is done in first week of May. The crop is ploughed up in 3rd week of June (45-50 DAS). Transplanting of rice is done after one week of ploughing of dhaincha crop. Apply 2/3rd dose of NPK fertilizers in fields where green manuring is done.

WATER CONSERVATION PRACTICES

Transplanting of rice requires huge volume of water. It can be saved by bringing change in planting method of the crop. Direct seeding of rice crop has been found very successful technology and is helpful in conservation of water resources. Levelling of fields with laser Level Machine helps in water saving in transplanting conditions.

LIVESTOCK

Temperatures are high during this month and some areas experience severs dust storms accompanied by thunder showers. Heat related diseases in animals that can be seen to affect animals during this time are fever, dehydration, decrease in body salts, loss of appetite and decrease in productivity. Animals should be protected from the heat and strong, hot, and dry summer afternoon winds. Adequate efforts should be made for fodder collection/purchase and storage for periods of shortage. To avoid loss of essential body salts in animals ensure that a salt mixture in appropriate quantity is mixed with the feed and water and given to animals. Depending upon the season, the content of the animal feed should be changed. Currently increase the quantity of wheat chaff and Jowar in the feed. Give dairy animals a balanced feed so that their milk production capacity is enhanced. Deworming of animals should be carried out. Maize, perennial grasses and other fodder species should be harvested now. Sheep should be sheared during this month.

Himachal Pradesh

Himachal Pradesh is a climatically diverse hill state where various crops are cultivated according to the distinct climatic and geographical conditions. To ensure the successful cultivation of these crops, it is essential to educate farmers about scientific farming technique through agro-advisories. The primary objective of agro-advisories is to promote scientifically validated agricultural practices that enhance farm productivity and income through the efficient use of available resources. The following agro-advisory outlines recommended agricultural activities and operations for farmers to undertake during the Kharif season.

GENERAL ADVISORY FOR FARMERS

Summer Ploughing: Deep summer ploughing after Rabi season helps to destroy soil-borne pathogens and conserves rainwater by reducing runoff and also aids in groundwater recharge.

Soil Sample Collection: After harvest of Rabi season crops, this is the ideal time to collect soil samples for analysis, as fields are vacant. Farmers should collect soil samples in zig-zag manner for accurate nutrient analysis. For collecting soil sample, remove surface debris, collect soil upto 15 cm depth for shallow-rooted crops using auger or khurpi & collect at least 10 to 15 samples from each sampling unit. Mix the samples thoroughly and remove foreign materials like roots, stones, pebbles and gravels. Reduce the bulk to about half to one kilogram by quartering the sample & put the sample in clean cloth or polythene bag and label with farmer and field information and send to nearby soil testing laboratory for nutrient analysis.

Demonstration of method of soil sampling in field

DEMONSTRATION OF METHOD OF SOIL SAMPLING IN FIELD

Use of Compost/Farm Yard Manure (FYM): Apply compost or Farm Yard Manure (FYM) at least 3 weeks before sowing to improve soil fertility and water retention. Enriching FYM with bio-agents like Trichoderma and Pseudomonas enhances its effectiveness.

Post-Harvest Storage: Ensure grains, pulses and millets are thoroughly dried before storage. Avoid reusing old gunny bags; instead, use treated bags soaked in 5 per cent neem solution or insecticide to prevent pest infestation.

Pro Tray Seedling Production: Adopt pro tray seedling technology using coco peat, perlite and vermiculite mixture for crops like tomato, brinjal, capsicum, and cauliflower. This method ensures healthy, uniform seedlings, reduces disease risk, supports timely transplanting, and is especially suitable for women farmers.

Snails attack: To prevent snail attacks, maintain clean and weed-free bunds. In case of infestation, apply metaldehyde baits as a control measure.

Rainwater Harvesting: Farmers are advised to adopt low-cost rainwater harvesting through silpaulin-lined ponds. These structures are easy to construct, cost-effective, and help store rainwater for irrigation during dry spells. Select a low-lying area, dig a pond, and line it with a durable silpaulin sheet to minimize seepage. This method enhances water availability during lean period and supports sustainable farming practices.

Demonstration on rainwater harvesting

CEREAL CROPS

Maize

In high hills, the best time for sowing of maize is from 15th April to 15th May using Girija variety for timely sowing and Bajaura Makka, Bajaura Popcorn, Bajaura sweet corn for late sowing condition. In mid and low hills, sowing operation should be done from 20th May to 15th June and 15th June to 30th June, respectively. University tested hybrids such as PSC-3322 Gold, PSC-4455, SMS-137, K-25 Super, Star-35, Vyas Gold, AHC-2337. HP-333 Gold, Sambha Gold can also be procured from the agriculture department sale centres at subsidized rates.

Optimum seed rate for maize is 20 kg per hectare. Sowing should be done at a depth of 3.5 cm, with a spacing of 60 cm between rows and 20 cm between plants to ensure optimal plant population (75,000-83,000 plants/ha). Kera method should be used for sowing of seed instead of broadcasting. Complete sowing 12-15 days before the monsoon (last week of June).

Use of Kera method for seed sowing in maize

Apply 10-15 t of FYM per hectare 2-3 weeks before sowing. In hybrid varieties, apply NPK @ 120:60:40 kg and 90:45:30 kg per hectare in high and low rainfall areas, respectively. In local varieties, apply NPK @ 80:40:30 and 60:30:20 kg per hectare in high and low rainfall areas respectively. Apply full dose of P & K at sowing and two split doses of N at first earthing up and one month thereafter. In case of Zn deficiency, apply 25 kg of zinc sulphate heptahydrate (21%) or 16.25 kg zinc sulphate monohydrate (33%) per ha during sowing.

For weed control, use pre-emergence herbicides like Atrazine @ 1.5-2.0 kg a.i/ha for sole crops while alachlor @ 1.5 kg /ha for mixed cropping systems. Weeds can also be controlled post emergence by application of herbicide Tembotrione @120 g a.i/ha with surfactant 1 L/ha at 2-3 leaf stage or herbicide Topramezone 25.2 g a.i/ha + atrazine 750 g a.i/ha at 2-3 leaf stage.

Demonstration of post-emergence herbicide in maize at farmers field

In areas where cutworm and white grubs are serious pests, chlorpyriphos @ 2.0 litre per ha mixed in 60-70 kg sandy soil may be used for soil amendment before sowing or cypermethrin 10EC @ 1ml per litre may be used for foliar application. Monitor the crop regularly for fall armyworm incidence. If the leaves are damaged or insect faeces are seen, then apply flubendamide (Fame) or emamectin benzoate or chlorantraniliprol @ 0.5 ml/L and repeat application at 15 days interval if needed. Proper earthing up should be done to prevent lodging of kharif maize due to high wind, cyclone etc. If there is heavy rainfall, care must be taken for drainage of excessive water from the maize field.

Paddy

Paddy nursery sowing @ 25 kg seed/ha after seed treatment with bavistin @ 2.5 g/kg for timely sown conditions may be completed from 20th May to first week of June using high yielding varieties HPR 1068, HPR 2143, RP 2421, HPR 2720, HPR 2880 and transplanting may be completed using 25-30 days old seedlings by end of June. In case of basmati rice, high yielding and disease resistant varieties Kasturi and HPR 2612 could be used. For late sowing conditions also, high yielding short duration variety HPR 2612 can be used. Varieties Bhrighu Dhan, Varun Dhan and Naggar Dhan could be used in Kullu valley and other colder areas. Red rice varieties HPR 2795 (upland areas) and HPR 2720 for irrigated transplanted area can be sown by mid-June. University tested hybrids Super-120, Star-795, AHR-8213 can be purchased from agriculture department.

Demonstration of paddy variety HPR 2612

The transplanted rice crop should be fertilized with NPK @ 90:40:40 with 50% N and entire dose of P & K at the time of transplanting and remaining N in two equal doses at 3 and 6 weeks after transplanting. In case of zinc deficiency symptoms in previous crop, apply 60 kg of zinc sulphate heptahydrate (21%) or 40 kg zinc sulphate monohydrate (33%) per hectare at puddling. The fertilizers should be applied 10-12 cm away from the base of the plant to avoid plant injury. Soon after application, the fertilizer on the soil surface should be covered to minimize losses.

Nursery raising of Paddy

Transplanting of Paddy

Azolla is a good biofertilizer in irrigated rice crop which not only add organic matter in the field but also supplies enough N to the rice crops & reduce 10-20 per cent of nitrogen and phosphorus fertilizer requirement. Continuous flooding of water generally provides the best growth environment for rice. After transplanting, water levels should be around 3 cm initially, and gradually increase to 5-10 cm (with increasing plant height) until the field is drained 7-10 days before harvest.

In transplanted rice, apply Butachlor 5 g @ 30 kg/ha or broadcast Butachlor 50EC @ 3L after mixing within 72 hrs of transplanting for weed management. Post emergence herbicide Bispyribac sodium @ 250 ml/ ha can also be sprayed at 20-25 days after transplanting. In case of direct seeded rice, high yielding varieties HPR 1156 (Sukara dhan), HPR 2656 and HPR 2795 could be sown by end May or first week of June @ 60 kg seed/ ha. In irrigated conditions, apply first irrigation at 25 days after sowing and schedule succeeding irrigations as per monsoon rains.

For the management of stem borer and leaf folder, apply Carbofuron granules (furadan 3g) @ 33 kg/ ha in standing water after 10 days of transplanting or spray the crop after appearance of pest incidence with Chlorpyriphos @ 3ml/ L or Emamectine Benzoate @ 0.5 g/ L water. In case of blast/ false smut incidence, spray Copper Oxychloride @ 3g/ L or Hexaconazole @1 ml/L water at panicle initiation stage. The harvesting of the crop is generally done when 85% of the grains turn straw coloured.

OILSEED

Demonstration of soybean variety Palam Soya

Soybean is the main oilseed crop grown in Kharif season in Himachal Pradesh. Sowing of soybean should be completed from May end to mid-June using high yielding varieties Palam Soya, Harit Soya or Palam Hara Soya 1. For getting optimum population, 75-80 kg per ha seed is required. The row to row spacing of 45 cm and plant to plant spacing of 15 cm should be maintained with depth of seed not more than 3-4 cm. Farmers are advised to do seed treatment with carbendazim or Thiram @ 3 -5 g/kg and with *Rhizobium* @ 20g /kg of seed before sowing. In case of aphid incidence apply thiametoxam @0.4 g/ L of water. Apply 20:60:40 dose of NPK kg/ha at sowing. Add sulphur @ 20 kg/ha for better oil content. Apply pendimethalin 750 g/ha or Oxadiazon 500 g/ha as pre-emergence for controlling many annual and broad leaf weeds. For post emergence weed control use Imazethapyr 100 g/ha or Imazethapyr 14 g/ha + Imazemox 14 g/ha in soybean.

PULSE CROPS

Blackgram

Among pulses, blackgram is the main pulse grown in Himachal Pradesh. Sowing of black gram should be started by June end and completed in first fortnight of July using high yielding varieties UG 218, Him Mash 1 and PB 114 in low and mid hills and Palampur 93 in high hills (>1500 m amsl) using basal dose of NPK @ 20:40:20 at the time of sowing. Seed bio fortification with Rhizobium and PSB culture should be done before sowing for better plant stand and yield. For weed control, apply pre emergence herbicide Pendimethalin @ 1.5 kg /ha for weed control.

Seed Treatment with Biofertilizer

Demonstration of blackgram variety Him Mash 1 at farmers field

Rajmash (Kidney Bean)

High yielding varieties Jawala, Him-1, Kanchan, Triloki, Baspa of Kidney bean (Rajmash) can be sown in the month of May in high altitude areas and in the month of June in low lying areas. Weed control in kidney bean can be done using pre-emergence herbicide Pendimethalin @ 1.5 kg /ha. For management of anthracnose,

seed treatment with bavistin @ 2g per kg seed can also be done or foliar application with bavisitn @ 1g/ L water can be followed, while in case of blister beetle incidence apply cypermethrin 10EC @ 1ml/ L and for bean bug/ whitefly management apply thiamethoxam @ 0.4g/ L water.

FRUIT & VEGETABLE CROPS

Apple

Fertilizer Application: After fruit setting in apple apply second dose of nitrogen in the form of Calcium Nitrate (300 g / tree) to the soil. Overuse or high rates of N applications can lead to excessive shoot growth and poor fruit colour.

Hail Damage: Spray 100 g carbendazim or 600 g mancozeb in 200 L of water immediately after hail. Spray 200 g Boric acid + 500 g Zinc Sulphate + 250 g Quick lime in 200 L of water within 3-4 days of hail storm. After 10 to 12 days, a spray of micro-nutrients like Agromin, Multiplex or Microvit @ 400 to 600 g per 200 L of water is also recommended. Spray the hail affected apple orchard with 1 kg Urea in 200L of water.

Diseases Management: For the management of leaf spots /blight, the farmers are advised to spray mancozeb (600 g/200L of water) as the protectant application in May month. However, where these spots/blights are observed, the farmers are advised to spray alternatively the formulations consisting of, hexaconazole 4% + Zineb 68% WP (500g/200L of water) or carbendazim 25% + flusilazole 12.5% SC (160ml/200L of water) at 10-12 days interval in the infected orchards.

High Density Plantation of Apple

High density apple orchards: Through summer pruning remove excess upright growing shoots during May-June and bend branches to blow horizontal to encourage spur formation in the month of June -July. Through fertigation apply N-P_2O_5 -K_2O @ 35-17.5- 35 g/tree/year age of plant in 14 splits at weekly interval starting from 15th March till the end of June.

Stone fruits

For management of leaf curling due to insect and fungal attack in plum and peaches, spray Oxydemeton-methyl or Dimethoate 1 ml + copper oxychloride 3 g per litre of water at pink bud stage (7-10 day before flowering). If not sprayed and the infestation is high then spray after petal fall.

Gummosis: For management of gummosis in stone fruits, clean the oozing spots after breaking of dormancy and apply Mashobra paste. After one month or before rainy season apply moshobra paste again. Spray Streptocycline 20 g per 200L of water before rainy season and copper oxychloride 600 g per 200 litres of water before leaf fall.

Pomegranate

Spray Cypermethrin 10 EC (100 ml in 100 litre of water) during first week of May for the control of Anar butterfly attack. After 15-20 days of first spray apply Quinalphos 200 ml per 100 litres of water. If needed repeat the above mentioned insecticides.

Wilt management: To manage wilt problem in pomegranate, three drenching at 20 days interval with propiconazole 25 EC @ 2 ml/L + Chlorpyriphos 20 EC @ 2 ml/L starting from appearance of first symptoms of wilt. Use 5-10 L solution/plant.

Mango

For the management of mango hopper spray pesticide at flower bud initiation i.e imidacloprid 0.5 ml/L or Cyantraniliprole 10.26 OD @ 0.3 ml/L or methyl demeton 25EC @ 1ml/L at emergence of inflorescence stalks and before flower opening . When fruits are of pea size, imidacloprid 0.5 ml/L or dimethoate (0.03%) (1ml/L) is recommended. Adding sulphur3.5g/L to the insecticide based on need to check mites and sooty may be done.

Citrus

Spray Zinc sulphate 1 kg + Lime 500 g in 200 litres of water during March, June and September to control zinc deficiency & Blitox @ 600 g per 200 litres of water during June- July to manage gummosis.

Litchi

Maintain sufficient moisture during May -June to prevent fruit cracking by providing irrigation at 3 days intervals. Mulching with grass around tree basin is helpful for moisture conservation. Application of calcium @ 2 g/l or Gibberellins @ 20 mg/l or NAA@ 20 mg/litre as spray after fruit set is also helpful in reducing cracking of fruits.

Fruit fly: For the management of fruit fly in Mango, citrus and guava, mix carbaryl 10 D in soils @ 50-100 g/tree, Install Palam trap 2/bigha /pheromone fruit fly traps @ 10/acre. Foliar spray with malathion 2 ml/L + gur 20 g a month before harvesting the fruit crop and repeat it after 15 days.

Evergreen fruit plants like Mango, litchi, Guava, Citrus fruits are planted in rainy season during July- August. Generally, a pit of 1 m^3 (1 x 1 x1 m) should be prepared well in advance i.e. one month before planting.

Tomato

To get quality and higher fruit yield in summer tomato production system, earthing up and rope staking should be completed by the end of April and split doses of urea @ 5 kg/bigha should be applied in the months of April and May, respectively. Split doses of potash @ 30 kg per hectare may also be applied in May-June to reduce the incidence of fruit rot disease. Before the onset of monsoon, lower leaves of tomato up to 20 cm from ground level should be removed to avoid the infection of buckeye rot


Demonstration of mulch with drip irrigation at farmer's fields in Solan disrict

and blight diseases. Drip irrigation with mulching should be used for better crop management and conservation of water. In Kharif tomato production system, nursery raising may be started in the month of June and transplanting should be completed by July. In areas where blossom end rot is a problem apply calcium chloride @ 5g/ L of water as foliar application.

For the management of early blight, buckeye rot and fruit rot diseases, apply copper oxychloride @ 3g/ L, Ridomil MZ @ 2.5 g/L and Mancozeb 45 @ 2.5 g or Kavach @ 2g/ L respectively as and when symptoms appear. For the management of fruit borer, apply Profenophos @ 1ml/ L or Chlorpyriphos @2ml or Cypermethrin 10EC @ 1ml per litre of water.

Bell pepper

Cultural Practices along with Fertilizer application: Elite open pollinated varieties viz., California Wonder, Solan Bharpur, Solan Shakti should be planted up to end of April to get higher yields. Optimum spacing of 60 cm may be maintained between row to row and 45 cm between plant to plant while transplanting of open pollinated varieties or hybrids. Apply total FYM (250q/ha), Single Super Phosphate (475kg/ha), Muriate of Potash (90kg/ha) with half of Urea (200kg/ha) at the time of field preparation. Remaining half of urea should be applied in two equal split doses one after one month of sowing and another before flowering. Under protected conditions, capsicum (coloured/ green) can be transplanted by May end. Apply FYM @ 120t/ha and NPK mixture @ 50kg/ ha before transplanting. Urea 11g, SSP 30g and MOP 8.4g per square meter should also be applied to get higher yield. Apply soluble fertilizers like Polyfeed (19:19:19) @150 kg/ha twice a

Demonstration on coloured bell peppers under protected conditions

Solan Shakti variety of bell pepper

week through drip irrigation after three weeks of transplanting and repeat it again 15 days before harvesting to get higher yields under protected conditions in capsicum and tomato crops.

Proper drainage should be maintained in field of bell pepper in rainy season to avoid the problems of diseases. For the management of powdery mildew and fruit rot diseases, use Hexaconazole or Contaf @ 0.5 ml/ L and Mancozeb or Ridomil MZ @ 2.5g as and when symptoms appear. For the management of fruit borer, spray Lambda Cyahalothrin @ 0.8ml/ L or Imidacloprid @ 0.5 ml/L or Flubendiamide @ 0.2 g/ litre of water.

Brinjal

Variability in shape and colour of fruit in Brinjal

Open pollinated varieties viz., Pusa Purple Long, Pusa Purple Cluster, Arka Nidhi, Arka Keshav should be grown to get higher yield. Transplanting of brinjal may be completed by April end at a spacing of 60x 45 cm. Application of FYM @100 q/ha, IFFCO mixture (12:32:16) @188 kg/ha, Muriate of Potash @ 33 kg/ha and urea @ 168 kg/ha should be applied to get higher yield in brinjal. Urea should be applied in split doses. For brinjal fruit and shoot borer apply Cypermethrin @ 1ml per litre may be applied at flowering stage. For the management of Phomopsis blight apply COC @3g/ L or Ridomil MZ @2.5 g/ L.

CUCURBITS & COLE CROPS

Cultural Practices along with Fertilizer application: Varieties, K-75, Solan Srijan are recommended for open cultivation of cucumber while seedless varieties Him Palam Kheera-1 and Him Palam Kheera-2 are suitable for protected cultivation. Australian Green, Pusa Alankar and Solan Aadvik varieties of summer squash have been recommended for cultivation. Nursery of cucurbits should be produced in polybags or plug trays for healthy nursery production. Cucurbits planting may be completed by April end using FYM and Fertilizers (NPK @ 100:50:60) before sowing with Nitrogen in 3 split doses at 30, 45, 70 days after transplanting.

Seedless cucumber production in protected conditions

Demonstration of Palam Fruit Fly Trap

For fruit fly management, Use Palam Fruit Fly traps @ 25 traps per hectare in May and use Malathion 30 ml + Jaggery 150 g per 15 L water at 15 days interval. Farmers are also advised to collect and dispose infested fruits in a pit apart from deep ploughing before plantation in summer. Use Bavistin (1g/L) + Mancozeb (2g/L) of water for management of fungal diseases and Imidacloprid @ 0.5 ml per litre for the management of sucking pests.

Him Palam Phul Gobhi Hybrid-1 and Him Palam Gobhi Hybrid-1 has been released for commercial cultivation in cauliflower and cabbage, respectively. Early varieties of cabbage and cauliflower should be transplanted at a distance of 45x30 cm and late varieties at a distance of 60x45 cm for getting higher production. Transplanting of cole crops in high hill areas can be started in the month of June using NPK @ 125:75:70 at the time of sowing with nitrogen in 3 splits (30, 60, 90DAT). For the management of cutworms apply cypermethrin 10EC @ 1ml/ L of water.

LEGUME

French bean

French bean is a shy nodulator and in order to encourage good nodulation and better nitrogen fixation, treating seeds with *Rhizobium* culture should be done a day before sowing and sowing should be completed by end of April or first week of May. Bush type varieties viz., Falguni, Solan Naina, Contender, Bahaar should be done at a distance of 45x15 cm for better aeration and to minimize the rapid spread of foliar diseases.

French bean production in open fields under mulching

Pole type varieties viz., Laksmi and SVM-I should be planted at a distance of 90x15 cm for better crop management and higher production. Application of FYM @ 200 q/ha, IFFCO mixture (12:32:16) @ 313 kg/ha, and urea @ 27.5 kg/ha should be applied to get higher yield in french bean. Urea should be applied in splits. Management of Anthracnose and angular leaf spot diseases can be achieved by applying Bavistin @ 1g/L as and when symptoms appear in end May.

SPICE S

Land preparations and application of FYM and Fertilizers (NPK @ 100:50:50) should be done before sowing, nitrogen should be applied in 3 splits (30, 60, 90 days after sowing) for ginger crop. Turmeric sowing may be completed by end April using NPK @ 30:30:60 before sowing and Farm Yard Manure. A layer of 3-5 cm mulch should be maintained on ginger crop by adding 50 q of dry leaves or 125 q of green leaves in one

Quality Ginger production in open fields

hectare. To avoid the rhizome rot in ginger, before storage rhizome should be treated with Mancozeb @ 0.25% for 60 minutes. Solar treatment of rhizomes should be done for 45 minutes before sowing in the field to avoid the diseases in ginger.

FLOWERS

Gladiolus

Gladiolus production at Solan district

For flower regulation, staggered planting at 15-20 days interval should be done. Treat the corm with Bavistin solution @ 2 g/liter before planting in mid and high hills in the month of March. Corms should be planted at a spacing of 25x15 cm for better crop management and higher flower yield. Basal dose of 5 kg and NPK@ 30g:30g:20g/m^2 should be applied and split dose of nitrogen should be applied @ 30 g/m^2 at 3 and 6 leaves stage at the time of earthing up. For disease control, use disease free flowering stock (> 4 cm), crop rotation and solar solarization.

Carnation

Rooted cuttings of carnation should be planted on raised bed of 1.2 m width with 0.5 m path between beds in mid hills in the month of March with planting density of 25-32 plant/m^2 and at a spacing of 20x20 cm. One week before planting, apply 20 g NPK/m^2 as the basal dose. At the time of planting, apply a mixture of VAM+ *Azospirillum* and PSB @ 3g/plant. After 40 days of planting, fertigation with 100 ppm N and 140 ppm K should be done, twice a week, for getting higher flower yield in carnation. Disbudding should be done in standard carnation when terminal flower bud is 15 mm in diameter and in spray types main flower bud is removed to encourage lateral buds. Wire mesh system of 15x15 cm staking net is used to support the plants. Two to three layers of mesh are installed 15 cm above soil surface and upper layers are separated by 20 cm. Crop rotation, soil solarization and application of neem cakes (100 t/ha) and *Trichoderma* (500 kg/ha) should be used after solarization for disease prevention and control in carnation.

Carnation production under protected conditions

Chrysanthemum

Propagation of chrysanthemum is done through terminal cuttings (5-10 cm long) and treated with 500 ppm NAA for 10-15 seconds before planting in cocopeat and sand (1:1) media for better rooting from the end of April to mid-June. Rooted cuttings are planted for off- season production at a spacing of 20x20 cm for standard chrysanthemum and 30x30 cm for spray type chrysanthemum. A week before planting application of FYM (5 kg/m^2), NPK@ 30 g/m^2 should be applied along with 1 kg vermicompost per square meter for enhanced flower production. Artificial short days are provided by covering the plants completely with thick dark coloured high density polythene black coloured inside and white outside for 16 hours daily in mid hill conditions for off-season flowering. Remove the lower leaves up to the plant height of 9-10 inches for disease prevention. Application of neem cake or leaves of cruciferous crops (100 t/ha) or *Trichoderma* (500 kg/ha) should be incorporated. Paddy straw should be used as mulch to avoid leaf blight in chrysanthemum.

Marigold

Under mid hill conditions transplanting of marigold should be done in the first week of July. Transplanting should be done at four leaves stage and at a spacing of 40x40 cm for African marigold and 30x20 cm for French Marigold. A total of 40 q/bigha FYM, 96 kg/bigha, SSP, 27 kg/bigha and Calcium Nitrate 48 kg/bigha may be applied for increased flower yield. Follow crop rotation with non-host crop for prevention of stem rot in marigold.

Marigold production under open fields

LIVESTOCK

Ensuring structural soundness of livestock shelters is the first line of defense against environmental stress and disease. Shelters must have adequate slope for drainage, non-slippery floors, and proper cross-ventilation. In flood-prone zones, raised platforms or elevated sheds are essential to minimize moisture-related diseases such as foot rot, mastitis, and parasitic infestations. In cold and snow-bound areas-especially in the upper reaches-thermal insulation using mud plaster, dung, or dual-layer roofing provides essential protection. Weekly sanitation of poultry sheds with 1% sodium hypochlorite and fumigation using formalin with potassium permanganate ensures hygienic housing and microbial control.

Clean and cool drinking water must be available throughout the day. Ruminants should consume no less than 50-60 liters daily. In high-altitude areas, black-colored water containers help warm the water via passive solar energy. To mitigate heat stress, shade nets, white-washed roofs, and oral electrolyte supplementation are advisable. Migratory herds grazing in high-altitude pastures must be provided shaded rest areas using either natural tree cover or portable shelters.

Vector and parasite management involves the application of acaricides every 3-4 weeks, ideally alternating chemical classes to prevent resistance. Integration of neem-based herbal sprays adds a sustainable touch to ectoparasite control. Deworming should be carried out in May and again in August based on fecal sample results to rationalize the use of broad-spectrum anthelmintics. Disaster preparedness should include maintaining a district-level veterinary emergency contact list, strategic fodder stockpiling in vulnerable areas, and pre-positioning of veterinary first-aid kits in remote villages.

Cattle and Buffalo

Vaccination against Hemorrhagic Septicemia and Black Quarter should be conducted during May-June, with biannual Foot and Mouth Disease vaccination scheduled before and after monsoon. Feeding must be based on balanced rations including green fodder like maize and cowpea, combined with dry roughage such as wheat or paddy straw. Exclusive feeding of fermented fodder must be avoided to prevent bloat and ruminal tympany. Lactating animals should be supplemented with 1.5-2.5 kg concentrate daily (depending on yield), along with 50 g mineral mixture and 30 g salt.

Weekly footbaths with 5% zinc or copper sulfate are recommended to reduce foot rot. Teat dipping with iodophor-based solutions after milking significantly lowers mastitis risk. Reproductive management should focus on insemination during early morning or evening hours in the June-August window to avoid heat stress-related infertility and ensure spring calving.

Sheep and Goats

Sheep and goats must be vaccinated against PPR and enterotoxemia by June. Deworming of migratory flocks is essential before they ascend to summer pastures. To enhance conception rates, flushing rations composed of grains, legumes, and mineral mixtures should be introduced 3-4 weeks prior to breeding. During monsoon, diet supplementation with leaves from Bhimal (*Grewia optiva*), Timla (*Ficus palmata*), and Dhaman (*Cenchrus ciliaris*), along with dry hay, improves nutritional resilience.

Hoof trimming on a monthly basis and periodic footbaths with antiseptics help prevent foot rot. Pregnant does and ewes must not be exposed to wet grazing in the early morning to avoid enterotoxemia and associated complications.

POULTRY (BACKYARD AND SEMI-COMMERCIAL)

A rigid vaccination protocol must be followed: Lasota for Ranikhet Disease on day 5 and every 2-3 months; Fowlpox at 6-8 weeks; IBD at 2-3 weeks; and Marek's Disease on day one. Thermal comfort must be maintained by keeping litter moisture under

25%, using lime beneath the bedding, and ensuring 14-16 hours of light daily in layers to sustain egg production. Vitamin C and electrolytes in water during heat peaks are essential. Biosecurity practices include use of footbaths with disinfectants; restricted access to poultry sheds by wild birds and visitors, and fogger or fan usage during the humid summer months.

Swine

Swine units must ensure annual vaccination against Classical Swine Fever. Nutritional care of breeding sows includes daily supplementation with 60-80 mL of calcium and 50-60 g of mineral mixture. Pigs should have access to wallowing areas or showers for thermal relief. Deworming using combination drugs like Levamisole and Albendazole should be conducted quarterly.

FODDER AND FEEDING MANAGEMENT

Fodder production and conservation must be tailored to the agro-ecological zone. In low hills, crops such as maize, bajra, cowpea, and Napier grass are ideal however in Mid-hill regions farmers may benefit from intercropping maize with cowpea and using Napier hybrids. In high hills, July-sown oats, Setaria grass, and perennial forages can be preferred. In cold dry zones, Lucerne, short-duration barley, and dried willow leaves offer high-value feed options.

African Tall maize should be sown during May-June in irrigated areas at a rate of 50 kg/ha. Silage should be prepared in July-August using chopped green fodder mixed with jaggery and salt, stored in drums or pits. Dry fodder should always be stored on raised platforms to prevent fungal spoilage. Alternate feed sources such as Azolla, hybrid Napier, and tree-based forages like *Grewia optiva, Bauhinia variegata,* and *Morus* spp. should be promoted. Pasture improvement through sowing *Cenchrus ciliaris* and *Stylosanthes* spp., along with rotational grazing and fencing, can prevent overgrazing and improve long-term forage productivity.

RAINY SEASON DISEASE SURVEILLANCE

The monsoon period predisposes animals to a surge in diseases such as foot rot, mastitis, pneumonia, and enterotoxemia due to high humidity and wet housing. Livestock should be actively monitored for symptoms of Lumpy Skin Disease (LS), vector-borne conditions like theileriosis, babesiosis, and anaplasmosis. Prompt diagnosis and early reporting are crucial. In case of animal mortality, carcasses must be disposed through deep burial (at least 4 feet) with lime layering to prevent environmental contamination and disease transmission.

Fisheries

Maintain DO >5 mg/L, pH 7.0-8.5; reinforce bunds and screen inlets to prevent escape. Apply lime @ 200-250 kg/ha; fertilize based on plankton levels. Use prophylactic $KMnO_4$ (2-5 ppm) or salt (1-2%) baths biweekly. Feed 25-28% CP floating pellets @ 2-3% biomass/day. Stock only acclimatized fingerlings. Prevent livestock runoff in integrated systems. Maintain records for water quality, feeding, and growth.

SPECIAL ADVISORY FOR COLD ARID ZONES (LAHAUL-SPITI & KINNAUR)

In high-altitude cold arid regions, livestock housing must be thermally insulated using dung plaster, mud walls, and locally available materials to conserve body heat during snow-laden months. Animals should be fed dry grasses, willow leaves, and barley, with supplementation of mineral bricks and salt to prevent deficiencies. Post-snowmelt, monitoring of yaks and donkeys for respiratory illness, especially pneumonia, is critical. Preventive vaccinations should be completed prior to onset of winter and again before transhumant herds migrate to alpine grazing pastures.

Mineral mixture &
Urea Molasses Mineral Brick

Hands-on training on drum silage preparation by CSKHPKV-KVK Mandi

Mineral mixture supplementation

Demonstration on Azolla cultivation to women farmers by CSKHPKV-KVK Mandi

Field vaccination of migratory Gaddi goats by AICRP on Goat Improvement – Gaddi Field Unit, CSKHPKV, Palampur

Ensuring well being of Spiti donkeys: hoof care, minerals, shelter & strategic feeding.

Jammu & Kashmir

JAMMU

Jammu region has three agro-climatic zones; sub-tropical (upto 800 m above msl), sub-temperate (800-1500m above msl) and temperate (above 1500m above msl). Rice is the major crop in irrigated plains, while maize is generally grown in hills under rainfed ecosystem. After Rabi harvest, deep plough fields to utilize high temperatures for killing soil-borne pathogen spores, and take preventive steps to avoid post-harvest pest infestation. The crop-wise agro-advisory for kharif season is presented as below:

CEREAL CROPS

Paddy

Soak paddy seed in carbendazim 10 g + streptocyclin 3 g/5 kg seed (in 8 L water) for 24 hrs before nursery sowing. In sub-tropical zone, use blast-resistant coarse/semi-fine varieties (SJR-5, Jaya, PR-113, PHB-71, Ratna) and superfine types (Jammu Basmati-129, Pusa Basmati 1121). For temperate/sub-temperate areas, prefer early, blast and cold-tolerant types like China-1039, Giza-14, K-84, K-343, K-39.

Blast disease

Stem Borer

Prepare nursery beds (dry or wet) with 15 kg FYM, 60 g urea, 50 g DAP per 10 m^2. Use 16-18 kg/acre seed for fine/coarse varieties (2+ seedlings/hill), 6 kg/acre for hybrids; treat seed with copper oxychloride @ 3 g/kg.

Control weeds manually or use butachlor 5G (1.5 kg/500 m^2) or pretilachlor (20 g/500 m^2). Apply 30:12:8 kg N:P:K + 8 kg $ZnSO_4$/acre; split N at puddling, tillering, and panicle stages. Apply full DAP, MOP, $ZnSO_4$, and 1/3rd N at puddling; split remaining N at tillering and panicle initiation stages, draining water before top dressing.

For chemical weed control, use butachlor 12 kg/acre after transplanting or anilophos + ethoxy sulfuron (500 + 60 ml/acre) at 10 DAT. Manage weedy rice with stale seed-bed and glyphosate (0.6 kg/acre) or paraquat (0.32 kg/acre).

For management of blast, spray the crop with tricyclazole @ 0.06% or azoxystrobin + difenoconazole @ 0.1%. For stem borer, apply Cartap hydrochloride 4G (8 kg/acre) in 5-7.5 cm standing water. Do not drain or irrigate for 72 hours. Spray Cartap hydrochloride 50 SP (240 g/acre) when there are 5% dead hearts or one egg mass/sq.m.

Maize

Grow hybrids (Ganga Safed-2, Vivek-25, HQPM-1) or composites (Mansar, C-6, C-2); use 8 kg/acre seed for line sowing, 12 kg for broadcast, and 14-16 kg in hills. Treat seed with Thiram/Captan (3 g/kg) or Carbendazim (2 g/kg) + Chlorpyriphos (5 ml/kg) in cutworm-prone areas. Apply 6 t FYM/acre 2-3 weeks before sowing; with FYM, reduce NPK by 25%; otherwise, use 24:16:8 kg NPK + 4 kg $ZnSO_4$/acre.

Blister Beetle

Fall army worm

Maintain spacing: 75×20 cm (hybrids), 60×20 cm (composites); use Atrazine @ 0.4 kg/acre or weed manually at 15 & 30 DAS. Keep weed-free till 40 DAS; do earthing-up at 30 DAS for stability and moisture.

For pests, apply chlorpyriphos 1.5% D (10 kg/acre) in last ploughing, use light (2/acre) & pheromone traps (6/acre), spray methyl demeton, cypermethrin or cartap hydrochloride in whorls. For Blister Beetle, Cut Worm, Stem Borer & Army Worm in maize, use acetamiprid 20SP @ 0.2 g/L or chlorpyriphos 20EC @ 480 ml/acre, apply chlorpyriphos 1.5% D @ 10 kg/acre in soil for cut worm, cartap hydrochloride 4G @ 8 kg/acre in whorls for stem borer, and adopt trap cropping (okra/arhar) and manual beetle removal for blister beetle. For smuts, treat seed with carbendazim/carboxin @ 2 g/kg; for stalk rot, drench with copper

oxychloride 3 g/L or apply bleaching powder @ 10 kg/acre; for leaf blight, spray propiconazole @ 0.1% at disease onset.

FODDER CROPS

Bajra and Jowar are important kharif fodder crops, with varieties like Giant Bajra, FBC-16, PCB 164 for Bajra, and MP Chari, Haryana Chari-260, Proagro Chari (SSG-998) for Jowar, suitable for both irrigated and rainfed conditions.

Bajra (Pearl Millet)

Use 2 kg of hybrid seed/acre, apply 40:24:10 kg NPK/acre, and manage pests like leaf caterpillars and weevils with chlorpyriphos 1.5% D @ 10 kg/acre.

Hybrid Jowar (Sorghum)

Sow 5 kg seed/acre with 20:12:6 kg NPK; for insect pests like shoot fly and stem borer, apply cartap hydrochloride 4G @ 8 kg/acre in central whorls at 10-20 DAS.

OILSEED CROPS

Sesame (Til)

Use 800 g-1 kg seed/acre in July; for pests like hairy caterpillars and whitefly, spray chlorpyriphos 20EC @ 2 ml/litre or imidacloprid 17.8 SL @ 0.3 ml/litre.

PULSE CROPS

Mash (Black Gram)

Use 6-8 kg seed/acre; varieties include Pant U-19, Uttara, Pant U-31, NDU 99-3, KUG 479; spray chlorpyriphos 20EC @ 2 ml/litre or imidacloprid 17.8 SL @ 0.3 ml/litre to manage hairy caterpillar and whitefly.

Moong (Green Gram)

Use 6-8 kg seed/acre; varieties include Pant Mung-6, Pusa Vishal, SML 668, Pusa 0672, Satya; manage YMV and sucking pests with resistant varieties and spray dimethoate 30 EC @ 1 ml/litre or thiamethoxam @ 0.03%.

Rajmash (Bhaderwah Local/Chinta Selection)

Intercropped with maize (row spacing 75 × 20 cm); sow 9.5 kg seed/acre; treat with copper oxychloride @ 3g/kg; control aphids and anthracnose with chlorothalonil @ 2 g/L spray.

COMMERCIAL CROPS

Sugarcane

Grown in parts of Jammu and Kathua, high-yielding sugarcane varieties like COJ-64, COJ-81, and CO-1148 are preferred. Manage termites with chlorpyriphos, borers with cartap, and diseases like red rot and grassy shoot using resistant varieties and appropriate sprays.

Saffron

Saffron requires 20-24 q corms/acre, with fertigation using 8 kg of Urea, 24 kg of DAP, and 13 kg of MOP, and management involves deep ploughing, raised beds, disease-free corms, and rodent control.

FRUIT CROPS

Start rainy season plantation for new orchards and gap filling in the old orchards. Procure the plants from authorised nurseries. Ensure that new graft should have at least 4 to 6 flushes with 60 -75 cm height and graft union should be 6''above the soil in the poly bag.

Mango

Plough mango orchards deep, immediately after harvest to expose the eggs of mealy bugs. Weeding should be done at least once in a month during monsoon. Harvest mangoes at proper maturity, spray mancozeb or copper oxychloride to manage anthracnose. Repeat the spray at 8-10 days interval.

Citrus

Select 6-9 month-old budded plants. Protect new growth from citrus caterpillar after 2-3 weeks. Spray Dimethoate (1.5 ml/L) against citrus psylla, leaf miner, whitefly, and lemon caterpillar. Ensure proper drainage. For citrus decline, spray copper oxychloride (0.3%) every 15 days or zinc sulphate (1 kg) + lime (500 g) in 200 liters of water. First top dressing per pit: Urea (100 g), SSP (150 g), MOP (75 g), applied 6 inches from the plant.

Guava

Irrigate every 4-5 days during the first month, then every 7-10 days if no rain in the first two years. Remove side shoots up to 50-75 cm from the base. Ensure proper drainage during monsoon to prevent wilting. Apply fertilizer in July for winter crop. Perform air layering operations. For Zinc and Magnesium deficiency, spray 2 g Zinc Sulphate, 2 g Magnesium Sulphate, and 5 g lime in 1 L water every 15 days.

VEGETABLE CROPS

Before sowing vegetable seeds, treat the seeds with fungicides like carbendazim, thiram @ 2 gm/kg seed or with *Trichoderma virdie* @5 gm /kg seed to prevent soil-borne diseases. Apply 8-10 t/acre well rotten FYM at the time of field preparation, half dose of urea, full doses of DAP and MOP at the time of sowing/transplanting and remaining half dose 30 days after planting.

Brinjal

Use varieties like Pusa Purple Long, Pusa Kranti, Pusa Ankur; seed rate is 160-180g/acre with recommended dose of FYM, 82.4 kg urea, 52.8 kg DAP, and 20.4 kg MOP. Use delta or sticky traps @ 8/acre for aphids, jassids, and whitefly; spray Imidacloprid 0.3 ml/l or dimethoate 2 ml/l if pests appear. Install pheromone traps @ 4/acre from 15 days after transplanting for fruit and shoot borer control. Plant saunf or coriander rows to attract natural enemies and spray cypermethrin 1 ml/l every 15 days starting from 20 DAT.

Brinjal Fruit & Shoot Borer

Chillies

Crinkling in chilli due to mite infestation

Grow chillies (NP-46 A, Pusa Jwala, CH-1, etc.) in sub-temperate/sub-tropical zones using 280-320 g seed/acre at 45×30 cm spacing. Apply 10 t FYM, 82.4 kg urea, 52.8 kg DAP, and 20.4 kg MOP per acre; control flower/fruit drop with 50 ppm NAA spray at full bloom. Treat seed for damping-off; control wilt by drainage, resistant varieties, and dipping seedlings in chlorothalonil 0.2% + streptocycline (100 ppm) before transplanting. For mite control, spray dicofol 18.5 EC @ 3 ml/l or wettable sulfur @ 2 ml/l.

Tomato

Use varieties like Pusa Ruby, Pusa 120, and Marglobe; transplant 4-5 week-old seedlings at 60×45 cm; apply 100 kg urea, 52.8 kg DAP, and 40.5 kg MOP/acre. Use 5 marla nursery for 1 ha; transplant 4-5 week-old seedlings. Apply 100 kg urea, 52.8 kg DAP, and 40.5 kg MOP per acre. Control early blight with mancozeb @ 0.25%; spray calcium ammonium nitrate to manage blossom end rot (Ca deficiency). Prevent fruit cracking (boron deficiency) with 3 borax sprays: in nursery (0.3-0.4%), at 3-4 and 5-6 weeks after transplanting; control buckeye rot with copper oxychloride @ 0.3%.

Bhindi (Okra)

Okra pod borer

Varieties suitable for the rainy season include Arka Anamika, Varsha Uphar, Pusa A-4, Hissar Unnat, Hissar Naveen, Jammu Okra-05, and Punjab Padmini; may be sown at 60×45 cm with a seed rate of 4.8-6.0 kg/acre. Apply 82 kg urea, 52.8 kg DAP, and 40.8 kg Murate of Potash per acre. Weed control: Pre-emergence pendimethlin@0.3 kg/acre, plus one hand hoeing at 30 days. Pest control: For aphids, jassids, and whiteflies, spray Methyl Demeton 25EC (1 ml/lt), Dimethoate 30 EC (2 ml/L), or Melathion 50 EC (2 ml/L) after flowering. Use delta/sticky traps (4/acre) and foliar spray of Imidacloprid 17.8 SL (0.3 ml/L) before flowering. Shoot and fruit borer control: Install Ervit lure (5-6/acre) for mass trapping. Spray Cypermethrin (1 ml/L) or Melathion 50 EC (2 ml/L).

Bottle Gourd

Varieties such as Pusa Summer Prolific Long, Punjab Long, Punjab Komal, Punjab Round and Pant Loki 4 can be grown at the spacing of 2 m (between rows) & 90 cm (between plants) with seed rate of 2 kg/acre. Apply 80 kg/acre urea, 44 kg/acre DAP and 20 kg/acre MOP.

Bitter Gourd

Varieties such as Puas Domausami, Punjab 14, Pusa Vishesh, Kalyanpur Baramasi can be used for summer and rainy season at spacing of 1-2 m × 75-90 cm with seed rate 2 kg/acre. Apply 87 kg/acre urea, 43.5 kg per/acre DAP and 33.2 kg per acre MOP. High nitrogen under High temperature conditions promotes staminate flowers.

Pumpkin

Pusa Vishwas, Azad Pumpkin1, Arka Suryamukhi, Arka Chandan, Punjab Samrat varieties can be raised at spacing of 2-2.5m x 75-90 cm with 2 kg seed per acre. Besides, FYM, apply 80 kg urea, 44 kg DAP, 17.2 kg per acre MOP per acre.

Sponge Gourd

Use Pusa Chikni & Pusa Supriya for the rainy season; sow 2 kg seed/acre at 1.5-2.5 m × 75-90 cm spacing; apply 34.8 kg urea, 26 kg DAP, and 20 kg MOP/acre.

Cucumber

Fruit fly and red pumpkin infestation in cucumber

Varieties such as Japanese, Long Green, Straight Eight, Poinsette and local kheera can be planted at the spacing of 1.0-1.5 m × 60-90 cm with seed rate of 0.8 to 1.2 kg per acre. Apply 34.8 kg urea, 22 kg DAP and 16.8 kg MOP per acre. Avoid excessive use of fertilizers and irrigation. Apply nitrogenous fertilizer at proper dose to avoid the staminate flowers. In cucurbits, control red pumpkin beetle with acetamiprid 20 WP @ 0.2 g/l; for fruit fly, install methyl eugenol traps (2-4/acre) or spray malathion 1 ml + 10 g gur/l in the evening. Similarly, manage powdery mildew with wettable sulphur @ 0.2% every 7-10 days. Also, prevent fruit rot by keeping fruits off the soil and harvesting ripe fruits promptly.

Mushroom (Button/Oyster)

It Can be processed into pickles, dried, or preserved using steeping solution.

LIVESTOCK

Cattle

Foot and Mouth Disease (FMD)

Provide adequate shade, ventilation, and clean drinking water to protect animals from high humidity and heat. Ensure timely deworming and vaccination against prevalent diseases like Foot and Mouth Disease (FMD) and Hemorrhagic Septicemia (HS). Cultivate Kharif fodder crops like maize, sorghum, or bajra and ensure silage preparation for consistent feed supply.

Small ruminants

Small ruminants (Sheep and Goat)

Avoid waterlogged and parasite-infested grazing areas; rotate grazing sites to minimize overgrazing and disease risk. Provide mobile or makeshift shelters during heavy rains to prevent pneumonia and foot rot. Regularly check for ecto and endo-parasites; ensure timely vaccination against diseases like PPR (Peste des Petits Ruminants) and Enterotoxaemia, ensure deworming before/after migration, and protect against foot rot and pneumonia during wet alpine grazing.

NUTRITION ADVISORY FOR WOMEN

Nutrition awareness is vital for women farmers during the summer season to help maintain their health, energy, and productivity. Here's a concise summary of key points:

Balanced diet

Include pulses like moong and masoor, as well as milk, curd, and paneer to support body repair and energy. For vitamins, eat green vegetables like spinach, bottle gourd, ridge gourd, and fruits such as watermelon, muskmelon, mango, and litchi to cool the body and boost immunity. Consume millets, peanuts, flaxseeds, and sesame seeds to get minerals and strengthen muscles and reduce fatigue.

Consume seasonal foods

Choose cooling foods like cucumber, bael juice, and melons. Prefer local and fresh produce for better nutrition and easy access. Also use chilled homemade buttermilk using mix curd, water, roasted cumin, black salt, and mint.

Stay hydrated

Drink 10-12 glasses of water daily. Include traditional drinks like buttermilk, coconut water, bael juice, and mango panna. Choose fresh fruit juices without added sugar for natural nutrition.

KASHMIR

CEREAL CROPS

Rice

Soil and Climate: Rice is adaptable to a wide range of soil types, from loamy to clay loams. Optimum growth and higher yield are achieved at day temperatures between 25-33°C and night temperatures between 15-20°C.

Nursery Management (Sowing/ Transplanting): Seed treatment and soaking are essential for proper sprouting. Prepare nursery beds 1 m wide and of convenient length, as per the requirement. Construct low poly tunnels using willow sticks and polyethylene sheets over the nursery beds to protect seedlings from chilling injury and to promote healthy growth. The nursery should be weed-

free, have access to adequate irrigation water, and be equipped with proper drainage facilities. Complete sowing of seeds in the nursery by the first fortnight of May. Use 50-60 kg of seed per hectare for transplanting in lower belts and 80 kg per hectare for higher belts. Sow pre-sprouted rice seeds in the nursery beds. Use pre-stored ponded water in nursery beds instead of running water to avoid chilling injury.

Nursery Preparation

Nutrient Management for Rice Nursery: Apply 275 g of urea, 450 g of DAP, and 200 g of MOP per Marla (25 m^2) area of nursery bed. These fertilizers should be incorporated into the soil during bed preparation. Additionally, apply 1 kg of nitrogen (N) per 100 m^2 of nursery bed area 6-10 days before uprooting the seedlings. Nutrient Management for Main Field (Transplanting). Apply well-decomposed compost or farmyard manure (FYM) at the rate of 15-20 tons per hectare. Incorporate this into the soil during land preparation. Application of vermicompost @ 2.5 t/ha can replace 5 t FYM/ ha and 25% of the recommended NPK dose.

Transplanting Guidelines: Transplanting should begin from the last week of May in lower belts. The field must be free from weeds, and rat burrows in bunds should be sealed to prevent water loss. FYM or compost should be incorporated into the soil during the final land preparation.

Basal Fertilizer Application (Before Transplanting): For varieties grown in lower belts the dose of urea is 80 kg/ha, DAP: 130 kg/ha, MOP: 50 kg/ha, Zinc Sulphate (if deficient): 10-15 kg/ha. For varieties grown in higher belts: Urea: 36 kg/ha, DAP: 130 kg/ha, MOP: 50 kg/ha, Zinc Sulphate (if deficient): 10-15 kg/ha. For varieties grown in waterlogged areas: Urea: 47 kg/ha, DAP: 130 kg/ha, MOP: 50 kg/ha, Zinc Sulphate (if deficient): 10-15 kg/ha.

Seedling Transplantation: Transplant 30-day-old healthy seedlings (about 20 cm tall) raised in traditional nurseries. If raised under protected nursery conditions, 25-day-old seedlings can be transplanted. Transplanting and Field Management. Transplant 2-3 seedlings per hill at a spacing of 15 × 15 cm. To encourage better tillering, shallow transplanting is recommended. Maintain standing water in the paddy field to ensure proper field levelling. A 2-3 cm water level should be maintained as needed. Avoid root damage during seedling uprooting and prevent wilting by minimizing exposure time before transplanting. Gap filling should be completed within one week of transplanting. Effective puddling and water management reduce weed pressure. Maintaining 5 cm of standing water helps suppress weed growth by creating a smothering effect. Apply Butachlor @ 1.5 kg/ha as a pre-emergence herbicide within 2-4 days after transplanting. Apply Eros @ 10 kg/ha or Erase @ 10 kg/ha within 3-5 days after transplanting to control grasses, sedges, and the first flush of Potamogeton. At the time of herbicide application, ensure a 2-3 cm water level in the field and maintain it for at least 4-5 days.

Recommended Rice Varieties: For Lower Belts of the Valley the recommended varieties are Shalimar Rice-1, Shalimar Rice-2, Shalimar Rice-3, Shalimar Rice-4 &

Shalimar Sugandh-1 while for the Higher Belts of the Valley Kohsaar, K332 & Shalimar Rice-5 are the recommended varieties.

PLANT PROTECTION

Common Diseases of Rice and Their Management

Seedling Diseases: Seedling diseases contribute to poor seedling emergence, uneven stands, and stand failure. Seedling diseases include seed and seedling decay (pre-emergence damping off) and seedling blight (post-emergence damping off).

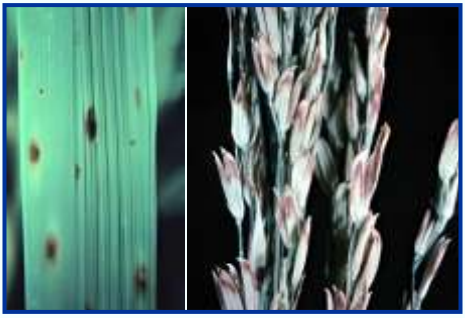
Rice Blast: Blast is the principal disease of rice owing to its wide spread distribution and large scale destructive nature, thereby making rice cultivation impossible in many areas despite management efforts. The symptoms appear on all the aerial plant of parts. Depending upon the site of symptom the rice blast is referred as 'leaf blast', 'collar blast', 'node blast' and 'neck blast.

Leaf blast

Nodal blast

Panicle blast

Brown Spot or *Helminthosporiose Leaf Spot*: The disease symptoms appear on leaves, glumes, coleoptiles, leaf sheath and panicle branches. On leaves and leaf sheaths the disease appears as typical oval or circular spots. The spot are evenly scattered all over the leaf surface. The spots when fully developed are dark brown to purplish-brown in colour with grayish white center. The disease causes black disclouration of grains so reduces seed/ grain quality as well as affects the yield.



Brown spot on leaves and Brown spot on panicles

False Smut or Green Smut: The disease appears only after flowering and the fungus infects individual grain/florets of panicle and transforms the growth into greenish spore

balls of velvety appearance. The spore balls are visible in between the glumes and gradually grow to attain a diameter of 1cm or more (double the diameter of normal grain). The spore balls enclose the floral parts and are slightly flattened, smooth, yellow in colour and covered by a membrane. The membrane bursts as a result of further growth and the colour of ball becomes orange and later yellowish green or greenish black. The affected florets, besides having smut balls, remain sterile giving chaffiness to the panicle.

Sheath Blight: The disease produces spots on leaf sheath. The spots are at first ellipsoid or oval but somewhat irregular in shape and greenish grey in colour. The spots later become greenish white in centre with brown margins. Sclerotia are formed on or near these spots, which are easily detachable. In field, the spots are usually observed near the waterline. When conditions are favourable for disease development, the infection spreads up to the culm and kills the entire leaf. Across the affected parts a series of copper-coloured bands appear. The disease is also called 'banded blight'.

Sheath blight

Sheath blight sclerotial on stem/panicles

Glume Discolouration: Grain discoloration is induced by fungal complex viz., *Helmithosporium oryzae, Cercospora sp., Fusarium sp., Curvularia lunata, Alternaria sp.*, etc. Causing brown spots when panicles hatch out the disease leads to decrease in the number of filled grains and increase in unfilled grains. The disease appears initially as darkening of glumes and spikelets usually brown to

Glume Discolouration

black in colour. The glumes show rotting symptoms. The disease intensity may range from sporadic discolouration to complete discolouration of whole glumes. Such discolorations appear externally on glumes or internally on kernels, or both. On glumes, the symptoms accordingly vary depending on the type of organisms involved and the magnitude of infection. The disease has shown increasing trend in recent years in the valley. The disease also decreases the seed quality and affects grain quality.

Integrated Disease Management: Most rice diseases can successfully be managed by use of healthy disease-free seed, proper field sanitation, application of balanced fertilizers, adherence to recommended cultural practices and, when necessary, use of biocides. Procure the seeds only from reliable registered seed agency or select only healthy and disease-free mature seeds for future use if taken from one's own crop. Before storage the seed should be cleaned, properly dried and treated with any one of the following fungicides: Tricyclazole 75 WP @ 0.6 g/ kg seed. Captan 50 WP @ 3.0 g/ kg seed. Mancozeb 75 WP @ 3.0 g/ kg seed. Mancozeb 75 WP @ 2.0 g + Carbendazim 50 WP @ 1 g/ kg seed.

Pre-sowing Seed Treatments: In order to minimize the chances of disease spread through seed, it is better to soak the seeds for overnight and at transplantation dip the seedlings roots in either of the following fungicides before sowing: Tricyclazole 75 WP @ 60 g/100 liter water, Ediphenphos 50 EC @ 100 ml/100 liter water,The sprouted seeds should not be treated with any fungicide as it may damage the plumule/ radicle.

MANAGEMENT OF DISEASES IN FIELD

Field sanitation: Stubbles and leftover straw should be collected and destroyed (either through burning or deep burial). Eradicate all the weeds from paddy field as it shall help in the removal of collateral hosts of the pathogens. The best way to control blast is to integrate the use of resistant varieties with good cultural practices (proper field selection, seeding rate, fertilization, and flooding).

Cultural Management: Strictly adhere to the recommended package of practice regarding land leveling, soil preparation, adequate puddling, plant spacing, fertilizer and manure use, crop rotation, water management and weed- and insect-pest management, etc. as these ensure better plant growth and development thereby help in minimizing the disease.

Fungicidal Management: Blast, brown spot and false smut are the most prevalent diseases of rice in Kashmir. In view of the present cropping system, it is impossible to completely eradicate the field inoculum even after taking all the precautionary measures. As a result blast incidence is inevitable. Besides pre-sowing seed treatment and seedlings dip as discussed above, the standing crop may be sprayed with fungicides no sooner the first disease symptoms appear in the field followed by three more sprays at 15-20 days interval. However, keeping in view the devastating nature of these diseases fungicidal sprays at the following four stages of crop growth are necessary to effectively control blast and other rice diseases. 1st spray at tillering stagem, 2nd spray at panicle initiation stage, 3rd spray at booting stage & 4th spray at milking or dough stage.

Recommended fungicides sprays: Ediphenphos 50 EC @ 100 ml/ 100 liter water,Tricyclazole 75 WP @ 60 g/ 100 liter of water, Isoprothiolane 48 EC @ 100 ml/ 100 liter water, Hexaconazole 5 EC @ 30 - 50 ml/ 100 liter water, Mancozeb 75 WP @ 200 g + Carbendazim 50 WP @ 50 g/ 100 liter water, Carbendazim 50 WP @ 50 - 100 g/ 100 liter water & Propiconazole 50 WP @ 100 ml/ 100 liter water. It is worthwhile to mention here that the spray of same fungicides during a single cropping season should not be repeated.

Maize

Nutrient Management: Apply well-decomposed compost or FYM uniformly at 15-20 t/ha during land preparation. Vermicompost @ 2.5 t/ha can substitute 5 t FYM/ha and 25% of the recommended NPK.

For Irrigated Maize: Hybrid Varieties: Urea: 100 kg/ha, DAP: 160 kg/ha, MOP: 67 kg/ha & Zinc Sulphate: 20 kg/ha (basal dose). For Composite Varieties: Urea: 80 kg/ha, DAP: 130 kg/ha, MOP: 50 kg/ha & Zinc Sulphate: 15-20 kg/ha (basal dose).

Rainfed Maize: Hybrid Varieties: Urea: 60 kg/ha, DAP: 100 kg/ha, MOP: 34 kg/ha & Zinc Sulphate: 15 kg/ha (basal dose). For Composite Varieties: Urea: 28 kg/ha, DAP: 87 kg/ha, MOP: 33 kg/ha & Zinc Sulphate: 10 kg/ha (basal dose)

Weed Control: Apply Atrazine (Atratraf 50 WP or Gesaprim 500 FW) @ 1.0-1.5 kg a.i./ha in 600 litres of water 2-3 days after sowing.

Earthing Up: Perform at knee-high stage (35-40 DAS) in early-sown crops.

Top Dressing of Urea: Urea @ 80 kg/ ha is recommended for Irrigated Hybrid maize while the doses of urea for irrigated composite, rainfed hybrid and rainfed composite are 65, 50 and 40 kg/ ha, respectively. Apply during first weeding, hoeing, and earthing up at the knee-high stage. It is important to avoid moisture stress during the knee-high stage in early-sown crops.

PLANT PROTECTION

Cutworm Management: Prefer early sowing (up to 3rd week of April). Apply Carbofuran 3% CG @ 32.5 kg/ha before sowing. Install light traps (5/ha) and pheromone traps (20/ha) for monitoring. Use pitfall traps to collect and destroy larvae.

Armyworm Management: Uproot stubbles of the previous crop. Spray Chlorpyriphos 20 EC @ 150 ml/100 litres of water.

Disease Management: Maintain field sanitation. Use disease-free seeds. Treat seeds with: Mancozeb 75 WP @ 3 g/kg seed, or Metalaxyl MZ 72 WP @ 2.5 g/kg seed. Foliar Spray for Disease Management in Maize: At the appearance of disease symptoms, apply a foliar spray of either: Mancozeb 75 WP @ 3 g/litre of water, or Hexaconazole 5 EC @ 0.05% concentration

PULSE CROPS

Moong (Green Gram)

Sowing should be done between 15th May and 30th May. Use a seed rate of 20-25 kg/ha. Maintain a spacing of 30 × 10 cm (row-to-row × plant-to-plant). Inoculate seeds with *Rhizobium* and *PSB* culture @ 5-10 g/kg of seed before sowing. Ensure the field is well pulverized and levelled before sowing. Ensure adequate soil moisture at sowing for better germination. Apply well-decomposed compost or FYM @ 10-15

t/ha and incorporate during land preparation. Apply the following as basal dose during the final ploughing: Urea: 15 kg/ha, DAP: 130 kg/ha, MOP: 50 kg/ha. To control early-stage weed infestation, apply pre-emergence spray of Pendimethalin @ 1 kg a.i./ ha within 2-3 days after sowing (DAS). Recommended Varieties: Shalimar Moong-1 & Shalimar Moong-2

Rajmash (Kidney Bean)

Complete sowing in the first fortnight of May. Bush type: Seed rate: 60-70 kg/ha & Spacing: 30 × 10 cm. Pole type: Seed rate: 30-35 kg/ha & Spacing: 60 × 20 cm. Recommended Varieties: Bush Type: Shalimar Rajmash-1, Shalimar Rajmash-2 and Pole Type: Shalimar Rajmash-3, Shalimar Rajmash-4. All other practices are the same as those for moong.

Cowpea

Complete sowing in the first fortnight of May. Use a seed rate of 40 kg/ha. Maintain a spacing of 30 × 10 cm. Recommended Varieties: Shalimar Cowpea-1 & Shalimar Cowpea-2. All other practices are the same as those for moong.

Soybean

Complete sowing in the first fortnight of May. Use 40-50 kg seeds/ha. Maintain a spacing of 45 × 10 cm. Recommended Varieties: Shalimar Soybean-1 & Shalimar Soybean-2. All other practices are the same as those for moong.

DISEASES OF PULSES

Diseases of Rajmash, moong, cowpea: Symptoms: The infected plants show gradual wilting and drying. Yellowing and premature drying of leaves and stems are noticed. The basal portion of stem and root region becomes black. When the bark of infected root is peeled, black streaks are seen and vascular tissues show discolouration.

Leaf spot: Symptoms: Leaves show light brown small spots. Shot holes are formed in due course. Lesions develop on petioles and stem

Angular leaf spot: Initial symptoms appear on leaves as circular spots in between the veins which attains angular shape which are dark grey in colour and latter turn to reddish brown to dark brown.

Anthracnose: Most striking symptoms appear on immature pods although symtoms also appear on leaves, petioles and stem. Infection appears as brick red colour on the veins on lower surface of the leaves. On veins brownish black lesions appear on pods sunken cankerious spots with lighter or grey centers develop.

Rust: The rust pustules appear on all the green parts. On the leaves there are numerous small, orange brown pustules each surrounded by a light-yellow halo. Infected leaves wither and may fall. similar rust pustules as on leaves develop on stem.

Bean Common mosaic virus: Downward curling of foliage is diagnostic character in bean common mosaic virus. The leaves of infected plants become mottled, chlorotic, puckered and tend to droop, leaf size is reduced.

White Mold: Appearnce of light brown water-soaked discolouration on the stem, leaves or pods and cottony growth on in collar region under humid conditions.

Affected plants appear wilted ripe prematurely and numerous sclerotia bodies develop on infected parts. Adopt cultural practices, use of disease resistant seeds, follow 3-4 year crop rotation. Seed dressing with Captan 50WP @ 3gm/kg seed. Spray the standing crop with carbendazim 5+Mancozeb 75WP @ 0.25%. In case of root rot or damping off Seed treatment with Talc formulation of *Trichoderma viride* @ 4g or *P. fluorescens* @ 10 g/kg seed (or) Carbendazim 2 g/kg or Thiram @ 4 g/kg. Spot drenching with Carbendazim @ 1 gm/ litre of water. For the management of Common Mosaic virus: Rogue out the infected plants in the early stages of growth. Spray Fenazaquin @ 1 ml/L on 45 and 60 DAS as prophylactic spray. For the Management of anthracnose disease seed treatment with Captan 50WP @3gm/kg seed. Spray the standing crop with carbendazim+ Mancozeb 75WP @0.25% or chlorothalonil 75WP @ 0.3% carbendazim+ Mancozeb 75WP@2.5gm/Kg of seed. For the management of rusts spray fungicides propiconazole 25EC@0.1% Or flusilazole40EC@0.02%. For the management of Aphids, white fly or bean common mosaic virus application of granular insecticides Thimet @1.5Kg/ha in soil at sowing time followed by foliar spray of Dimethoate 30EC@0.05%.

FRUIT CROPS

Apple

Crop Load Management: A well-managed crop load is essential for achieving optimal fruit size and minimizing biennial bearing. Chemical Thinning: Apply Naphthalene Acetic Acid (NAA) @ 10 ppm when fruitlets are 10-15 mm in size or 7-35 Days After Full Bloom (DAFB). This helps in thinning excess fruit, promoting better growth of the remaining fruits. Hand Thinning: Retain 4-6 fruits/cm^2 of Trunk Cross-Sectional Area (TCSA) to ensure sufficient space for fruit growth. This improves fruit size and helps in reducing biennial bearing.

Fertilizer Application: Fertilization is critical to meet the nutritional needs of apple orchards. 2^{nd} Dose of Nitrogen (N) & Potassium (K): Apply the second dose of Nitrogen and the remaining Potassium 3-4 weeks after fruit set, as per soil test recommendations. This will help in supporting healthy fruit development during the critical period of cell division. Calcium Spray: Calcium plays a pivotal role in fruit quality, especially during dry spells. Spray Calcium Chloride @ 0.3% during prolonged dry spells (more than 2 weeks) to prevent bitter pit and other related disorders that affect fruit quality.

Irrigation & Mulching: Proper irrigation and mulching can significantly improve orchard productivity, especially in challenging climatic conditions. Irrigation: Ensure regular irrigation during the critical cell division stage to support healthy fruit growth. Mulching: In rainfed or water-scarce areas, apply mulch (preferably organic, such as grass/straw) around tree basins. This helps conserve moisture and control weed growth, ensuring better root health.

Weed & Orchard Sanitation: Maintaining cleanliness in the orchard is essential for preventing pest and disease buildup. Weed Control: Keep the tree basins weed-free to prevent competition for nutrients and water. Sanitation: Remove fallen fruitlets, flowers, and pruned material to reduce disease/pest load and maintain orchard hygiene.

Stone fruits (Cherry, Almond, Peach, Plum, Apricot etc)

Keep stone fruits well-watered during fruit set and fruit developmental stages. Use hail nets when there is colour change in cherry.

Pest & Disease Surveillance in Apple and other fruit crops: Effective pest and disease management starts with regular monitoring. Pay attention to common pests such as Apple Blotch Leaf Miner (ABLM), aphids, and fruit borers, along with diseases like scab. Neem Oil: Apply Neem oil (1500 ppm) as a foliar spray at 300ml/100 litres of water during Fruit. Developmental Stage III. This acts as a preventive measure for managing insect pests.

Apple Blotch Leaf Miner (ABLM): A major pest that can damage apple orchards. Sanitation: Maintain orchard hygiene by removing infested leaves. Use pheromone traps (1/kanal). Sticky traps placed 10m apart for better pest tracking. Mass Trapping: Install 2 pheromone traps/ kanal. Pesticide Treatment (after first moth catch): Choose one of the options: Thiamethoxam 25 WG @ 50g/100 L or Imidacloprid 6% + Lambda-Cyhalothrin 4% SL @50ml/100 L or Flubendiamide 39.35 SC @ 40ml/100 L.

Fruit Borer (Helicoverpa armigera): Infestations of fruit borers can increase due to climatic variability. Taking prompt action is necessary. Infestation Control: Destroy infested fruits and larvae immediately. Install 8-10 pheromone traps/ha or 1 trap/kanal. Mass Trapping: Use 2 traps/kanal. Pesticide Application: If 1-2 moths/trap for 5 consecutive nights, apply: Chlorpyriphos 20 EC @ 100ml/100L. Quinalphos 25 EC @ 100ml/100 L.

San Jose Scale & Wooly Apple Aphid: These pests can cause significant damage if not controlled effectively. Apply Dimethoate 30 EC or Quinalphos 25 EC @ 100 ml/100 litres of water for pest control.

Aphids: Aphid populations can explode during certain seasons. Apply Thiamethoxam 25 WG @ 50g/100 litres of water or Thiacloprid 21.7 SC@ 40ml/100 litres of water to manage aphid infestations.

Disease Management: Preventing and managing diseases like scab and root rot is vital to maintaining the health of the orchard.

Scab & Foliar Diseases: Preventive Measures: Apply fungicides such as Mancozeb 75 WP @ 0.3%, Captan 50 WP @0.3%, or Zineb 75 WP @ 0.3% before the onset of rains. Curative Measures: If symptoms appear, apply curative fungicides like Hexaconazole 5 EC @50ml/100 litres or Flusilazole 40 EC @ 20ml/100 L.

Root Rot: Remove the infected soil and expose the roots to sunlight. Drench the tree basin with Carbendazim 50 WP @ 0.1% or Carbendazim + Mancozeb mix @ 0.5%.

Collar Rot: Clean the affected collar area and apply Chaubatia or Bordeaux paste. Drench the soil under the tree canopy with Metalaxyl MZ 72 WP @ 0.3% or Copper Oxychloride50 WP @ 0.6%.

Almond, plum, peach, apricot, cherry and Pear

Foliar fungal disease: Spray Carbendazim 50WP (0.05%) or Thiophanate Methyl 70WP (0.05%) or Dodine 65WP (0.06%).

Fabrea leaf & fruit spot: Spray Thiophanate Methyl 70WP (0.05%) or Carbendazim 50WP (0.05%) or Mancozeb 75WP (0.3%) or chlorothalonil 75 WP (0.25%).

VEGETABLE CROPS

Solanaceous Vegetables

Brinjal

Recommended varieties/ hybrids are Dilruba (150-200 q/ ha), Pusa Purple Long (150-200 q/ ha), Black Beauty (150-200 q/ ha), Shalimar Improved: (200-225 q/ ha), DBL- 02 (40 t/ha), Shalimar Brinjal Hybrid-1(800 q/ ha), Shalimar Brinjal Hybrid-2 (540 q/ ha) and Pusa Hybrid-5 (520-540 q/ha). Sowing time is Mid April-End of May with seed rate of 500-750 g/ ha for varieties and 300 -400 g/ ha for Hybrid and recommended NPK of 150:120:120 and recommended spacing of 60x45cm

Bell Pepper

Recommended varieties/ hybrids are California Wonder (60-70 q/ ha), Chinese Giant (50-60 q/ha), Nishat-1(180-200 q/ ha), Shalimar Capsicum Hybrid-1 (700-750 q/ ha) and Shalimar Capsicum Hybrid-2(600-650q/ ha). Seed rate for varieties is 1 -1.5 kg/ ha and for Hybrids (300 -400 g/ ha) and recommended spacing is 60 x 45 cm (varieties) and 60 x 60 cm (hybrids). Crop sowing is carried in the month of April to Mid-May. Manures and Fertilizers recommended for the crop is 120:90:30-40 NPK.

For higher fruit yield give, 3 sprays of water-soluble fertilizers having combination of NPK as 17:10:27 with a concentration of 0.5% (5g/L) starting from 30 DAT at 10 days interval. Also 3 sprays of micronutrient mixture B (Borax), Zn (Zinc Sulphate), Cu (Copper sulphate), Fe (Ferrous sulphate), Mn (Magnese Sulphate) and Mo (Ammonium molybdate) at a concentration of 0.5% (5g/L) starting from 40 DAT with 10 days interval is recommended for higher fruit yields. In order to increase seed yield of Nishat-1 upto 2.58 q/ ha apply micronutrients as foliar spray. Also spraying of NAA@ 20ppm and pinching of apical shoot is recommended to obtain higher seed yield.

Chillies (Hot Pepper)

Recommended varieties are Shalimar Long (75-100q/ ha), Kashmir Long 1 (150 q/ ha) and PC-56 (140-150 q/ha). Sowing of chillies can be carried in April-mid May with Seed rate of 1.5-2.0 kg/ ha. spacing of 25 -30cm and using NPK @120:83:60 before transplanting and nitrogen in two split doses (½ at time of sowing and remaining ½ at 30-40 DAT is recommended for the crop.

For seed production of chillies and bell pepper an isolation distance of 400 m and 200 m is maintained between two varieties for production of foundation and certified seed, respectively. Seed yield increases with a foliar application of important micronutrients (Zn, Mn, Cu, Fe and B) at a concentration of 0.5% (5g/ l of water).

Tomato

Sowing time for tomatoes in Kashmir valley is Mid-March to April with seed rate of 500-600g/ ha. Recommended varieties/ hybrids are S-I (250-275 q/ ha), S-II (200-210q/ ha), Roma (200-225q/ ha), Pant Bahar (250q/ ha) and PT-3 (300q/ ha). S-I can be transplanted at spacing of 45 x 30 cm and Roma and S-II at 60 x 45 cm.

Integrated nutrient management : Combined application of azotobacter (seed treatment@500g/ ha) + 75% recommended N and 100% P&K (125:60:60) is an optimum nutrient combination for obtaining higher fruit yield.

Different stages of harvesting

Green stage: Fully mature green fruits are harvested to get more price of the produce at early stage. Breaker or turning stage: The fruits are harvested when 1/4 th blossom end of the fruit show pink colour. This is suitable to send the fruits to long distances.

Pink stage: When 3/4th of the surface towards blossom end shows pink colour. These fruits can be used to sale in the local market as well as to send distant markets.

Ripe stage: When entire fruit develop pink or red colour but fruits are still firm. This stage is suitable for table or salad purpose and to sale it at farmers field.

Over ripe stage: When fruits attain maximum colour and become soft. Such fruits are suitable for processing purposes.

Potato

Varieties recommended for Kashmir valley are Kufri Jyoti(200-250 q/ ha), Gulmarg Special(250 - 280 q/ ha), Kufri Giriraj(200-250q/ ha), Shalimar Potato- 1(350 q/ ha), Shalimar Potato-2(250-300 q/ ha),Kufri Pukhraj (30-35 t/ ha), Kufri Himalini, Kufri Ghirdhari (300-350 q/ha) and Kufri Shailja (300-350 q/ ha).potato seed tubers can be planted at spacing of 60x20cm and seed rate of 20-25q/ha. First earthing up is done when plants are 10 -15 cm long and Final earthing up is done when the crop is 6 -8 weeks old.

Methods of breaking dormancy: The cutting of tubers in pieces during the advanced stage of dormancy may help in breaking the dormancy. Cut the tubers in pieces having at least three healthy eyes and dip in 1% solution of thiourea for one hour. The planting should be done just after treatment or kept in wet gunny bags for one night.

Integrated Nutrient Management: Application of vermicompost @ 4.5t/ha along with 50% RFD (75:50:50) is recommended to obtain higher tuber yields. For supplementing Sulphur requirements Copper Sulphate@10kg/ ha is recommended. To improve shelf life in potato tubers spray Calcium Sulphate (0.2% sol) at 50,60 and 70 days after planting. Treat tubers with 1% urea and 1% sodium bicarbonate + biofertilizer (*Azotobacter + Phosphobacteria*) @ 2.5 kg/ ha and apply only 80:75:75 (NPK/ ha) as INM strategy.

Cucurbitaceous Vegetables

Raising cucurbit seedlings indoors: Seedlings of commercially important cucurbits are raised indoors in warm rooms/ locations with slightly extra care and cost, for getting seedlings early in the season. 2-3 seeds are sown in polyethylene bags of 100-gauge thickness and 12 cm x 10 cm in size filled with well crushed Dal weed or garden soil, 4 -5 weeks before the normal date of sowing. The bags before filling are provided with 4 - 5 holes on upper side for proper aeration and 2 -3 holes in the bottom to drain out excess water. When the

outside temperature rises (May), the seedlings are transplanted in the open fields along with the polyethylene bag to which a longitudinal cut is given with a sharp blade. Care is taken that the soil ball in these bags does not get disturbed. Plants raised in polyethylene bags are found to give highest early yields. The crop-wise package recommendations are given below.

Bottle Gourd

Variety recommended for growing in Kashmir conditions is Shalimar Improved(200-250 q/ ha). Seeds can be sown @ 6 -8 kg/ ha directly in Mid-April-May and spacing maintained at 200 -250 cm x100 cm. Entire Recommended dose (NPK@70:30:30 kg/ ha) of P, K, ½ N be applied as basal dose and remaining ½ N can be applied in two equal split doses first when plants start growth and 2nd when fruiting has started. Bottle gourd responds well to application of plant growth regulators for growth, sex modification and fruit development. A foliar treatment of 150 ppm (1.5mg/L water) of ethephon at 4 true leaf stage and a second spray of same concentration at fifteen days interval is desirable to achieve better results.

Cucumber

Recommended varieties/ Hybrids include Japanese Long Green (80-100 q/ ha), Pusa Sanyog (200 q/ ha), Shalimar Cucumber Hybrid-1 (500-600 q/ ha) and Shalimar Cucumber Hybrid-2 (600-650 q/ ha). 2-3 seeds per hill can be sown directly in the field in the month of Mid-April-May with seed rate of 2.5kg/ ha and 1.2-1.5kg/ ha and spacing of 120cm x 30 cm and 150cm x50cm for Varieties and Hybrids resp. recommended NPK is 70:30:30 kg/ha

Bitter Gourd

For Kashmir zone Recommended variety is Arka Harit (80-100 q/ha). Seeds are directly sown in the field, after being soaked in luke warm water for about 24 hours and then held in wet cloth kept at some warm place, till the seed coat ruptures, 2-3 seeds are planted per hill with seed rate of 5 -6 Kg/ ha can be sown in Mid-April-May and spaced at 150 -200cm x 60cm. NPK recommendation is 60:25:25kg/ ha.

Seed production of cucurbits: For collecting seeds from various cucurbits care should be taken that the following crops are not raised in one single plot: Sponge gourd and ridge gourd, Muskmelon, longmelon and snap melon, Pumpkin and squash, Watermelon and Round gourd. Besides all cultural practices, the following points should be kept in mind: Maintain isolation distance of 800 meters and 500 meters between two varieties for raising foundation and certified seed, respectively. Rouge out all off-types and diseased plants before flowering, during flowering at immature fruit stage, and finally during mature fruit stage. Immature tender fruits may be harvested once from seed plot for consumption rest of fruits and leaving rest of fruits for ripening. Fruits are harvested when fully ripe. Seeds are extracted by cutting the fruits. Seeds are gently rubbed with wood ash and dried. Fruits of bottle gourd, sponge gourd and ridge gourd may be dried or seeds may be extracted as and when required for planting. Fully ripe fruits of pumpkin and squash may be kept for a couple of weeks, before extracting seeds. However, seeds from fully ripe musk melon, water melon, bitter gourd and cucumber are extracted as soon as possible. Well-dried seeds are stored in airtight containers.

Important management tips for raising cucurbits: Select a plot with an efficient drainage system. Plant the seed when the soil has attained the optimum temperature between 20- 25°C when the winter is over and follow space planting as recommended. Irrigate twice or weekly during hot summer. Apply fertilizers properly when the vine starts growing. Adopt timely plant protection measures against diseases and insect pests. Harvest the melons (except long melon) when they are mature whereas harvest the gourds when in immature state. Procure the seed of a recommended variety from a reliable source. Hand pollination may be adopted to get higher yields. Do not grow cucurbits under shade, if possible. Do not grow cucurbits under very humid conditions. Do not irrigate heavy soils after sowing. Do not allow tender fruits to go beyond marketable stage. Do not sow the seeds in nursery because cucurbits do not withstand transplanting shock. However, as recommended seedlings can be raised indoors in polythene bags.

Leguminous Vegetable

French Bean

Bush type varieties like Bountiful, Master, Arka Komal, Contender and pole type varieties like Kentucky Wonder, Painted Lady and Asparagus beans can be grown successfully in Kashmir conditions with seed rate of 80-100 kg/ ha, 25-30 kg/ ha and 20-25 kg/ ha and spacing of 30 cm x 10 cm, 100 cm x 50 cm and 100 cm x 50 cm in Bush type, Pole type and Asparagus beans respectively. Sowing can be carried from April - June. Entire FYM, K and ½ N (recommended dose is of FYM is 20-25 t and 30:60:60 NPK at the time of sowing and other ½ N when true leaves emerge.

Bhindi (Okra)

Pusa Sawani (60-80 q/ ha) is Recommended variety of okra for Kashmir valley. Seeds pre-soaked in hot water at 50°C for 30 minutes and directly sown on the ridge tops which are 15 -20 cm high above ground and 45 cm apart can be sown in Late April-May with seed rate of 15-20 kg/ha. After the seeds have germinated and plant has attained height of about 7-10 cm, plants are thinned to a spacing of 30cm between plants. NPK @120:90:60 can be applied.

Seed Production: Besides all cultural practices required for commercial production of okra, retain first 10 fruits on main stem for obtaining higher seed yield. Foliar application of 100 ppm (1mg/L) NAA (Naphthalene Acetic Acid) after 30 days and 50 days of sowing gives higher yield.

LIVESTOCK

Cattle

Maintain cleanliness in and around farms and ensure availability of clean water. Ensure that the sheds receive enough sunlight during the day to prevent dampness and to complement the cleaning process. Ensure 6-8 hours of daily grazing to animals if community pastures are available. Concentrate mixture should be fed as per the body weight, production and stage of pregnancy to ensure optimal productive performance. To mitigate scarcity of fodder during winter months, fodder crops such as maize, bajra, and sorghum should be sown, so that it can be preserved through ensiling.

Maintaining an emergency stock of dry fodder and concentrates is crucial for ensuring uninterrupted animal nutrition during unforeseen weather events such as heavy snowfall. Green $^{1}/_{3}$ and $^{2}/_{3}$ dry fodder should constitute the total fodder requirement of the animal. Concentrate feed, 1 kg per 2.5 liters of milk produced in cattle should be provided to fulfill their nutritional needs. Avoid sudden change in feed and fodder, change should be gradual so that animal can adopt to the new ration without experiencing any health issue. Commercially available mineral mixture at the rate of 60g per animal should be incorporated in the ration to meet the daily requirement of the minerals. However, it should be discontinued once pregnant animals are dried off, to reduce risk of milk fever post calving.

A strategic deworming schedule should be followed to prevent development of anthelmintic résistance. This involves deworming animals based on parasite risk and fecal egg counts rather than routine blanket treatments. Rotating between classes of anthelmintics and targeting high-risk animals helps preserve the efficacy of dewormers, ensuring long-term parasite control and minimizing drug resistance in the herd. Follow proper biosecurity measures to prevent outbreak of any disease. This is crucial for preventing the introduction and spread of infectious diseases within a herd. It includes controlling the movement of animals, people, and equipment; maintaining cleanliness and disinfection routines; quarantining new or sick animals; and regularly monitoring animal health. Use of corrosive chemicals for disinfection should be discouraged as it can increase the risk of lameness in animals. For prevention of mastitis, it is essential to use both pre- and post-milking teat dips. Consistent use of quality teat dips, along with proper milking hygiene, plays a key role in maintaining udder health and reducing mastitis incidence and ensuring production of clean and hygienic milk for human consumption. For prevention of malignant catarrhal fever sheep should never be cohoused with cattle.

Vaccinations against prevalent diseases-such as Foot-and-Mouth Disease (FMD), Hemorrhagic Septicemia (HS), Lumpy Skin Disease (LSD), and Black Quarter (BQ)-should be administered well in time. Strategic vaccination plays a critical role in safeguarding herd health and preventing economic losses. Animals consuming leguminous green fodders such as clover are at a higher risk of developing bloat. Early recognition and prompt treatment are essential to prevent economic losses. Preventive measures, such as gradual diet introduction and use of anti-bloat agents, should also be considered. Topical ecto-parasitic agents used for spraying on animals should also be thoroughly applied to all cracks and crevices within the shed, as these are common hiding spots for parasites. For effective control, the application should be repeated at recommended intervals on both the animals and the environment. This is particularly important in managing biting midges and other ecto-parasites, which cause irritation, stress, and production losses in livestock.

Sheep/ goat

Weaning of lambs/kids may be done after 90 days' age (except weak lambs/kids). Feeding of Creep mixture (CP >20%) should be ensured to lambs/kids - Lamb/ kid growth rate should be regularly monitored by recording their body weight at regular intervals. Ensure at least 6-8 hrs. of daily grazing to animals. If good grazing facilities

are available, no concentrate supplementation is required. While grazing, animals should be monitored continuously for development of bloat due to excess consumption of certain excess green fodders (e.g., clovers) and in case of any such eventuality, veterinary assistance should be sought. Sheep are seasonally migrated to subalpine and alpine pastures to take advantage of nutrient-rich forage, reduce grazing pressure on lowland areas, and support overall flock health and productivity. This traditional transhumance practice is especially important in regions like Kashmir, where high-altitude grazing improves wool quality and animal condition. Prior to migration, ensure animals are vaccinatied against economically important diseases. Such as pox, PPR, Foot rot and FMD. A strategic deworming schedule should be followed to prevent development of anthelmintic resistance. This involves deworming animals based on parasite risk and fecal egg counts rather than routine blanket treatments. Rotating between classes of anthelmintics and targeting high-risk animals helps preserve the efficacy of dewormers, ensuring long-term parasite control and minimizing drug resistance in the herd. Provide salt licks and mineral blocks. This is essential to meet mineral deficiency especially at higher altitudes where soil and forage may lack essential minerals.

Backyard Poultry

Ensure proper night shelter and effective litter management, using saw dust or rice husk. Replace it every 2-3 weeks. Birds under scavenging backyard conditions or free range should be provided with supplemental feed. Additionally, vitamin C and electrolytes should be incorporated in drinking water to prevent heat stress. Deworm if it is necessary, with appropriate dewormer. Follow proper vaccination schedule to reduce early chick mortality and off set economic losses. Use pre and probiotics to improve gut health, reduce stress and improve immunity. This ensures wholesome and hygienic poultry products for human consumption.

Trout Fish

Trout fish, particularly species like rainbow trout, thrive in clean, cold water that is rich in oxygen. These fish are sensitive to water temperature and quality, with an optimal range for growth being between 50°F to 60°F (10°C to 15°C). Maintaining clean and cold water helps prevent disease and stress, ensuring healthy fish that grow at their optimal rate. Ensure a continuous water flow rate appropriate to the fish biomass. Maintain pH between 6.5 to 8.0 and dissolved oxygen above 7 mg/L. Commercial trout feed should be fed at 3-5% of body weight, divided into multiple feedings. Fish should be segregated according to size to prevent cannibalism, as larger fish may prey upon small ones. Routines inspection of the stock for signs of bacterial, fungal or parasitic infection can aid in prevention of disease. Adopt strict biosecurity measures to prevent disease outbreaks. For maximizing the returns, harvest the trout fish that have reached typical marketable size (250-300g)

CEREAL CROPS

Paddy

Farmers are advised to grow upland paddy with varieties like Vandana, Virendra, Abhishek, Swarna Shreya, Anjali, Sahbhagi Dhan, CR Dhaan-320, IR-64, etc., using the Direct Seeded Rice (DSR) method in upland areas. For direct sowing of paddy seeds in upland areas, summer ploughing should be done in May, and land preparation should be completed in the first week of June. Varieties such as CR Dhaan-320 and Swarna Shreya should be purchased in May itself. Short-duration varieties like Anjali, Sahbhagi, Vandana, and Sushak Samrat are suitable for direct sowing in the first fortnight of June.

For medium land paddy cultivation, to minimize delays due to late monsoon arrival, nurseries for paddy seedlings should be prepared at 10-day intervals in June. Improved variety seeds like Sahbhagi Dhan should be purchased at the end of May. Nursery sowing should be done in the first week of June to enable timely Rabi crop cultivation. A nursery of 100 m^2 is sufficient for one hectare. For this, 40 kg of OP variety seeds or 15 kg of hybrid seeds should be sown. Paddy seeds should be treated with Carbendazim @ 2 g/kg of seed. Fertilizers should be applied at a rate of 40:20:20 kg N:P:K per hectare. Of the nitrogen, 50% should be applied at sowing, 25% at 30-35 days, and the remaining 25% at 45-50 days after sowing. Entire phosphorus and potassium should be applied at sowing.

Farmers are advised to get their farm soil tested and apply fertilizers as per recommended doses. For transplanted paddy, apply fertilizers at a rate of 80:40:20 kg N:P:K per hectare. Nitrogen should be applied in split doses: 50% at transplanting, 25% at 30-35 days, and 25% at 50-60 days after transplanting. Phosphorus and potassium should be fully applied at transplanting. To prevent zinc deficiency, apply 25 kg of zinc sulphate during field preparation. For effective weed control, apply 2.5 litres of Pendimethalin 30 EC mixed in 500 litres of water

Management of paddy field

per hectare within 1-2 days of sowing. Bispyribac 10 SC should be applied at 250 ml/hectare 20-25 days after sowing. In case of chlorosis (iron deficiency), spray 1% ferrous sulphate solution (2.5 kg in 250 litres of water) two to three times at weekly intervals, and ensure adequate irrigation. For Terai paddy, seedlings should be prepared as per medium land rice guidelines. Varieties like Rajendra Mahsuri, Rajshree, and BPT-5204 should be selected and purchased in advance, preferably in May.

Maize

Farmers are advised to plough the land during May and apply 3-4 quintals of lime per hectare. Seeds should be sown in the first week of June or at the onset of the monsoon. To control termite populations and larvae, 100-150 quintals of well-decomposed farmyard manure (FYM) along with Methyl Parathion 2% dust at the rate of 25 kg per hectare should be incorporated into the soil during land preparation. Use 20 kg of seed per hectare of recommended maize varieties such as PMH-3, Orange Flint, HQPM-1, or HQPM-5. At the time of sowing, apply 86 kg of urea, 130 kg of DAP, and 68 kg of MOP per hectare. If the field remains dry, provide irrigation after 30 days. After proper weeding, apply an additional 65 kg of urea. Ensure the field has proper drainage to prevent water stagnation. Two weeks after germination, apply 10-15 granules of Fipronil 0.3G or Carbofuran 3G in each plant to manage early-stage pests. To control the incidence of Fall Armyworm in the maize crop, spray Emamectin Benzoate 5% SG at the rate of 1 gram per 3 litres of water.

PULSE CROPS

Farmers are advised to grow pulses (especially pea, chickpea, and lentil) during Kharif season. The recommended varieties for upland field include: Pigeon pea- Narendra Arhar-1, Narendra Arhar-2, Rajeev Lochan, IPA 203, Malviya Arhar-Mal-13; Black gram- WBU-109, Birsa Urd -1, PU-31; Green gram- Virat, Shikha, HUM-12, IPM 2-14, IPM 2-3, HUM-16; Horse gram- Birsa Kulthi-1, Payur-2, Madhu, VLG-19 etc. Oil seed crops like Niger- Utkal Niger-150, DNS-4, BNS-3, Pooja, JNS-29, JNC- 6, BNS-1; Sesame-RT-351, Krishna, Sekhar, RT-346, GT-4, GT-6, Punjab-1; Groundnut-K1812, TLG-45, ICGV-00350, K-6, TG-37A, TG-38 Dharni, Grinar-3, TG-51, TCGS-1043, AK12-14 etc.

Pulses (especially pea, chickpea, and lentil) suffer White powdery fungal growth on leaves, leading to leaf yellowing and reduced yield. Carbendazim 50% WP @1.0 g per litre of water (apply at first sign of disease) or Tebuconazole 25% EC @1.0 ml per litre of water (apply preventively or when symptoms first appear) is advised. Blight (Alternaria, Cercospora spp.) affect chick pea, use of Mancozeb 75% WP @ 2.5-3.0 g per litre of water (apply when symptoms first appear) and copper Oxychloride 50% WP@2.5-3.0 g per litre of water (apply at early stages of disease) is advised. Aphids (Aphis craccivora) affect pulses especially chick pea, use Imidacloprid 17.8% SL @0.5 ml per litre of water or Thiamethoxam 25%WG @0.3 g per litre of water. For Podborer (Helicoverpa armigera) spray Spinosad 45 SC @ 0.3 ml/litre or Emamectin Benzoate 5 SG @ 0.5 g/litre at flowering and pod formation stages.

OILSEED CROPS

Farmers should select light sandy soil with good drainage for cultivation, and land preparation should begin in the first week of June. Recommended varieties for groundnut include K-1812, K-6, Dharni, Birsa Mungfali-3, Birsa Mungfali-4, and Birsa Bold. For niger, recommended varieties are Birsa Niger-1 and Birsa Niger-3. These seeds should be purchased in May and sowing should be completed before July 10. For sesame, suitable varieties include RT-351, Krishna, Kanke Safed, and Shekhar. For soybean, recommended varieties are Birsa Safed Soybean-2 and JS-2098, and for sunflower, DCS-107 is suggested.

Before sowing, seeds should be treated with carbendazim at 2 g/kg of seed and chlorpyrifos at 6 ml/kg of seed. At the time of sowing, fertilizer should be applied at the rate of 25:50:20:20 kg per hectare of N:P_2O_5:K_2O:S (Nitrogen: Phosphorus: Potash: Sulphur). For termite control (*Odontotermes spp.*), pre-sowing treatment should be done with Chlorpyrifos 20% EC at 2.0-2.5 ml per litre of water as a soil drench. For post-sowing treatment, apply Fipronil 0.3% GR (granular formulation) at 10-12 kg per hectare to control active termite populations. In case of rust (*Puccinia arachidis*), Propiconazole 25% EC should be used at the rate of 1 ml/ L of water as a foliar spray during early flowering or upon symptom appearance. To prevent damage caused by the Bihar hairy caterpillar, affected leaves should be plucked and buried in pits at the initial stage. If infestation worsens, Indoxacarb 15.8 SC should be sprayed at the rate of 10 ml per litre of water. For management of tikka disease or brown spots on leaves, Dithane M-45 should be sprayed at 1.25 kg /ha.

FRUIT CROPS

Mango

Mango varieties such as Amrapali, Dussehri, and Neelanchal Kesari should be irrigated at weekly intervals to ensure proper fruit growth and development. For quality fruit production, apply 500 grams of urea and 400 grams of muriate of potash per plant. During the fruit development stage, spray micronutrients on the leaves. After harvesting, provide adequate nutrition to the plants to restore their vitality. With the onset of the monsoon, sow green manure crops such as 20 kg of hemp or 10 kg of dhaincha per acre. Incorporate manure and compost into the soil 45 days after sowing. Pruning of mango trees should be carried out in the months of December and January.

Litchi

To control panicle blight of litchi, spray Difenoconazole 5% EC at 2.5 g/10 L of water or Carbendazim at 1.0 g/L of water on the leaves. Maintain adequate moisture levels in the orchard to ensure high-quality fruit production. Fruits should be harvested in the early morning hours (between 4:00 and 8:00 AM) and kept in a cool place within the orchard, where sorting and grading can be carried out. If pack houses are available nearby, transport the fruits while protecting them from high temperatures so that proper grading and packaging can be done. Use ventilated cardboard boxes or other suitable packaging and ensure cold chain management during transportation to the point of sale. For optimal shelf life, store fruits in cold storage at a temperature of 1-5 °C and relative humidity of 85-95%. Immediately after harvesting, prune the trees by removing pest-infested, diseased, dry, or unwanted twigs and branches. Also, remove fallen or leftover fruits to eliminate potential hiding places for pests and pathogens.

Perform light tillage and inter-cultivation to promote proper aeration and sunlight penetration in the soil. For healthy tree growth following the first good rainfall, apply 60-70 kg of well-decomposed farmyard manure (FYM), 2 kg of neem, Karanja, or Castor cake, 1.1 to 1.2 kg of urea, and 3.5 to 4 kg of single super phosphate (SSP). Make a 20-30 cm wide and deep ring within 1 meter of the canopy spread to apply the fertilizers. If rainfall is delayed, conduct light irrigation after fertilizer application. Mite-infested plant parts, including twigs and leaves, should be removed and buried deep in the soil. To suppress mite populations, apply propargite 57 EC at 3 ml/L of water at 15-day intervals.

Papaya

Prepare seedlings for planting papaya with varieties such as Pusa Delicious, Pusa Nanaha, Taiwan, Pusa Dwarf, and Surya. Papaya can be grown as a standalone crop or inter-cropped with newly planted litchi, mango, or amla, with a spacing of 1.8 x 1.8 meters. It should be planted on raised ridges to prevent scab and root rot. To achieve higher yields, apply 200-250 grams of nitrogen, phosphorus, and potassium per plant, along with 4-5 kg of lime per plant. For controlling pests and diseases, use Imidacloprid 17.8% SL at 0.3 ml per litre of water as a spray at the new flush stage to control leaf miner in citrus and lemon. To manage Anthracnose in mango and papaya, apply Carbendazim 50% WP at 1 g/L of water during the flowering and fruit set stages. Reapply during the rainy season if spots appear. For fruit flies in mango, use a combination of Methyl Eugenol traps with Malathion 0.1% bait, and set up pheromone traps and bait sprays around the fruit set. To control mealybug in mango and papaya, use Chlorpyrifos 20% EC at 2.5 ml/L of water and spray on the base and crown of the plants after rainfall. For scale insect infestations in guava, apply Buprofezin 25% SC at 1 ml/L of water and spray on the affected trees twice, at 15-day intervals.

VEGETABLE CROPS

Farmers are advised to cultivate Brinjal, Onion, Ladyfinger, Tomato, Chilli, Capsicum, Cowpea and Cucurbits. Farmers can select brinjal varieties like Pusa Purple Long, Pusa Purple Round, Pusa Purple Cluster, Pusa Kranti, Pusa Anmol, Swarna Shri, Swarna Mani, Swarna Pratibha, Swarna Shyamali and Swarna Ajay etc. Right time for sowing and field preparation of Kharif cucurbit crops especially sponge Bottle gourd (Pusa smooth or hybrid), bitter gourd (Arka Harit, Pusa Special, Pusa Do Fasli or hybrid), gourd (Arka Bahar, Pusa Meghdoot, Pusa Manjari, or F1 hybrid). Fertilizers and Seed Treatment (*PSB and*

Azotobacter). Ensure staking with metal wire or nylon rope and bamboo while selection of indeterminate varieties like Arka Samrat & Arka Rakshak in tomato cultivation in kharif season and planting on raised bed. Ridge and furrow method of cultivation is recommended for vegetable cultivation in kharif season along with proper drainage of water.

To control Yellow Vein Mosaic disease in okra, farmers should remove and destroy affected plants as soon as symptoms appear. After that, spray Thiamethoxam 25 WG at 100 g per hectare for effective disease management. To control red beetle in cucurbits, apply ash dust with kerosine oil on plants and near the root zone. To control red beetle infestation in cucurbitaceous crops, farmers are advised to apply Chlorpyriphos 2% dust @ 20 kg/ha in the vicinity of the root zone. Fruit fly in Cucurbits use Malathion 50% EC + Jaggery (5%) @2 ml/L + 50 g jaggery pot spray on foliage at fruiting stage. Powdery Mildew in cucurbits use Hexaconazole 5% EC @1 ml/L as Foliar spray at disease onset. To control leaf spot in ridge gourd, spray 3.5 ml Indofil M-45 in 1 L water. Wilting in brinjal and tomato plants can be controlled by spraying of 1g Streptocycline + 30 g copper oxychloride in 30 L of water in the root zone of the plants.

For leaf spot in Brinjal and Tomato use Mancozeb 75 % WP @2.5 g/litre water. For fruit and shoot borer in brinjal & tomato use Emamectin benzoate 5% SG @ 0.4 g/litre water (Foliar spray at 10-15-day intervals after flowering) or Spinosad 45% SC @ 0.3 ml per litre water as foliar spray or coragen 20 SC @ 60 ml in 200 litre water/acre. Leaf curl virus (Vector: Whitefly) in Chilli and Capsicum and TVMV in Okra use Imidacloprid 17.8% SL @ 0.3 ml per litre. For Anthracnose / Fruit Rot use Carbendazim 50% WP @ 1gm/litre as foliar spray and repeat after 10 days. To prevent Onion tip burn, apply 400ml Hexaconazole by mixing in 200lt water and spray over 1 acre.

OTHER CROPS

Leguminous fodder crops such as Rice bean, Cowpea, and Guar bean can be grown in place of common non-leguminous fodder crops for animals during the Kharif season. For turmeric and ginger cultivation, add 25-30 tonnes of well-decomposed farmyard manure (FYM) per hectare at the time of final ploughing and complete sowing by mid-May. Lac producer farmers should spray Kusum-Jethwi on Kusum or other trees based on the infestation of enemy insects from the day of insect infestation (Jethwi). After 90-95 days of insect infestation, prepare a solution by mixing 20 ml of Spinosad (Success) 2.5% SC organic insecticide, 10 grams of Carbendazim, or 10 ml of Hexaconazole insecticide and

Management for lac cultivation

fungicide in 10 litres of water. This solution should be sprayed on the lac-coated branches using a sprayer (make sure to wear a mask while spraying). For Rangini-Baisakhi Beehan lac crops, cut the Ari Lac from the Plum trees and prune the entire Plum tree. Farmers who have not yet pruned the vacant Palas trees should complete this work as soon as possible.

LIVESTOCK

Proper vaccination schedules should be followed before the onset of the rainy season to prevent FMD and Black Quarter disease in cattle and buffaloes. Vaccination of sheep and goats against PPR and Enterotoxemia is also recommended. For dairy units, farmers should prepare feed from locally available ingredients such as maize, wheat, and pulses. It is advised to provide 20-25 grams of mineral mixture as supplementary feed to the dairy animals. Feeding should be done during the cooler parts of the day, such as early morning or late evening. Incorporating green fodder and moist feed will help with hydration. Avoid spoiled feed to prevent digestive issues. Proper sanitation and hygiene are essential. The floor of the animal shed should be cleaned regularly to prevent disease infestation, and milk utensils and equipment should be frequently cleaned. Provide adequate space to the animals to prevent overcrowding.

Piggery

For pig units, farmers are advised to grow green fodder and add 40% green matter with 60% concentrated fodder, such as rice husk, maize, wheat husk, oil cake, mineral mixture, and salt. To prepare concentrated feed, mix 60% rice husk, 20% ground corn, 20% oil cake, and 20% rice bran. Also add 10% wheat bran, 8% salt, and 1.5% vitamin and mineral mixture. Providing extra immunity boosters like zinc and selenium in the feed is recommended. Ensure pigs are vaccinated against common monsoon-related diseases like Swine Fever and Foot and Mouth Disease (FMD).

Poultry

For poultry units, cleaning the poultry shed every other day is essential. Regularly sprinkle bleaching powder or lime to disinfect the area, and all equipment and sheds should be properly disinfected. In backyard poultry farming, birds should be allowed to roam in the open yard during the day. Deworm the birds using Piperazine Hydrochloride at 5 ml per 10 birds. Vaccinate the birds against Ranikhet and fowl pox. Provide clean and fresh water three times a day. For adult birds, mix 2 grams of Electrol powder and 5 ml of Vimeral in 5 litres of water. If any symptoms such as drowsiness, cough, cramps in legs, or changes in stool color are observed, contact the doctor immediately.

Diagnostic visit to poultry farm

In-situ moisture conservation measures covering both soil and land management practices to be practiced. They include field bunding, compartmental bunding, ridges and furrows, conservation furrows, broad bed and furrow systems, dead furrows at 30 DAS especially in red soils for groundnut, groundnut+redgram, finger millet + pigeonpea, pigeonpea + field bean and pigeonpea + cowpea intercropping. Frequent interculture required both in kharif and rabi for weed control and moisture conservation. Avoid dry sowing of crops such as cotton, groundnut especially in shallow soils. Sowing needs to be done only when sufficient moisture is available in soil root zone. Unless 50 - 60 mm rainfall is received over 2-3 days, sowing should not be carried out. Facility of crop insurance including weather-based insurance to be availed. Follow the weather advisories available for the region. Do not burn crop residue. Take up rotavator operation in harvested fields of Cotton, Wheat and Safflower for incorporation of stubbles and crop residue in the soil. Border crops (Jowar/Bajra/Maize) should be practiced in vegetable growing fields which will prevent the vector entry in the main field. Attend ploughing operation immediately after the harvest of rabi crops which reduces the pest & weed incidence in next season.

CEREAL CROPS

Paddy

Paddy is commonly cultivated using a seed rate of 62.5 to 75 kg per hectare, depending on the variety. Popular varieties include MO-4, Abhilasha, Intan, RNR 15048, Tunga, KHP-10, and BPT 5204. Sowing is generally done in June to August, with some varieties like RNR 15048 and BPT 5204 sown in the first fortnight of July and transplanted in August. The recommended fertilizer dose for most varieties is 75:75:90 kg of N:P:K per hectare, while BPT 5204 and RNR 15048 require a higher nitrogen input of 150 kg along with 75:75 kg of phosphorus and potassium. Seed treatment is a crucial practice and involves the use of Carbendazim 50 WP at 2 grams per kg of seed to prevent fungal infections. In some cases, seeds are also treated with

Streptocycline (0.1 g), copper sulfate (0.1 g), and biofertilizer *Azospirillum* at 400 g per 25 kg seed mixed with 50 g of jaggery.

Seedlings may also undergo root dipping in Carbendazim solution before transplanting. Transplanting is done either manually or with machines, maintaining a spacing of 20 by 10 cm or 8 by 4 inches depending on the practice. Weed management begins with pre-emergent application of Pendimethalin 30 EC at 1 L/acre or Pyrazosulfuron ethyl 10% WP at 200 g per hectare, followed by post-emergent spraying of Bispyribac sodium 10 SC at 100 ml per acre. Paddy crops can be rainfed, especially for varieties like MO-4 and Tunga, while others require irrigation during critical stages such as tillering, panicle initiation, flowering, and grain filling. Additional foliar nutrient application includes potassium nitrate at 10 grams per litre of water at 60 days after transplanting, along with nano urea, nano DAP, and micronutrient sprays such as Samriddhi. Zinc sulphate may also be sprayed at 10 g per litre.

Pest management involves several strategies. For stem borer control, clipping the terminal leaf during transplanting is recommended, along with spraying Chlorpyriphos 20 EC at 2 ml per litre or applying Fipronil 0.3G at 10 kg per acre and using pheromone traps at the rate of 7 per acre. Leaf folder can be managed with Flubendiamide 48 SC at 0.08 ml per litre, while gall midge is controlled with Chlorpyriphos sprays. For brown plant hopper and case worm, soil application of Carbofuran granules (10% at 5 kg or 3G at 8 kg per acre) is effective. In terms of disease management, blast is addressed through seed treatment with Carbendazim and spraying Tricyclazole 75 WP at 0.6 to 1 g per litre or Propiconazole 25 EC at 1 ml per litre. Brown leaf spot is managed by spraying Carbendazim at 1 g per litre. Bacterial blight is controlled using a combination of copper oxychloride (50 g) and *Streptocycline* (25 g) per acre. Udubatta disease can be prevented by treating seeds with Carbendazim 50 WP at 4 g/kg. To avoid grain discoloration during the harvesting stage, spraying Nativo (Trifloxystrobin + Tebuconazole) at 0.4 g / litre is recommended.

Other cultural practices include salt water treatment to eliminate chaffy seeds and incorporating green manure like sunhemp, particularly with the Intan variety. Ratoon cropping is practiced for varieties like Intan and IET 7191, but only if the main crop performs well.

Finger Millet

Recommended variety is MR-6, with a seed rate of 12.5 kg/ha, sown during June-July. Fertilizer application is 100:50:50 kg NPK/ha. *Azospirillum* biofertilizer is applied. Line sowing is done at a spacing of 30 × 10 cm. The crop is grown under rainfed conditions with no intercrop. Hand weeding is the primary weed control method. Blast disease is managed by spraying Saaf at 2 g per litre of water. Stem borer is controlled using Coragen at 0.5 g per litre of water.

Maize

Maize is cultivated during both Kharif and Rabi seasons using a variety of hybrids such as CP-818, Arjun, Dharma (G.H. 150125), Shrusti (G.H. 0727), and private hybrids. The seed rate varies between 15 to 25 kg per hectare depending on the hybrid and season. Sowing is done from May to July for Kharif and from September to

October for Rabi crops. Recommended spacing is 60 cm × 20 cm or 60 cm × 30 cm, and sowing can be done by line sowing, seed-cum-fertilizer drill, or dibbling method. Fertilizer application varies with soil and irrigation conditions. For irrigated maize, a dose of 150:65:65 kg NPK per hectare along with 25 kg zinc sulphate is advised, while in dryland conditions, 100:50:25 kg NPK with 10 kg zinc sulphate is sufficient. Top dressing of urea at 45 days after sowing (DAS) improves yield. Application of micronutrients such as 19:19:19 at 5 to 10 g/litre of water and nano urea at 4 ml per litre is recommended during key stages like vegetative growth, tasseling, silking, and grain filling. Biofertilizers such as PSB, KSB at 500 g/ha, and Azospirillum at 500 g/ha for seed treatment further enhance nutrient uptake.

Intercropping systems such as maize with greengram, blackgram, cowpea, soybean, redgram (6:1), avare (8:1), and pigeonpea (4:2) are beneficial in increasing land-use efficiency. Irrigation should be provided every 8-10 days in red soils and every 10-12 days in black soils, with special attention during sowing, vegetative, and grain filling stages. Weed management includes one intercultivation at 30 DAS and hand weeding at 40 DAS. Atrazine 50% WP at 2-2.5 kg/ha is recommended as a pre-emergent herbicide, followed by post-emergent application of Tembotrione 42% SC at 287.5 ml/ha or Tambotrion 34.4% SC at 285 ml/ha. For disease management, Turcicum leaf blight can be controlled with Mancozeb 75 WP at 2.5 g/litre, downy mildew with Metalaxyl + Mancozeb at 2 g/litre, and bacterial stalk rot with Copper hydroxide at 2 g/litre.

Seed treatment with Captan or Thiram at 4 g/kg of seed is also essential. Fall army worm is a major pest in maize and can be managed by seed treatment with Chlorantraniliprole at 0.4 ml/kg, spraying Emamectin Benzoate 5 SG at 0.2-0.3 g/litre, Chlorantraniliprole 18.5 SC at 0.2-0.3 ml/litre, and installing pheromone traps at 10 per hectare. Biological control with *Nomuraea rileyi* or *Beauveria bassiana* at 10 g/litre is also effective. Aphids can be managed with Azadirachtin 300 ppm at 5 ml/litre, while Spinetoram 11.7% SC at 0.5 ml/litre applied at 15-20 DAS helps manage early-stage armyworm attacks. In some cases, Diplodia ear rot has been observed at harvest.

OILSEED CROPS

Sunflower

Sunflower varieties suitable for cultivation include KBSH-44, KBSH-53, KBSH-78, KBSH-85, and KBSH-90. The recommended seed rate is 5 kg per hectare, and it can be sown during June-July, September-October, and December-January. Under irrigated conditions, apply fertilizers at the rate of 36:36:25 kg NPK/ha, and under rainfed conditions, apply 15:20:15 kg NPK/ha along with 4 kg of zinc and 6 kg of borax per hectare. Treat seeds with *Azotobacter* at 150 g/kg, Imidacloprid at 5 g/kg to control necrosis, and Metalaxyl at 6 g/kg for downy mildew. Maintain a spacing of 60 × 30 cm, and irrigate every 8-10 days in red soils and every 15-20 days in black soils. Apply a foliar spray of borax at 2 g/l during flower opening. For weed control, use Butachlor 50 EC or Alachlor 50 EC at 2.0 l/ha or Pendimethalin 38.7 EC at 1.8 l/ha. To manage diseases and insect pests, spray Imidacloprid 17.8 SL at 0.5 ml/l at 25 and 45 DAS for necrosis and sucking pests; Cypermethrin 35 EC at 1 ml/l for leaf-eating caterpillars; 5% NSKE or NPV (100 LE) for head borer. Practice thinning at 15-20 DAS and rotate with legumes for better productivity.

Groundnut

Recommended varieties are Dh 256 and Kadarilepaxi, sown during the rabi/summer season at a seed rate of 150 kg/ha. Fertilizer application includes 18 kg N, 46 kg P_2O_5, and 25 kg K_2O per hectare, along with 500 kg gypsum and 25 kg each of zinc and iron sulphate. Seeds are treated with 30 g of Captan 80 WP before sowing, and dibbling is done at a spacing of 30 x 10 cm. No intercrop is recommended. Foliar application of 20 g urea per litre of water is done at 30 and 60 days after sowing. Irrigation is crucial at flowering and pod development stages.

Inter-cultivation is carried out at 15, 30, and 40 days after sowing. Weed management includes pre-emergent application of 1.3 litres of Pendimethalin 30 EC. Major diseases include leaf spot, managed by spraying 1 g Carbendazim 50 WP or 1 ml Hexaconazole, and collar rot, managed by seed treatment with 3 g of Carbendazim 25% + Mancozeb 25%. Pest control includes spraying 2 ml of Profenofos 50 EC or 1 ml of Monocrotophos 36 SL for leaf miner, and 2 ml of Quinolphos 25 EC for Spodoptera caterpillar. Application of 2 quintals of neem cake before sowing is also advised.

PULSE CROPS

Redgram

Recommended varieties of redgram include TS-3R, GRG-811, and GRG-152. Use 10-12.5 kg of seed per hectare and sow during June-July. Apply fertilizers at 25:50:75 or 25:50:125 kg NPK per hectare in red soils and 25:50:0 in black soils. Treat seeds with *Rhizobium* 500 g, *PSB* 500-1250 g, PGPR 500 g, Trichoderma 10 g/kg, and soak in 2% calcium chloride solution followed by shade drying for 7 hours. Use a spacing of 90 × 30 cm under normal planting, 120 × 20 cm for wider rows, and 45 × 10 cm for compact planting. Redgram can be intercropped with bajra, little millet, greengram, soybean, or blackgram. Apply pulse booster or pulse magic during flowering and pod-filling stages.

For weed management, use Pendimethalin at 3.25 L/ha as pre-emergence and Imazethapyr at 1 L/ha at 3 weeks after sowing. For disease management, use *Trichoderma*-treated seeds for wilt, Oxydemeton-methyl at 1.5 ml/L for sterility mosaic, and Metalaxyl + Mancozeb at 4 g/kg seed for *phytophthora* blight. To control pod borers, use Emamectin benzoate at 0.3 g/Lor Coragen at 0.3 ml/L. For *Helicoverpa*, apply Profenophos at 2 ml/L, NSKE at 3 ml/L, or Chlorantraniliprole at 0.15 ml/L. Practice nipping at 45-50, 55-60, and 75-80 days after sowing to promote branching.

Greengram

Recommended varieties for greengram include DGGV-2, BGS-9, Pusa Baisakhi, and DGGV-1. The seed rate varies from 7.5 to 15 kg/ha, and sowing is done during June-July. Apply fertilizers at 12.5:25:20 or 25:50:0 kg N:P:K/ha as a basal dose at sowing. Treat seeds with *Rhizobium* 500 g and *PSB* 1250 g. Maintain spacing of 30 × 10 cm or 37.5 × 10 cm. It can be intercropped with redgram or sugarcane. During flowering and pod formation, spray pulse booster or pulse magic at 8-10 g/l.

For weed control, apply Pendimethalin at 3.25 l/ha immediately after sowing.

Control leaf spot with Mancozeb at 2 g/l + COC at 3 g/l, downy mildew with Sulphur at 3 g/l + Tebuconazole at 1 ml/l, and powdery mildew with Propiconazole or Hexaconazole at 1 ml/l. Manage yellow vein mosaic virus using *Trichoderma* at 4 g/kg seed and rogue out infected plants. For insect pests like sucking pests, spray Dimethoate at 1.7 ml/l + Acetamiprid at 0.3 g/l, Thiomethoxam at 0.3 g/l for thrips, and Chlorantraniliprole at 0.2 ml/l for pod borers. During periods of water stress, apply foliar spray of micronutrients at 2 g/lL

Black gram

Blackgram varieties such as DU-1 and TAU-1 are commonly sown in the month of June, using a seed rate of 15 kg per hectare. A basal dose of 25:50:0 kg of NPK per hectare is recommended, with the entire fertilizer quantity to be applied at the time of sowing. Phosphorus is preferably applied in the form of rock phosphate for better effectiveness. Prior to sowing, seeds should be dipped in a 2% calcium chloride ($CaCl_2$) solution for 30 minutes to help mitigate drought stress, followed by shade drying for 8 hours. Seed treatment involves the application of 500 grams each of *Rhizobium* and *phosphorus solubilizing bacteria (PSB)* per seed lot.

Blackgram should be sown in rows with a spacing of 30*10 cm. During the flowering stage, foliar application of Pulse Magic at 10 g/ litre of water is recommended to promote flowering and pod development. For weed control, Fluchloralin 45 EC should be applied at 2 L/ h2 as a pre-emergence herbicide. The crop is susceptible to powdery mildew, which can be managed by spraying Hexaconazole at 1 ml per litre of water. Thrips infestation can be controlled by spraying either Thiomethoxam at 0.2 grams or Imidacloprid at 0.3 m/L.

COMMERCIAL CROPS

Cotton

Cotton is the major crop of our district and commonly cultivated varieties include Prvardhan Reventha, Rasi Seeds RCH-929, and UAS Agriculture varieties. The crop is sown by dibbling method during the first fortnight of June with a spacing of 90 cm x 30 cm. The recommended fertilizer dose is 60:30:30 kg NPK/ha, and seeds are treated with zinc sulphate, iron sulphate, and manganese sulphate each @ 4 g/kg of seeds before sowing. Redgram is generally used as an intercrop. For foliar nutrition, magnesium sulphate @ 5 g/litre is sprayed. Being a rainfed crop, irrigation is generally not required, and weeding is carried out manually. For disease management, angular leaf spot is controlled by spraying carbendazim + mancozeb @ 2 g/litre, while thrips are managed by spraying imidacloprid @ 0.3 ml/litre, and pink bollworm (PBW) is controlled by profenofos @ 2 ml/litre.

Sugarcane

Sugarcane varieties suited for Belagavi include Co 86032, CoC 671, Co 94012, SNK 632, SNK-635, and SNK-08101, with the ideal sowing seasons being June-July and October-November. The seed requirement is 7,000 to 8,750 setts per hectare, and the recommended fertilizer application is 250:75:187.5 kg/ha of N:P:K for optimal growth. Setts should be treated before planting by soaking them in a solution of 100 g Carbendazim 50 WP, 100 ml Chlorpyriphos 20 EC, and 100 g urea in 100 liters of water for 10 minutes. The planting methods include ridges and furrows (spacing of

90, 120, 150, or 180 cm) and the pit method (spacing of 90 cm x 45 cm). Intercropping with onion (1:2 ratio) and soybean (1:1 ratio) is recommended during the early stages of crop growth.

For irrigation, follow a stage-wise schedule: every 7 days during germination (8-35 days), every 10 days during tillering (36-100 days), every 7 days during the grand growth stage (101-270 days), and every 15 days during ripening (271-365 days). Weed management involves manual or mechanical weeding at 30, 60, and 90 days after planting, along with chemical control. Pre-emergence herbicide application of Atrazine 50 WP (1 kg in 300 liters of water/ha) should be done 2-3 days after planting, while post-emergence control at 60 days after planting includes spraying 2,4-D sodium salt 80 WP (1 kg in 300 liters of water) or Mesotrione 40 SC (140 ml in 200 liters of water/acre).

For pest and disease management, rhizome weevil infestation can be controlled by treating rhizomes with 20% Neem Seed Kernel Extract. To control leaf-eating caterpillars, apply 2.5 ml/liter of Chlorpyriphos, and for thrips, use 0.3 ml/liter of Imidacloprid or 1.5 ml of Dimethoate per liter. Leaf spot disease can be managed with 1 ml/liter of Propiconazole. For nematode control, apply 12 grams of *Pseudomonas*, 12 grams of *Pachelomyces*, and 500 grams of Neem Cake. Early shoot borer management includes earthing up at 6 and 10 weeks, removing infested shoots, and releasing *Trichogramma parasitoids* (50,000/ha) at 7-day intervals for five times.

VEGETABLES CROPS

Onion

Commonly grown onion varieties include Arka Kalyan, Arka Niketan, Arka Pragati, Bhima Super, and Bhima Red, while in the Gadag region, Bhima Super is the most preferred variety. The recommended sowing seasons across both regions are June-July, September-October, and January-February, depending on the crop type. For transplanting, 8-12 kg of seed per hectare is required, while seed drill sowing needs 20-25 kg/ha. In bulb planting, approximately 875 kg of bulbs per hectare is used. A general seed rate of 5-6 kg/ha is recommended when using Bhima Super or Arka Kalyan varieties. Before sowing, seed treatment with Captan 80 WP at 2 g/kg of seed helps control fungal diseases, and Imidacloprid 60 FS at 15 ml/kg of seed is essential for protection against sucking pests. The recommended fertilizer dose is 30 tonnes of FYM per hectare, along with 125:75:125 kg/ha of N:P:K fertilizers. In Belagavi, sowing methods include seed drill sowing, transplanting, and bulb planting, whereas in Gadag, broadcasting is commonly practiced. For transplanting, a spacing of 15 cm between rows and 10 cm between plants is ideal. In general, criss-cross or line sowing with a spacing of 45 × 30 cm is also recommended. In the Gadag region, farmers commonly intercrop onions with chilli, coriander, or wheat. To enhance plant growth, foliar sprays of Arka Vegetable Special or 19:19:19 formulation at 3-5 g/litre of water are beneficial. Additionally, spraying Miraculin at 2000 ppm (2 ml/litre) 50 days after sowing helps improve yield. Irrigation should be provided once every 4-5 days, based on soil and weather conditions, and must be stopped 15 days before harvesting. While onion in Gadag is mostly rainfed, it requires supplemental irrigation during dry spells.

Chilli

Chilli cultivation includes both irrigated and rainfed practices, with popular varieties being Byadagi Dabbi, Byadagi Kaddi, Hybrid 5531, Krishnaprabha Rudra, Noolvi Dabbi for dry chilli, and Arka Tanvi, Arka Yashasvi, and Nagavi Giddagayi for green chilli. Under irrigated conditions, the seed rate is about 250 to 400 grams per hectare, whereas for rainfed conditions, it ranges from 1 to 1.25 kilograms per hectare. The ideal sowing time is May-June for kharif and October or January-February for irrigated crops, with transplanting carried out from July to August. Fertilizer recommendations for irrigated chilli are 150:75:75 kg NPK/ha, while for rainfed conditions, it is 100:50:50 kg NPK/ha.

Seed treatment should be done using Imidacloprid 70 WS at 10 g/kg, Thiram 75 WP at 2 g/kg, *Trichoderma viride* at 4 g/kg, or *Azospirillum* at 200 g/kg, and seedlings can be dipped in Azospirillum solution (400 g per litre of water) during transplanting. Spacing should be 75 cm x 45 cm under irrigation and 90 cm x 90 cm under rainfed conditions. Both transplanting and direct sowing methods are practiced. Intercropping with marigold and crops like onion or Bt cotton is encouraged, along with border cropping using hybrid maize or sorghum. A foliar spray of NAA at 0.3 ml/L during flowering and Arka Vegetable Special at 3 g/litre enhances plant growth and yield. Irrigation should be scheduled once in 5-7 days in red soil and once in 15-17 days in black soil.

Weed management is achieved using Pendimethalin at 0.5 litres/ha or 4 ml/litre applied on the day of sowing or the next day. Major diseases like anthracnose, powdery mildew, *Alternaria* leaf spot, and murda complex can be managed by integrated practices. Specific foliar sprays include Carbendazim 50 WP at 1 g/litre or Fenconazole 10 EC at 1 ml/litre for powdery mildew and Mancozeb 75 WP at 2 g/litre or Copper Oxychloride at 3 g/litre for anthracnose. Pests such as thrips, mites, and whiteflies are controlled through IPM practices including seed treatment with Imidacloprid, foliar sprays of Difenthiuron 50 WP at 1 g/litre, and installation of 25 blue and yellow sticky traps per hectare.

Tomato

Recommended varieties for tomato include Arka Rakshak, Arka Samrat, Arka Abhijith, Arka Vardhan, and Arka Vikas, with fruits weighing around 75-100 grams. Suitable sowing periods are June-July, October-November, and January-February. For nutrient management, hybrids require 250:250:250 kg/ha of NPK, while varieties require 115:100:60 kg/ha. Seeds are treated with *Trichoderma* subtilis @ 50 g/kg or Thiram @ 1.25 g/kg for protection against seed-borne diseases. The crop is planted on ridges and furrows (90 × 45 cm) or raised beds (75 × 45 cm) for rainy season crops. Foliar nutrition with Vegetable Special @ 3 g/l is applied fortnightly.

Irrigation is scheduled once in 5-7 days based on moisture and weather. Weed control is achieved using pre-emergent herbicides like Alachlor or Butachlor @ 1.5 litre/ha. Major diseases include damping off (managed by seed treatment or drenching with Metalaxyl or Mancozeb), Tomato Leaf Curl Virus and Spotted Wilt Virus (managed by vector control and removal of infected plants), early and late blight (controlled by sprays of Azoxystrobin, Copper Oxychloride, or Metiram), bacterial wilt (managed by soil drenching with Streptocycline and crop rotation),

powdery mildew (Myclobutanil spray), and nematodes (managed by trap cropping and soil drenching with Velum Prime or Carbofuron).

Pests such as thrips, whiteflies, and Tuta absoluta are managed by sprays of Imidacloprid 17.8 SL @ 0.5 ml/l + neem oil 2.5 ml/l, Fipronil 80 WG @ 40 g/acre, or combinations of Fipronil and Imidacloprid, Cyantraniliprole, Acetamiprid, Spirotetramat, and Pongamia oil. For bacterial wilt, soil drenching with Copper Oxychloride 50% WP @ 3 g/l is advised. Avoid over-irrigation and maintain optimal moisture. Intercropping with marigold (1 row every 16 tomato rows) and border cropping with maize or bajra helps reduce pest incidence.

FRUIT CROPS

Pomegranate

The preferred variety is Bhagwa, planted at a spacing of 3.2 x 2.6 meters with a planting density of 1200 plants per hectare between June to September. Propagation is done through air layering and tissue culture, with cuttings treated using 5000 ppm IBA. Intercropping with cowpea, cucumber, cabbage, onion, and pea is practiced during the first 5-6 years. Fertilizer dose is 197:99:99 NPK kg/ha. Borax is applied at 1 g/L of water. Drip irrigation is scheduled at 11 L/day during rainy season, 12 L/day in winter, and 22 L/day in summer. Herbicides such as Diuron (1 kg/ha in nursery) and Nephromide (2 kg/ha in the main orchard) are used for weed control. Pomegranate is prone to several diseases like bacterial blight, anthracnose, fruit rot, *Cercospora leaf spot, Alternaria fruit spot,* and *Fusarium wilt*. Management includes fungicide sprays (e.g., Dithane M-45, Captan, Bavistin), sanitation, and orchard hygiene. Pest issues include the anar butterfly (fruit borer), bark-eating caterpillars, whiteflies, aphids, mealy bugs, and fruit flies. Integrated Pest Management (IPM) practices include cultural sanitation, pruning, biological agents like *Trichogramma*, neem-based products, polythene bagging, and chemical treatments like malathion.

Grape

Popular varieties include Thompson Seedless, Manik Chaman, and Sonaka, planted at a spacing of 2.4 x 1.8 meters with a planting density of 2314 plants per hectare from June to September. Propagation is done through hardwood cuttings, treated with IBA at 250 mg/L. Bitter gourd and ridge gourd are suitable intercrops. A fertilizer dose of 1000:500:1000 kg NPK per hectare is applied. Gibberellic acid (GA_3) at 90 ppm is sprayed at different crop stages. Irrigation is managed through drip with 15 L/day after summer pruning and 10 L/day after winter pruning. Pre-emergent herbicide Diuron at 1 kg/ha is used. Major diseases include downy mildew (*Plasmopara viticola*), powdery mildew (*Uncinula necator*), black rot (*Diplocarpon vitis*), anthracnose (*Elsinoe ampelina*), *Botrytis* (gray mold), and Pierce's disease (*Xylella fastidiosa*). Pests such as leaf-eating caterpillars, mealybugs, mites, thrips, grape leaf folders, girdle beetles, flea beetles, and root-knot nematodes are managed through IPM practices, including sanitation, biological control using ladybugs and lacewings, and judicious use of insecticides and miticides.

Coconut

The recommended variety is Tiptur Tall, with a spacing of 10 m × 10 m, planted during June-July with an average population of 100 palms per hectare. The fertilizer dose per

palm includes 500 g Nitrogen, 320 g Phosphorus, and 1200 g Potassium. Cocoa is a common intercrop. Micronutrients like boron and zinc are applied. Drip irrigation is used. Weed management is done by hand weeding. Stem bleeding is managed by root feeding with Hexaconazole. Black-headed caterpillar is managed through the release of Goniozus nephantidis, a biological control agent.

Banana

Elakki Banana and G9 are the popular varieties grown in karnataka, apply NPK at 400:240:500 kg/ha along with 40 tons of FYM per hectare before planting. The recommended spacing for Elakki Banana is 1.5 x 1.5 meters in a triangular shape, accommodating 5,120 plants per hectare, while other banana varieties should be spaced at 2.1 x 2.1 meters, accommodating 2,270 plants per hectare. In high-density planting of G9 tissue culture banana, use a 6x6 feet spacing with 2 cm^3 pits, resulting in 7,500 plants per hectare and a potential yield of 135 tons per hectare. A spray of Arka Banana Special is recommended starting 5 months after planting and continuing for up to 10 months. Mix 75 grams of Banana Special with 15 liters of water, along with 1 lemon's juice and 1 sachet of shampoo, and spray every 20 days. Rhizome Weevil infestation can be prevented by treating rhizomes with 20% Neem Seed Kernel Extract . To control Leaf-Eating Caterpillars, apply 2.5 ml of Chlorpyriphos per liter of water. For Thrips, use 0.3 ml of Imidacloprid or 1.5 ml of Dimethoate per liter. To manage Leaf Spot Disease, spray 1 ml of Propiconazole per liter of water. Nematode infesatation can be controled by combined application of 12 grams of *Pseudomonas,* 12 grams of *Pachelomyces* and 500 grams of Neem Cake.

Cashew

Cashew cultivation requires selecting recommended varieties such as Vengurla-4, Netra Jambu-1, Bhaskar, Ullal-1, Ullal-2, Ullal-3, Chintamani-1, and Chintamani-2. The ideal planting time for Vengurla types is between June and October, while Ullal and Chintamani types should be planted from May to June. For spacing, a 7 m x 7 m arrangement supports about 200 plants per hectare, while an 8 m x 8 m arrangement accommodates approximately 156 plants per hectare. The soil should be red sandy loam with good drainage. Nutrient management includes applying 60:60:60 g of NPK per plant in the first year, doubling the dose for the second to fourth year, and applying 500:250:250 g of NPK per plant from the fifth year onward. Foliar nutrition with 19:19:19 at 2 g/litre should be sprayed once every 15 days during summer. Suitable intercrops for cashew cultivation include turmeric, ginger, and field crops, excluding sunflower and maize.

Irrigation should be provided at 40-50 litres per plant, three times per month. Weed management can be done through hand weeding and light intercultivation as needed. Pest and disease management involves spraying Lambda Cyhalothrin @ 0.5 ml/litre or Quinolphos @ 1 ml/litre for tea mosquito bug, spraying COC 50 WP @ 3 g/litre for leaf spot, and swabbing with a 2% COC solution and 2 ml Chlorpyriphos 20 EC for stem borers.

Arecanut

Recommended varieties of arecanut include Mangala, Mohitnagar, Sumangala, Swarna Mangala, Theerthalli Local, Channagiri Local, and South Canara Local. Planting is preferably done in May-June or September-October using pit planting (pit size: 90 cm × 90 cm × 90 cm) at a spacing of 2.7 m × 2.7 m or 3.3 m × 3.3 m, with a density of 1372 plants/ha. Wider spacing is preferred when intercropped with high-value crops such

as banana, cocoa, nutmeg, black pepper, or ginger. Fertilizer recommendation is 100:40:140 g NPK per plant annually, applied in two equal splits - first in September-October along with 12 kg organic manure and second in February (for irrigated) or June (for rainfed). Additionally, zinc sulfate and borax are applied at 5 g per plant during October-December. Irrigation is usually done through the basin method at 175-200 litres per palm per irrigation, adjusted as per season: every 7-8 days in November-December, every 6 days in January-February, and every 4-5 days from March to May. Drip irrigation is also practiced. Common diseases include bud rot, leaf spot, collar rot, crown rot, foot rot, and yellow leaf disease. Bud rot can be managed with sprays of 1% Bordeaux mixture, 0.3% Copper Oxychloride (COC), or 0.2% Metalaxyl + Mancozeb 72WP, applied before the onset of monsoon and repeated after 30-45 days. Pests such as spindle bug, Pentatomid bug, red palm weevil, mites, root grubs, inflorescence caterpillar, and ambrosia beetle affect the crop. Red mite infestations are managed by spraying wettable sulphur (80%) at 0.4%.

LIVESTOCK

To ensure the health and productivity of livestock during the kharif season, it is essential to implement appropriate management practices. Cattle, buffalo, sheep, and goats should be vaccinated against Hemorrhagic Septicemia, while sheep and goats also require vaccination against Enterotoxaemia. Deworming of all animals using Piperazine, Albendazole, or Fenbendazole is recommended to control internal parasites during the rainy season. Along with green fodder, daily feeding of dry fodder to cattle, buffalo, and sheep is necessary for better digestion and nutrient absorption. Grazing of maize and jowar seedlings should be strictly avoided, as these can cause cyanide poisoning, potentially leading to animal death.

Pesticides, insecticides, and fertilizers must be stored safely away from animals to prevent accidental toxicity. Farmers can prepare animal feed using locally available ingredients, such as cereals (maize, jowar, wheat) 35-40 kg, bran or polish of grains 30-35 kg, oil cakes (groundnut, safflower, cottonseed) 25-30 kg, mineral mixture 2 kg, and salt 0.5-1 kg to make 100 kg of cattle feed. To prevent the spread of Lumpy Skin Disease (LSD), which is a vector-borne illness, livestock should be protected from mosquitoes, house flies, and ticks by using mosquito nets, repellents, and washing animals with ectoparasiticidal drugs. Additionally, burning dry neem leaves in the morning and evening can help reduce mosquito bites. Farmers are also encouraged to cultivate improved fodder and crops during the Kharif season, utilizing the monsoon rains. Furthermore, all backyard poultry birds should be compulsorily vaccinated against Ranikhet Disease.

Fisheries

Maintain 6 feet water in the fish pond for proper growth and development of fishes. Remove unwanted plants and animals prior to release of fishes in the pond. As a supplementary food, floating pallets or groundnut cake (25%), paddy husk (40 %), sweet potato powder (10%), fish meal (24 %), vitamin and mineral mixture (1%) should be mixed and feed scientifically. Continue to feed fishes 3-5 % of body weight on daily basis. The suitable breeds for fresh water aquaculture are catla, rohu, mrigal, amur common carps, jayanti rohu, pungasius, GIFT tilapia, grass carp, silver carp, murrel. Prior to release of fingerlings (15 days) mix cow dung (100 kg/100 m^2) in the pond for plankton production.

Conserve water in surface and sub surface horizons of soil, which in turn address drought related issues in coconut, arecanut, pepper, cocoa, nutmeg etc. Intercultural operations in uplands during the onset of south west monsoon and subsequent operations during the offset of North east monsoon will help in conserving surface moisture helping almost all crops in home steads and uplands especially in plain lands of High hills and mid land laterites. Use gypsum to manage soil acidity by blending with conventional soil ameliorants in equal proportion is beneficial in increasing the nutrient use efficiency of almost all upland crops like Coconut, Arecanut, Spices like Pepper, Cardamom, Banana and vegetables by managing the acidity in subsurface soil.

CEREAL CROPS

Rice (Wetland)

During first crop season, rice can be cultivated under two situations; wetland and upland. Under wetland land situation, two methods can be followed, direct sowing and transplanting. For direct sowing, rice is sown in April before the rains start. Wet seeding is done after the receipt of rain. Land should be prepared well by thorough ploughing. Use 32-40 kg seeds per acre. Seed treatment with *pseudomonas* @ 10 g / kg seed should be adopted before sowing. Basal dose of lime @ 140 kg / acre should be applied at the time of first ploughing. Organic manure @ 2 t / acre should be applied while ploughing. Weeds are a major problem in direct sown rice. Hence herbicides like Butachlor 50 EC @ 1 l /acre or Pretilachlor 540 EC @ 600 ml / acre or Pretilachlor + Bensulfuron methyl @ 4 kg / acre may be applied 6 - 9 days after sowing in case of wet seeded rice and 0-6 days in case of dry seeded rice.

For transplanted paddy use 24 - 34 kg seed per acre. Seeds should be treated with *Pseudomonas fluorescens* @ 10 g/ kg seed. For transplanted rice, nursery should be prepared. Wet method can be adopted in areas here water is available. Otherwise, dry nursery can be raised. It is better to adopt dry method in first crop season, if the time of planting is uncertain and depends on the receipt of rains. Nursery beds of 5 -

10 cm height and 1.5m width are recommended. The height of the beds can be increased to 15 cm in dry nursery. One tenth of the main field area should be taken for nursery. Organic manure should be applied at 1 kg / m^2. If nitrogen deficiency symptoms are noticed, urea can be applied @ 1 kg / 100m^2.

Short duration varieties should be transplanted at an age of 18 days, medium duration at 20 -25 days and long duration at 30 days. In first crop season, transplanting can be delayed up to 35 days in medium duration varieties and up to 25 days in short duration varieties, if growth is slower. Paired row planting with a spacing of 35 cm between the pairs and 15 cm within the pair will improve the growth of the plants, make intercultural operations easier, reduce pest and disease incidence and increase yield. Date of planting may be adjusted so as to avoid synchronisation of the critical stages of maximum tillering or heading with the usual flood period in the tract.

If water shortage is experienced in the season due to unexpected reduction in monsoon showers, irrigation to maintain 5 cm water level two days after the disappearance of ponded water is sufficient. Apply fertiliser dose of 70: 35: 35 kg NPK / ha for high yielding short duration varieties, 90: 45: 45 kg NPK / ha high yielding medium duration varieties and 40: 20: 20 Kg NPK / ha for local varieties. Phosphorus should be applied fully as basal dose at the time of transplanting. Nitrogen should be applied as 2-3 split doses as basal dose, at tillering and 5 - 7 days before panicle initiation. Potassium fertilisers should be applied as two equal splits as basal and 5- 7 days before panicle initiation. In case of direct seeded rice, nitrogen should be given as three equal splits. Second dose of lime @ 100 kg / acre may be applied one week before first top dressing.

A broad-spectrum weedicide, Pretilachlor + Bensulfuron Methyl 0.66 WP @ 4 kg/ acre may be applied at 0-6 days after transplanting. To manage pest and diseases, release egg parasitoid, *Trichogramma* japonicum and *Trichogramma chilonis* @ 2 cc/ acre for six weeks starting from one week after transplanting and three weeks after transplanting respectively for the management of rice stem borer and leaf folder. In areas endemic to Brown plant hopper, avoid closer planting, provide alley ways after every 3 m and apply nitrogen in split doses. Chances of incidence of bacterial leaf blight is higher during first crop season.

Biocontrol agent *Pseudomonas fluorescens* should be applied as seed treatment @10g/ kg seed, seedling root dip @ 1 kg/ acre during transplanting and foliar spray @ 20g / litre one month after transplanting. When incidence is noticed, apply bleaching powder @ 2 kg/ acre in small pouches in standing water to avoid spread of the disease. Foliar spray with cow dung slurry @ 20g/ l will manage the disease. In severe cases, apply streptocyclin @ 40 g/ acre. False smut is likely to occur if humidity is high during inflorescence emergence. A prophylactic spray of propiconazole 25 EC is recommended @ booting stage to prevent false smut.

Rice (Upland)

Rice is grown in upland situation in certain areas during rainy season. Local varieties such as modern varieties and high yielding short duration varieties such as Harsha, Annapoorna, Aiswarya, Swarnaprabha, Mattathriveni and Vaishak are suitable for

upland. Fertiliser recommendation for local variety is 40:20:20 kg NPK / ha and 60:30:30 Kg NPK / ha for HYV. Phosphorus should be applied fully as basal dose. Nitrogen should be applied as 3 equal split doses as basal dose, at tillering and 5 - 7 days before panicle initiation. Potassium fertilisers should be applied as two equal splits as basal and 5- 7 days before panicle initiation.

FRUIT CROPS

Coconut

Ensure proper drainage and water conservation measures in coconut gardens. In all gardens where sufficient sunlight are receiving intercropping can be done with arecanut, black pepper banana, pineapple tubers, ginger, turmeric and medicinal plants Provide shade to the young palms. Planting of new coconut seedlings can be taken up, apply 1 kg lime and one week later, apply 25 kg organic manure and recommended dose of nutrients. Pest management: Rhinocerous beetle can be controlled in cow dung pits using Metarhizium anisipliae @ 250 g per 750 ml of water per Cubic meter pit. The bio control agent should be sprinkled over the cow dung pits as well as on sides at three months interval to manage the pest. In case of severe attack applying 20 g Fipronil 0.3GR with 200g sand in the inner whorls of coconut palm / palm. Application of 250g neem cake or marotti (Hydnocarpuswightina) cake mixed with equal volume of sand in the innermost 2-3 leaf axils during April-May before the onset of south-west monsoon. This treatment is to be done twice, ie., during September-October after the southwest monsoon. Red palm weevil can be controlled by coconut log traps with fermenting toddy or pineapple activated with yeast or molasses can be set in coconut gardens to trap the free floating population of Red palm weevil. Use insecticide to each trap to kill the weevil trapped. Use pheromone trap @ one per ha and to be placed outside coconut garden In case of severe attack applying 20 g Fipronil 0.3GR with 200g sand in the inner whorls of coconut palm / palm. Whiteflies can be controlled by spraying neem oil @5ml per one litre along with soap @ 10gm per one litre on the lower surface of leaves to reduce the incidence of whiteflies in coconut.

Banana

In Kerala, banana cultivation during the Kharif season (June to September) begins with land preparation in May or early June. The land is ploughed or dug 2-3 times to loosen the soil, and pits of size 60 x 60 x 60 cm or 45 x 45 x 45 cm are prepared. These pits are filled with topsoil mixed with 10-15 kg of farmyard manure (FYM), 1 kg of neem cake, and wood ash or sand to improve soil fertility and drainage. Planting is typically done in June or July, using either healthy sword suckers or tissue-cultured plants. Common varieties cultivated during this season include Nendran, Robusta, Poovan, Grand Naine (G-9), and Red Banana. The spacing varies depending on the variety, with tall varieties planted at 2.5 x 2.5 m and dwarf or high-density types at 1.5 x 1.5 m or 1.8 x 1.8 m. Proper drainage is essential during the monsoon to prevent rhizome rot.

Nutrient management involves applying FYM at 10-20 kg per pit as a basal dose. Chemical fertilizers like nitrogen (200 g), phosphorus (60 g), and potassium (200 g) per plant are applied in 3-4 splits at 1, 3, 5, and 7 months after planting. Foliar sprays of micronutrients such as zinc, magnesium, and boron are also recommended.

Weed control is achieved by mulching with banana leaves or straw, which also helps in moisture conservation. Intercropping with legumes like cowpea or groundnut is sometimes practiced. Drainage channels are constructed to avoid water stagnation during heavy rains.

Pest and disease management is critical during the rainy season. Pseudo-stem and rhizome weevils are managed using chlorpyrifos or neem-based insecticides, while Sigatoka leaf spot is controlled by removing affected leaves and spraying fungicides such as carbendazim or mancozeb. Proper drainage and field sanitation help reduce the incidence of Panama wilt. To prevent lodging due to strong winds and heavy rains, tall varieties are supported using bamboo props or coir ropes. De-suckering is done regularly to maintain one mother plant and one follower per pit, while deleafing involves the removal of dried or diseased leaves to reduce humidity and disease pressure.

SPICE CROPS

Black Pepper

Field sanitization: Phyto-sanitary measures to be done which includes the removal and destruction of dried and diseased vines, fallen leaves, and any plant debris that may harbour pathogens. Thoroughly removing the litter from the base of pepper before the rains will prevent the diseases such as foot rot.

Shade regulation: Before the onset of monsoon, the unnecessary branches of the supporting trees should be cut and replaced to provide shade. Prune the runner shoots or tie back to the standards before the onset of the monsoon. Pruning can be repeated in July-August in over shaded gardens. It will help the gardens to get good air circulation an sunlight and reduce the attack of pollu beetle.

Intercultural Operations: With the onset of monsoons inter cultural operations in the interspaces of the pepper vines helps to improve soil aeration and water infiltration. This not only supports root development but also facilitates better microbial activity in the soil, contributing to overall plant vigor.

Soil Acidity Management: It is a critical factor in pepper cultivation, especially in the lateritic soils of Kerala that tend to be acidic. Application of lime @ 500 grams per vine need to be done after receiving rainfall. It will help to reduce the incidence of fungal diseases too. Liming helps to neutralize soil acidity, enhances nutrient availability, and promotes better uptake of essential elements by the plant roots.

Organic manure preparation: Prepare *Trichoderma* enriched compost to apply around the vines at the rate of about 10 kg/vine. Dry neem cake (10kg) and cow dung (90kg) are to be powdered and mixed to get a coarse texture and then moistened by sprinkling of *Trichoderma spp.* @ 1-2 kg per 100 kg of neemcake - cow dung mixture. After thoroughly mixing, cover it with a perforated polythene sheet or ordinary newspaper and keep it in shade for 4-5 days for multiplication. Again mix well and keep for three more days for further multiplication. This preparation is ready for incorporation in the soil. Application of Trichoderma enriched organic manure prevent the diseases like quick wilt in black pepper.

Ginger

Prepare beds of convenient length across the slope with 1 m width, 25 cm height with a spacing of 40 cm between beds. Provide drainage channels, one for every 25 beds on flat lands. Apply bleaching powder (15 g) and lime (250 g) per 3 m2. Apply organic manures at the rate of 20 t FYM + 2 t neem cake + 1 t ash + 4 t vermicompost per ha during land preparation or planting. Treat the seed rhizomes with *Pseudomonas fluorescens* (2%) + cow dung supernatant (2%). Plant healthy rhizomes (20-25 g with at least 2 buds) in small pits, at a spacing of 20 cm x 20 cm to 25 cm x 25 cm and at a depth of 4-5 cm with at least one viable healthy bud facing upwards. Apply *Pseudomonas fluorescens* (2%) + cow dung supernatant (2%) at the time of planting, 2 MAP and 4 MAP. Immediately after planting, mulch the beds thickly with green leaves @ 15 t/ha-1. Repeat mulching with green leaves twice @ 7.5 t/ha-1 first 44-60 days and second 90-120 days after planting. Apply fertilizers as per soil test. If symptoms of rhizome rot appear, dig out the affected plants and drench the soil with Cheshunt compound or 1 % Bordeaux Mixture.

Turmeric

Prepare land to fine tilth. Apply organic manures at the rate of 20 t FYM + 2 t neem cake + 1 t ash + 4 t vermicompost per ha during land preparation or planting. On receipt of pre-monsoon showers, prepare bed of 3 m × 1.2 m with a spacing of 40 cm between beds. Ensure good drainage also specially by providing drainage channels, one for every 25 beds on flat lands. Take small pits in beds in rows with spacing of to 25 cm × 25 cm. Plant finger rhizomes flat with buds facing upwards and cover with soil and dried manure. Immediately after planting, mulch the beds with green leaves @ 15 t ha-1. Repeat mulching with the same quantity of green leaves 50 days after planting. Apply lime, manure and fertilizers as per soil test. If symptoms of wilt or rhizome rot appear drench the soil with Cheshunt compound or 1 per cent Bordeaux Mixture.

LIVESTOCK

Ensure the availability of green fodder to the animal daily. Provide mineral and vitamin mixture in prescribed quantity daily. Mix 30g sodium bicarbonate and 1-teaspoon yeast in the feed daily to avoid digestive disorders associated with excessive acidity. Animal should not be allowed to graze in open grazing lands to avoid lightening risk. Vaccinate animals against foot & mouth disease and haemorrhagic septicaemia. Take precautions to avoid ecto parasitic infestation. If fever, shivering, brown coloured urine, off feed etc. are noticed, consult veterinary doctor immediately. Assure increased ventilation in the shed. In poultry farms, use lime in deep litter system at weekly intervals.

Fisheries

The pre monsoon showers bring down water pH in brackish water farms. Check pH of water on receiving rains, if required, add liming materials to improve pH. Ongoing Pearl spot seed producers are advised to collect fry stage fishes from ponds and stock in HDPE happa nets (16 mm) till marketing. Cage fish culture farmers may reduce standing stock by selling harvestable fish directly to the consumers.

CEREAL CROPS

Barley

Sowing of recommended varieties e.g. HBL-1 or local varieties like "Yangnas, Tukzur, Sermotoktok, Tukchumin" can be done. Seed rate of 100 kg/ha via seed drill or 300 kg/ha via broadcasting method may be followed. FYM @ 15 t/ha or sheep manure @ 4-6 t/ha alongwith Ghanjeevamrit @5t/ha may be used. Under cold arid Ladakh conditions, pre-sowing irrigation is recommended to ensure proper germination. For disease infestation like loose smut, roughing out of the infected tiller, and hot water treatment of seeds.

Wheat

To make a fine tilth, the field should be ploughed two or three times with a cultivator and then planked after each ploughing. Pre-sowing irrigation is recommended to ensure proper germination. Recommended varieties like HD 3086, HD2967 or local variety "Tokar" may be sown for good yield. FYM @ 15t/ha alongwith Ghanjeevamirt @ 5t/ha as basal dose. Line sowing with seed drill is recommended with a seed rate of 100 kg/ha or broadcasting @ 300kg per ha.

Buckwheat

Recommended variety i.e. "Broo" may be used as a second crop after harvest of barley as it is a short duration crop. Seed rate of 30-35 kg/ha may be used. Thinning may start after 20 days from sowing.

Soil Sampling Technique: The main objective is to collect representative soil samples to assess nutrient levels, pH, texture, and other soil properties. For such purpose, a clean auger, spade (khembu), or khurpi; plastic sample bags or container; plastic sheet or bucket; rubber bands or threads and labeling materials like marker, pen etc. are needed. The procedures are as follows; Remove surface debris. Take 5-10 samples per field in a zig zag manner from a depth of 15 - 30 cm. Mix these samples on

a clean sheet or bucket and collect a composite sample (about 500g) after quartering method. Avoid contamination from rusty tools. Label samples with location, date, previous crop grown, depth and geo coordinates if possible. Store in sealed bags and send to a lab for analysis. The time of sampling is after the harvest of Barley/wheat crop in higher altitudes and Buckwheat crop in lower altitudes i.e Kargil district and Sham valley of Leh district or before sowing of these crops.

VEGETABLE CROPS

Potato

Recommended varieties for Ladakh are Kufri Himalini, Kufri Jyoti, Kufri Chandramukhi and Kufri Karan. Start planting of potatoes in April in lower belt areas and in May for higher belts at 60x20cm spacing with seed rate of 20q/ha after treating them with *Tricoderma viride* @5g for managing incidence of Late blight. Apply 20-25 t FYM/ha and mix them with need cake @ 250kg/ha for reducing the incidence of cutworms. Irrigate the field on need basis, preferably at 7-10 days interval during summers. Place the haulms over the plant 15days prior to harvesting to increase the shelf life.

Pea

Recommended Varieties for Ladakh are Arkel, Bonneville, VL-7, Pusa Pragati Az-20 and PS-1100. Sow in March- April at 30x10cm spacing with seed rate of 5kg/kanal. Apply FYM at 15-20 t/ha at the time of land preparation. 3-4 irrigations are recommended during flowering and pod stage. For management of pod borers: Deep ploughing in 2-3 years to eliminate pupa, installation pheromone traps, hand collection of larvae, Neem oil 2% is recommended. Manage Powdery mildew with wettable sulphur at 1gm/L.

Cole Crops

Cabbage, Cauliflower, Broccoli

Sow nursery in April at seed of 500g/ha in protected structures and transplant in open field in lower belts and over plastic mulch in upper belts by mid-May-June at spacing of 45-60 x 45 cm after hardening of seedling for 24hrs. Apply 25 t/ha of FYM at field preparation. Irrigate the field immediately after transplanting later at 7-10days interval. Manage infestation of Diamond back moth by installing pheromone traps, using mustard as trap crop in case of severity spray Bt@1 ml/L. For aphid problem, remove weeds, balance nutrition, proper ventilation and spray neem oil @ 5m/l as prophylactic treatment and repeat every 5 days in case of severity. Cabbage butterfly can be managed by hand picking egg and larvae and by spraying Bt@1 ml/L in case of severity. Use compost tea sprays; maintain good drainage for managing diseases like downy mildew.

Onion

Recommended varieties for the region are Brown Spanish, Red Coral, Liberty and Local white. Sow nursery by March- April in line preferably in low tunnel or trench with seed rate of 8-10kg/ha, transplant in main field at spacing of 15x7cm in May-June. Use row covers simultaneously for managing maggot infestation at seedling stage. Alter the time of planting preferably late by 15 days in area having severe

maggot issues for escaping the first flight of adult onion flies. Apply well-rotted FYM at 20-25t/ha. Remove culls, deep ploughing, use of cover rows, sticky traps crop rotations are the recommended practices for mitigation onion maggot menace. Apply neem oil or copper-based fungicides as natural treatments for managing downy mildew in onion.

Carrot

Sow in April-May at 30 x 8-10 cm spacing with seed rate of 5-6 kg/ha. Nantes Group, Pusa Yamdagini, Kuroda varieties are recommended for this region. Apply FYM at the rate of 20-25 t/ha during field preparation. Sow over ridges in areas having hard soil for reducing cases of forking. Light irrigation at regular interval with balanced dose of nutrients for managing splitting. Apply gypsum (calcium sulfate) to soil with foliar spray of calcium chloride (0.5%) for management of cavity spot.

Radish

Recommended varieties are White Icicle, Pusa Himani, Local (Gya Labuk). Sow over ridges or side of seed beds at distance of 25x10cm with seed rate of 8- 10kg/ha in April-May. Apply 20-25 t/ha of FYM at field preparation. Harvest before roots become pithy/bitter. Spray neem oil (5%) or garlic-chilli extract; introduce ladybird beetles for managing aphids. Avoid heavy soils as they may result in forking.

FRUIT CROPS

Apricot

The premium quality of dried apricot verities are Halmon and Phating while premium fresh quality is Rakcheykarpo. Other vaities like tokpopa, Rogan, Satani, Suffaida, Nari. Apricot nurseries (1-4-year-old) should be planted in the dormant stage and the tree row are oriented in north-south direction. Stake budded/grafting nursery plants and weak branches of tree to avoid damage due to snow and wind. Pits of 1 m x 1 m x 1m should be dug in the month of November-December and fill the pit with soil mixed with some FYM to avoid the freezing soil condition during planting in Feb-March.

Fertilize Apricot trees in early spring season before new growth begins and at the time of planting with 10 kg FYM (Well rotten) or 5-6 kg of vermin compost and increase the amount progressively with year. Apply fertilizer under canopy of trees at least 30 cm away from tree trunk and mix it well with the soil. Fertilizer should be applied when sufficient moisture is present in the soil or immediately before rain is expected. Never apply fertilizer in too dry or too wet soils. During fruit growth and development, 2 to 3 irrigations should be given. Mulching with hay and black polythene helps in conservation of moisture. Flowers and young fruits are sensitive to low temperature that will risk of falling in early spring, hail-storm at the time of flowering.

Remove dry, diseased and intercepting branches as well as old shoots with unproductive spurs. Apricot should be trained to open centre and modify central leader system. The old trees require heavy pruning to encourage new shoots and the yearly pruning should not be heavy. In case of old with open centre system, retain 4-5

wide angled scaffold branches, uniformly distributed around the trunk to maintain a strong frame work. Apply Bordeaux paste or white lead paint or zinc paint on cut surface with diameter 1-2 cm.

Maintain orchard sanitation and management practices for avoiding infestation with pests like aphids, brown tail moth, codling moth, gypsy moth, fruit fly and scales. For managing infestation of brown tail moth, go for pruning of twigs or nay part of the plant containing nest of the pest during winter month avoiding direct contact with the larvae as their hairs are known to cause serious allergies in human. Bur lapping of trunks can also be practiced for avoiding pest like codling moth and gypsy moths. Manage infestation of aphids by prophylactic spray of Neem oil@ 5m/L in infestation prone areas and maintaining geometry of the plant with constant training and pruning.

Apple

The most premium cultivars of apple are Karkicho, Tha kushu, Skur Khusu, Mar kushu, Nass kushu. Other introduced varieties are Gala and Delicious. A well-drained slightly acidic (about 6.5-6.7 pH) loam soil with good depth (more than 45 cm) is ideal for apple cultivation. Apple can't tolerate wet field, and water logging may cause collar rot and death of trees. In-case of prolong dry weather, 2-3 irrigation should be given at fortnightly intervals with proper drainage and good aeration are most suitable.

Trees on seedling rootstocks are more vigorous, having long gestation period, and low in productivity, therefore, high density is considered as most important method to achieve high productivity. Apple plants raised on dwarfing rootstock M9 should preferably be planted in flat land having deep soil, and assured irrigation. Apple plants on semi dwarfing rootstock MM106 and on semi-vigorous rootstock MM111 also require deep soil but can be planted in site having gentle slope beside the flat land. Layout of an orchard should be done in such a way that tree rows are oriented in the North-South directions for better light penetration than East-West direction. In medium and high-density orchards, the trees are to be trained to encourage rapid canopy development by following the main principles of training and pruning.

Apple plants should be trained to open centre or modify central leader system. Remove dry, diseased and intercepting branches as well as old shoots with unproductive spurs. Pollination are necessary for good yield. Nearly 10% plant population in an apple orchard should be pollinizers (Golden Delicious, Oregon Spur, Red Gold, Granny smith, Golden spur, Starspur). Apply FYM @ 5 kg/plant or vermicompost @ 2.5 kg /plant (one-year old) and increase the amount progressively upto 5 year i.e. 25 kg FYM/ plant and 12.5 kg/plant vermicompost.

Codling moth being a serious pest of apple, one should go for proper orchard sanitation picking dropped fruits, bur lapping of trunks during Autumn, use of pheromone traps for catching male adults and scrapping any loose barks around the plant. For managing Woolly apple aphid, spray neem @5m/L water every fortnightly once the pest starts appearing and

LIVESTOCK

Dairy Cattle

Depending upon the altitude it is advised to use indigenous Ladakhi Cattle in altitude higher than 12000 ft ASL for milk production and Cross Bred Jersey fits best at altitude below 12000ft ASL.

Keep a routine watch for any heat signs in cows and immediately contact Animal Husbandry Department for AI if heat is detected in cows. Vaccinate your animal against FMD and HS before the start of season. Practice regular deworming with broad spectrum anthelmintics, after every 3-4 months or as per the local Veterinarians advice. Farmers are advised to clean the floor of animal housing regularly with phenol@1 ml per litre of water and white washing of the feeding and watering trough to prevent infection. Disinfect the farm premises with suitable chemicals such as 1% hypochloride+ bleaching powder (7gm in 1 litre of water) or 1% sodium hypochlorite or 0.5% hydrogen peroxide or 2% Sodium hydroxide etc. with proper care to prevent FMD outbreak.

Supplementation of mineral mixture @ 50-60 g/day in adult dairy animals is recommended for optimum production. If there is temporary shortage of availability of green fodder or concentrate feed, farmer can also prepare home-made feed by using grains like wheat, maize wheat bran, oil cakes and salt. They can also prepare silage for their adult dairy animals. For clean milk production adopt general hygiene practices while milking and handling milk and milk products. Washing hands before and after feeding and milking animals with soap and water or using alcohol-based sanitizer or 1% potassium permanganate solution.

Ensure animals are free from thirst, hunger and malnutrition and protect the animals against extreme cold climatic conditions along with providing a safe environment. Provide a comfortable and ventilated housing especially during winter. Don't allow animals to graze on alfa-alfa grass during the month of May-June, as this grass has high content of Hydrogen cynide (HCn) during early growth stage, which causes acute bloat in ruminants resulting in instant death. In case of non-disposal of milk, farmers can process their milk to ghee, butter and other value-added products like curd or paneer that can be sold locally.

Farmers are advised to prepare hay, alfa-alfa and silage as scarcity fodder for their animals and enough quantity should be stored for long winter feeding. Farmers are advised to be fed edible tree fodders as well as chopped alfa-alfa fodder regularly to sustain the production. Regular supplementation of area specific mineral mixture @50-60g/day adult cows and calcium to the lactating and pregnant cows@ 60-80 ml/day /cow is very much essential for milking cows for optimum production and productivity. Provide 1 kg concentrate for every 2.5 kg milk for cows along with 5-6 kg of dry alfa- alfa fodder and hay. Feed colostrum to new born calf within twelve hours calving @1/10th of body weight. Provide tender leafy fodder to the calves for early development of rumen.

Sheep & Goat

Changthangi sheep and goat herders are advised follow late breeding practices in late autumn preferably October so that the kids are borne in March which reduces kid

mortality. During breeding season, one male against every 50 females should be used for breeding to avoid inbreeding. Ensure deworming of sheep and goats every 6 months using a broad spectrum anthelmintic. Vaccinate your animal against FMD, PPR, Goat Pox and Sheep Pox. Give enterotoxaemia vaccination @ 2 ml s/c to pregnant Ewe/Doe before one month of expected date of lambing/kidding. Provide 25-50 g molasses per day to each pregnant Ewe/ Doe to prevent pregnancy toxemia. Follow rotational grazing, with a grazing period of 8 hrs during winter and 10 hours in summer. Give amprolium as a drench in kids to prevent coccidiosis in young ones. Herders are advised to take care of nutrition of pregnant and lactating ewes and does especially during winter and supplementary feeding with local barley or concentrate feed should be given @ 200-300 gms/day for adult and 150-200gms/day for young ones.

Treatment with Ivermectin for ticks and mites in sheep and goats should be done during winters and Dipping with Butox or N-cidol during summer months soon after combing/shearing. Stock enough dry fodder/ concentrate feed/ barley for the herds to feed then during heavy snow days. Practice Drum silage making using locally available ingredients (developed by KVK- Leh) to meet the nutrient requirement and to meet scarcity of fodder

Back Yard Poultry

The poultry farmers are recommended, disinfect the premises of poultry houses with 1% sodium hypochlorite and inhibit the entry of outsiders to the poultry houses and premises. The litter materials in poultry shed need to be changed to prevent coccidiosis infestation. If red diarrhoea symptoms are noticed in the birds, immediately administer anti- coccidial drugs (in the drinking water for 3 -5 days.)

Poultry birds may be fed with green leaves along with grinded maize/rice. The saw dust should be dried completely in sun before using as bedding material. Apply hydrated lime powder @ 1-2 kg per 10 sq.ft area in the shed before birds are placed in the shed. Add 8% sugar solution containing 1% sodium chloride during first 15 hours after placement. Maintain proper shed temperature (35 C) during the first week of brooding. Provide good ventilation in the shed during the first three weeks of brooding. Provide minimum 23 hours light in the brooder continuously. The adult birds should be allowed to move out in the open yards during daytime. Vaccinate the adult birds against Ranikhet disease @ 0.5ml intramuscular after 2 months of age. Provide Layer mesh @ 20gms/bird in addition to free range feeding to the layers for good egg production. Deworm the birds using piperazine hydrochloride @ 5ml per 10 birds. Provide a minimum light of 16 hours for adult birds. Use anti-stress vitamins such as vimeral @ 10ml per 10 birds for 3 days in a week.

Conserve water in surface and sub-surface horizons of soil during rainy season which in turn address drought-related issues in coconut and other crops grown in the island. Use natural mulching with locally available farm materials for conservation of moisture.

HOMESTEAD GARDENS

Drought management in homesteads should be undertaken through husk burial in trenches, mulch with dried coconut leaves in coconut basins. Plant intercrops like tubers, vegetables, perennial vegetables, medicinal plants, spices and banana to make each homestead as nutritional garden.

FRUIT & VEGETABLE CROPS

Coconut

Farmers have to provide staking to young coconut seedlings as protection from heavy winds. The green manure crops may be sown and should be ploughed in and incorporated in to the soil during August-September. To conserve moisture farmers are advised to use natural mulching materials near the coconut basin like green or dry leaves at the close during the onset of north east monsoon. Farmers are advised to collect all the bio wastes of the farm and compost it for manure. Sanitize the field to control Rhinoceros beetle, Crown cleaning and Fill crown with sand 250g +4 naphthalene ball can be administered and effectively hook out the beetle using beetle hook. For preventing and controlling bud rot sanitize the field clean the Crown cleaning and drench with Bordeaux mixture.

Banana

Take care of newly planted banana with organic manure (10kg/ plant). Be vigilant about rhizome weevil. Apply neem-garlic emulsion to control the vectors spreading Bunchy top virus. Spray neem oil and garlic emulsion @6ml/ litre on the lower leaf surface to control mites. Provide stake to banana plant or protection from heavy

winds. It is advised that farmers have to sanitize the field and perform the weeding periodically. Use the dried banana leaves for Mulching. To prevent Rizhome rot use healthy planting materials, remove the outer layer of rhizome then soak in cow dung slurry and shade dry after the use of this panting material, soil drenching with Bordeaux mixture 1%, field sanitation and avoid water logging has to be performed. To prevent Rhizome Weevils and Pseudo stem weevil use healthy planting materials. Remove the outer layer of rhizome then soak in cow dung slurry and shade dry after the use of this panting material.

Farmers interested for vegetable cultivation can start seedling production through nursery method. Farmers should use good quality seeds in warm and protected place by using seedling trays or seed beds with fertile soil enriched with FYM or compost. Seeds should be treated with *Pseudomonas florescence* (10g/Kg). Control of Root Knot Nematode apply Neemcake 1kg/Plant. Similarly, to control Powdery mildew, spray Bordeaux mixture 1% in the affected areas. To control fruit rot soil drenching with *Trichoderma* 10 g/l can be performed.

LIVESTOCK

Animal growers are advised to avoid water logging near livestock farms including poultry sheds. For livestock keep the hooves away from water to avoid hoof rotting disease. It is advised to take measures to reduce the tick and flies problem. It is always to be kept in mind that the farm area must be disinfected using disinfectants regularly. All animal growers should make sure that the feed is stored in a dry place. Vaccinate animals against foot & mouth disease and haemorrhagic septicaemia. If fever, shivering, brown coloured urine, off feed etc. are noticed, consult veterinary doctor immediately

FISHERIES

Efficient indigenous fishing techniques developed to catch different fishery resources in the lagoon as well as the open ocean waters may be adopted in fishing. Cage fish culture farmers may reduce standing stock by selling harvestable fish directly to the consumers.

CEREAL CROPS

Rice

Land preparation: During the summer months, broadcast the seeds of green manuring crops such as dhaincha, sunhemp, black gram, or green gram, and incorporate them into the field just before flowering stage to maintain soil health. Land preparation for dry nursery may be done with the onset of pre-monsoon showers. Perform deep ploughing to destroy pest larvae, and level the land to ensure uniform water distribution. Considering the current weather conditions, farmers are advised to prepare rice nurseries. For transplanting in one hectare, approximately 800-1000 m^2 of nursery area is sufficient. The nursery soil should be well pulverized and divided into beds 1.5 meters wide and of convenient length. During nursery preparation, an adequate quantity of well-decomposed FYM should be incorporated into the soil.

Varieties and seed treatment: Use high-yielding varieties such as Pusa Basmati 1718, PB 1985, PB-1847, PB-1885, PB-1886, Danteswari, JR 206, Pusa Basmati 1121, and Pusa Sugandha 5, Mahamaya, MTU-1318, Swarna Sub-1 (flood tolerant) for better production. Before sowing, seeds should be treated with 1 g of *Streptocycline* per 10 liters of water for every 5 kilograms of seed and Vitavax @ 2.5 g/Kg seed or Carbendazim 12% + Mancozeb 63% @ 2.5 g/kg seed. The ideal time for transplanting is from June 15th to July 15th, with a row-to-plant spacing of 20*10-15 cm.

Weed management: Paddy should be sown in line and pre-emergence herbicide like Pretilachlor 50% EC @1500 ml/ha or Pyrazosulfuron 10% WP@ 200 ml/ha should be applied within 3 days after sowing. Followed by post emergence application of Bispyribac sodium (10%) @ 250 ml/ha.

Pest and disease management: For management of stem borer and leaf folder, release *Trichogramma* cards @ 50,000 to 75,000 per hectare at 21, 30, and 45 days after transplanting. To effectively control stem borers, apply Profenofos 40% + Cypermethrin 4% @ 1000 ml/ha or Chlorantraniliprole 18.5 SC @ 200 ml/ha.

Additionally, Install pheromone traps @ 5 traps/ha to monitor and manage stem borer populations in the rice field. Regularly monitor rice fields for brown plant hopper infestations. If the pest population exceeds the economic threshold level, spray Imidacloprid 17.8% SC at 250 ml/ha. In case of severe infestations, spray Dinotefuran 10% + Pymetrozine 40% WG @ 250 g/ha. To control blast disease in paddy, treat the seeds with Tricyclazole @ 2 g/kg and spray Propiconazole 25 EC @ 500 ml/ha. If large, muddy-colored spots with purple margins appear on rice sheaths above the water surface, indicating sheath blight, spray Trifloxystrobin 25% + Tebuconazole 50% @ 0.5 gm/L or Carbendazim 50% WP @ 2 gm/L on the affected areas.

Repeat the spray after 12-15 days, if necessary. To conserve rainwater in fields, construct bunds that are high and wide to maximize water retention.

Maize

Use of high-yielding varieties such as Vivek Hy-17, Vivek Hy-43, Pusa Vivek QPM-9, VLQPM-45, Hybrid Maize-1, HQPM-1, Vivek Makka Hy-51, Pusa HM-4, DMRH-1308, IMH 230, and IMH 231. A germination test is essential to ensure an optimum number of healthy plants in the field. This should be followed by bio-priming or seed treatment using Carbendazim 50% WP @ 2 g/kg seed, Imidacloprid 600 FS @ 2 g/kg seed, *Trichoderma* @ 10 g/kg seed, and *Azotobacter* @ 10 g/kg seed to enhance productivity. The optimum sowing time is from June 15th to June 30th, with a spacing of 60 x 25 cm (row x plant). Apply balanced fertilizers, including zinc-based fertilizers, for better crop growth.

Integrated Weed Management

For weed control, apply Topramezone 33.6% SC @ 30 ml per acre as a post-emergence spray at 20-25 days after sowing. The pupae of Fall Armyworm and stem borer, as well as the spores of *Rhizoctonia solani* (the causal agent of sheath blight), remain in the soil. Therefore, deep summer ploughing is crucial to reduce the inoculum potential. The infestation of Fall Armyworm can be significantly minimized by dry sowing or sowing at the onset of the monsoon, practicing crop rotation, and alternating maize with other crops that are not affected by Fall Armyworm. Additionally, apply a basal dose of nutrients and use the ridge and furrow method of bed preparation. These practices should be completed by the last week of May or the first week of June. Monitor regularly to prevent Fall Armyworm infestations. If necessary, spray Spinetoram 11.7 SC @ 350 ml/ha or Emamectin Benzoate 5 SG @ 200 g/ha. To control leaf blight disease, take up spray of Mancozeb 75 WP @ 1000 g/ha.

PULSE CROPS

Green gram

Use of high-yielding varieties such as IPM 410-3 (Shikha), IPM 205-7 (Virat). Before sowing, mix 2.5 kg *Trichoderma* with 1 quintal of FYM and incorporate it into the soil, to control soil borne diseases. Use of 20-25 kg/ha of improved green gram seed for sowing. To control yellow mosaic virus, treat the seeds with Imidacloprid 48% FS at 2 ml/kg of seed.

OILSEED CROPS

Soybean

Use improved high yielding soybean varieties such as JS 20-69, RVS 2002-4, JS 20-98, JS 20-116, Indore Soya 142, NRC 150, NRC 152, JS 2172, RVSM 2011-35 and Indore Soya 130. To eradicate the pest propagules, including the pupae of major pests and the spore structures of major pathogens that remain on farms, such as on threshing floors and in the soil, it is essential to minimize the initial pest/pathogen load. Sanitation of threshing floors, deep ploughing of fields, and cleaning of bunds are necessary. Farmers should also collect all crop debris and bury it in a compost pit.

Seed materials should be carefully processed to remove physically damaged, discolored, or undersized seeds. Only clean, healthy, pest- and disease-free material should be stored as seed. Also treat the seeds with Carbendazim 25% + Mancozeb 50% WS @ 3 g/kg seed + biological fungicide *Trichoderma viride* @ 8-10 g/kg seed, *Bradyrhizobium* culture and Phosphate *Solubilizing Bacteria* @ 10 g/kg seed each to get higher yields. For the control of stem fly in soybean, treat seeds with the Thiamethoxam 30 FS @ 10 ml/kg seed before sowing.

Ensure that soybean is sown on raised bed and Broad Bed and Furrow methods, to conserve moisture. For early maturing and short-statured varieties, maintain 30 cm row spacing. For long-duration and tall varieties, maintain 45 cm spacing between rows and 10 cm between plants. Apply fertilizers based on soil test recommendations. Generally, N: P_2O_5: K_2O at 25:60:40 kg/ha along with 20 kg/ha bentonite sulphur is recommended.

VEGETABLE CROPS

Nursery management: Prepare nursery beds with deep summer ploughing. To protect the nursery from hot winds in June, sow dhaincha seeds along the borders. Always prepare raised nursery during monsoon season and sowing should be done in line to avoid mortality by damping off disease. Soil application of *Trichoderma harzianum* culture @ 100 gm per bed during preparation of nursery bed is very helpful to escape various fungal diseases. Prepare tomato, brinjal, and chili nursery under 50% green shade net, which help reduce vector-borne diseases and thereby ensure the production of healthy seedlings. To protect the nursery from direct sunlight, cover it with a net at a height of 6.5 feet. Sow early-maturing cauliflower on raised beds @ 600-700 g/ha. Treat seeds with Thiram 75 % DS @ 2.0-2.5 g/kg of seed before sowing. Irrigate moderately in the morning or evening to maintain soil moisture.

Field Management: The current weather is favorable for onion cultivation. Before sowing, treat the seeds with Captan 75 WS @ 2.5 g/kg seed. In transplanted onion, dip the onion roots in a solution of Carbendazim 12% + Mancozeb 63% @ 2.5 g/L of water prior to transplanting. Raise the onion nursery with high-yielding varieties such as Agrifound Dark Red, Pusa Ridhi, N-53, Bhima Super, Bhima Raj, and Bhima Dark Red @ 12-15 kg seeds/ha. Considering the current temperature, farmers can begin garlic sowing. Ensure that the soil has adequate moisture before sowing. Recommended improved varieties to be sown such as G-1, G-41, G-50, and G-282.

During field preparation, apply the recommended dose of farmyard manure along with phosphorus fertilizer. Top dressing of nitrogen @ 20-25 kg/ha for cucurbit crops and 30-40 kg/ha for tomato, brinjal, and chili to be done for getting higher yield. For better fruit setting in tomato, brinjal, and chili, spray

NAA @ 125 ml/ha. To prevent fruit cracking in tomatoes, spray 0.1% of borax at fruit setting stage.

For management of early blight and fruit rot of totmato, spray Copper Oxychloride @ 3 g/L or Metalaxyl 4% + Mancozeb 64% WP @ 1.5 g/L. For control of fruit and shoot borer in brinjal, tomato, okra; spray Beauveria bassiana or Metarhizium anisopliae @ 1.5 L/ha or Lambda Cyhalothrin 10 WP @ 1.25 g/L or Emamectin Benzoate 5% SG @ 150-200 g/ha. Erect pheromone traps @ 10 no./ha. In cucurbit crops, install 25 fruit fly traps per hectare during May to reduce the fruit fly damage. For control of leaf spot disease in chilli, spray Chlorothalonil 75% WP @ 2 g/L of water every 15 days. Keep monitoring regularly for mites, jassids, and leaf hoppers in vegetable crops, considering the prevailing temperatures. Light irrigation at short intervals is recommended in this weather. Neem oil @ 5.0 ml/L should be used in all vegetables for control of sucking pests at regular intervals. To control shoot borer in ginger and turmeric, spray Emamectin Benzoate 5% SG @ 150-200 g/ha. In case of leaf spot symptoms, spray Carbendazim 12% + Mancozeb 63% @ 2.5 g per liter of water at 15 days interval.

Transplant 25-30 days old brinjal and tomato seedlings. Before transplanting, treat the seedlings with a solution of Carbendazim 50% WP @ 20 grams and Streptocycline @ 1 g/10 L of water. Use wilt resistant variety like arka samrat or grafted tomato is recommended for higher yields.

FRUIT CROPS

During field preparation, mix well decomposed farmyard manure @ 25-30 t/ha into the soil. Begin pit digging with a proper layout plan for establishing new orchards. Prepare pits (1*1*1 M) in summer season for establishment of new orchards, purchase fruit plants seedlings like mango, guava, sapota, jackfruit, Aonla etc., from reliable sources. Establish the plants with the onset of the monsoon after filling the pits with a mixture of FYM, soil, and sand in ideal proportions. Apply macro and micronutrients based on soil test values and recommended dose of fertilizers into consideration, along with dusting of 1.5% chlorpyrifos. In established plantations, training and pruning should be done before onset of monsoon. Grow fruits crops like Papaya, Lemon, Banana as intercrop in established plantations for additional income. Best mango variety for Kymore plateau and hill districts are Dashehari, Langda, Amrapalli, Chausa etc for higher productivity.

LIVESTOCK

Livestock management during summer

When ambient temperatures exceed the upper limits (24°-26°C for exotic and crossbred cows, 33°C for indigenous cows, and 36°C for buffaloes), the animals' bodies struggle to regulate temperature through sweating and panting. High temperatures can lead to reduced milk production, decreased fertility, and in severe cases, even death. Reproductive performance is adversely affected-such as difficulty in detecting estrus in female animals, lower conception rates, extended service periods, and longer dry spells. Indigenous breeds can tolerate heat better, but exotic and crossbred animals are more susceptible to heat stress. Buffaloes are particularly vulnerable due to their dark skin and fewer sweat glands.

Animals experiencing heat stress or other health issues may exhibit rapid breathing, characterized by panting, fast and shallow breaths, and mouth breathing. Their skin often becomes dry and rough, while the eyes may appear red and watery. A noticeable reduction in feed and water intake is common, accompanied by digestive disturbances such as acidity, loose stools, and slowed gut movement. Urine output tends to decrease, indicating impaired hydration or kidney function. Affected animals may also display lethargy or weakness, often sitting or lying down frequently. Additionally, an increased heart rate is typically observed, often linked to heavy or labored breathing.

Housing and Environment: Keep animals in the shade and protect them from direct sunlight. Ensure adequate space in the shed, as overcrowding increases heat. Plant trees around the animal shelter to keep the surroundings cool. Construct well-ventilated sheds that allow hot air to exit and cool air to enter. Keep the shed roof high for better airflow. Paint the roof white to reduce heat absorption. Place mulch or wet jute sacks on the roof to lower the temperature.

Cooling: Install fans, foggers, and water sprinklers. Hang wet gunny sacks or soaked sheets around the animal shed. Ensure a constant supply of cool, clean water in cement tanks.

Feed and Water Management: Provide animals with continuous access to cool and clean drinking water. Feed them in the morning and evening to avoid generating excess body heat. Give enough salt or electrolytes to maintain the body's mineral balance.

Vaccination and treatment: If an animal shows signs of heat stress, consult a veterinarian immediately. Meanwhile, move the animal to a cool place, bathe it with cold water or wrap it in a wet cloth, and use a fan to cool it down. Some animal diseases can spread to humans (zoonotic diseases). Vaccination helps prevent the transmission of such diseases from animals to humans and from one animal to another. Never vaccinate animals that are sick, weak, or under stress. Treat them first and vaccinate only after recovery. Follow the prescribed vaccination schedule for livestock and get them vaccinated regularly through government or veterinary centers. Timely vaccinate to animals through FMD and H.S. Vaccination should be administered to prevent brucellosis (infectious abortion) in female calves aged 4 to 8 months.

Artificial Insemination (AI) should be continued in consultation with veterinary officer on door-to-door basis rather than direct visit to the dispensaries. To maintain productivity and improve immune status of animals, it is suggested for regular supplementation of mineral- 60g/ day in adult dairy animals and 20-30g in small ruminants. Also, administer deworming medication. Offer clean and cool water three times a day. In case of injury in lactating cows, apply Himex ointment. In case of temporary shortage of availability of green fodder or concentrate feed farmers can prepare home-made feed by using grain like wheat, maize, wheat bran, oilcakes and salt. They can also prepare silage for their adult dairy animals. Due to increased maximum temperatures, goats should be kept in shaded areas and given clean, fresh water three times daily. Vaccinate goats against PPR (Pestedes Petits Ruminants), Contagious Pneumonia, and ETV (Enterotoxaemia). Also, implement control measures for ticks and

lice. To control ectoparasites, apply Butox or Cleaner @ 2 ml/L of water over the animal's body, ensuring the mouth is covered during application. Use smoke in animal shelters to keep away mosquitoes and other insects.

Poultry

During this hot summer provide good ventilation, maintain proper shed temperature and make availability of ample cold drinking water to maintain body temperature of birds. Use anti-stress vitamins such as vimeral to increase immunity and to reduce climate stress. Local poultry farmers are advised to feed concentrate mix with local available grain in ratio of 2:1 in the diet to maintain the health and growth of poultry birds during the scarcity of quality feed. The moisture and quality of the litter materials in poultry shed need to be maintain to prevent coccidiosis infestation. All the equipment in the shed should be disinfected using hot water and with any other proper disinfectant. Disinfect the premises of poultry houses with 1% sodium hypochlorite and inhibit the entry of outsider to the poultry houses and premises. Poultry farmers are advised to vaccinate the chicks at the age of 5-7 days against Ranikhet disease. Ensure vaccination of chicks against Ranikhet disease, if not done earlier.

Deworm the birds using piperazine before onset of monsoon season. After removing adult birds from the previous flock, thoroughly clean and disinfect the poultry shed. Maintain a 3 to 4-week gap between two flocks to ensure floor and environment sanitation (known as downtime). Use a brooder guard to create a circular space about 5 feet in diameter; this is sufficient for about 200 to 250 chicks. Place a heat source (such as infrared bulb, regular bulb, or gas brooder) in the center of the circle. Spread a 2-inch thick layer of straw or wood shavings inside the circle and cover it with old newspaper. Arrange feeders and drinkers in a circular pattern like the spokes of a wheel.

FOOD AND NUTRITION

Farmers-Scientists interaction

During the summer, farmers and farm women should prioritize staying hydrated, consuming seasonal fruits and vegetables, and maintaining a balanced diet rich in protein and fiber. It is important to remain vigilant about food safety during the hot season and focus on nutrient-rich, easily digestible meals. Heat can cause dehydration, so drink water frequently throughout the day, not just when you feel thirsty. Avoid sugary drinks, they can lead to dehydration and other health issues. Summer offers a variety of nutritious options like watermelon, mangoes, cucumbers, and tomatoes. Always choose local produce, it is often fresher and more affordable. Include protein rich foods like lentils, beans, chickpeas, and paneer are excellent sources of protein. Eat fiber-rich foods like whole grains, vegetables, and fruits support digestion and help prevent constipation. Prefer light and refreshing foods, salads and curd can be easier to digest during summer. Avoid heavy, fried, or processed foods. These can be hard to digest and may contribute to dehydration.

Maharashtra

The Kharif season, stretching from June to October, is a crucial agricultural period for the state of Maharashtra, significantly influencing the livelihoods of millions of farmers. Characterized by the onset of the southwest monsoon, this season supports the cultivation of key crops such as rice, cotton, soybeans, pulses, and millets. However, climate variability, erratic rainfall, and changing weather patterns pose continuous challenges to sustainable agricultural production. In the light of these challenges, the Kharif 2025 Agro-Advisory aims to provide timely, region-specific, and science-based recommendations to empower farmers with the knowledge needed to make informed decisions.

REGIONAL ADVISORY

Maharashtra is divided into several agroclimatic zones, each with unique characteristics influencing crop selection, sowing windows, and input management. The following region-wise advisories aim to support farmers with tailored recommendations for improved productivity and resilience.

VIDARBHA REGION

The Vidarbha region of Maharashtra is composed of Bhandara, Chandrapur, Gondia Gadchiroli, Nagpur, Amravati, Akola, Yavatmal, Buldhana, Wardha, Washim and possesses state agricultural university viz., Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

Soil Testing & Preparation (All Crops)

Soil testing is crucial for effective fertilizer management, optimizing input use, and maintaining soil fertility. For proper soil sampling, the recommended depths are 15-20 cm for crops like sorghum, rice, groundnut, and wheat; 30 cm for cotton, sugarcane, and banana; and 30 cm for fruit trees, sampled from a distance of 1-1.5 feet from the trunk. Additionally, applying decomposers to crop residues like straw and leaves enhances organic matter content, improves soil structure, and boosts water retention, contributing to sustainable agricultural practices.

CEREALS CROPS

Paddy

Paddy after Transplanting

For optimal crop establishment, use certified seeds or ensure farm-saved seeds have over 70% germination. Perform salt treatment (300g salt/10L water), discard floaters, wash, dry, and treat with fungicide and Trichoderma (4-5g/kg seed). Sow from the 2nd week of June to 10th July (direct-seeded) or transplant from 2nd to 20th July. Deep plough with a sub-soiler, align with the slope, dig farm ponds, and prepare for drill sowing. Apply Pendimethalin 30% EC (50ml/10L water) after sowing and Bispyribac sodium 10% SC (6-7ml/10L water) 10-15 days later. Use 100:50:50 kg NPK/ha-full P & K with half N at planting; split the rest at tillering and panicle initiation. Begin seed preparation with a salt treatment (300 g salt per 10 L water); discard floaters, then wash, dry, and treat the seeds with fungicide and *Trichoderma* at 4-5 g/kg of seed. For optimal growth, direct seeding is recommended from the second week of June to July 10, while transplanting should be done between July 2nd to 20th July. Land preparation includes deep ploughing using a sub-soiler, ensuring cultivation is aligned parallel to the slope. Farm ponds should be dug for water harvesting, and the land should be prepared for drill sowing. Weed management involves applying Pendimethalin 30% EC (50 ml/10 L water) as a pre-emergence herbicide after sowing, followed by Bispyribac sodium 10% SC (6-7 ml/10 L water) as a post-emergence treatment 10-15 days later. Nutrient management consists of applying 100:50:50 kg NPK per hectare, with full doses of phosphorus and potassium and half of the nitrogen at planting. The remaining nitrogen is split and applied during the tillering and panicle initiation stages.

Maize

Fall armyworm attack in maize

Sowing of maize is recommended from mid-June to the first week of July, using the PDKV Arambha variety. Apply 20-25 cartloads of FYM per hectare before sowing. Treat seeds with biofertilizer at 25 g/kg. The recommended fertilizer dose is 120:60:60 (N:P:K), applied in three splits-1/3 at sowing, 1/3 at 30 days after sowing (DAS), and 1/3 at 50 DAS. Maintain clean cultivation with deep ploughing, trap crops like Napier grass, bird perches, and pheromone traps. For pest management, spray 5% NSKE and release *Trichogramma* at 50,000 per acre weekly. For Fall Armyworm control, treat seeds with Cyantraniliprole + Thiamethoxam and apply Emamectin or NPV sprays if necessary.

COMMERCIAL CROPS

Cotton

High Density planting in cotton

The cotton crop is sown during May-June. Land preparation includes deep ploughing every three years for rainfed areas and annually for irrigated ones, followed by two harrowings and one pre-sowing harrowing. FYM or compost is applied at 12-15 cartloads for rainfed and 20-25 cartloads or 5 t/ha for irrigated fields, with 2.5 t/ha vermicompost if available. Seeds are treated with Imidacloprid or Thiomethoxam (7.5 g/kg), Thiram or Captan (3 g/kg), and biofertilizers *Azotobacter* (25 g/kg) and PSB (20 g/kg). Sowing times vary: 20-30 May for irrigated, early June for dry sowing, and 15-30 June post-monsoon. For Bt/Hybrid (irrigated), spacing is 120x90 cm with a seed rate of 2-2.5 kg/ha, while Deshi improved (rainfed) is sown at 60x15 or 60x30 cm with 9-15 kg/ha. Intercropping with green gram, black gram, or soybean (1:1) or with sorghum and pigeon pea (6:1:2:1) is recommended. Gap filling and thinning are done within 3-5 days after emergence. Irrigated Bt requires 40:60:60 NPK, while Hybrids need 35:50:50 NPK, both applied in two splits. Rainfed varieties receive 20-30:20-30:20-30 NPK as a basal dose using the ring method. Delayed application reduces yield by 10-40%. Foliar sprays of 2% urea (flowering) and 2% DAP (boll stage) are advised. Drip fertigation involves staged application: 10% at sowing, 20% at 20 DAS, 25% each at 40 and 60 DAS, and 20% at 80 DAS, with phosphorus applied as basal. Weed control is crucial for the first 60 days, requiring 3-4 hoeings and 2-3 weedings. Moisture conservation is done by opening furrows at 40-60 DAS. Rainfed cotton benefits from 2-3 protective irrigations during flowering and bolling.

Common pests like Jassid, Thrips, Aphids, and Mites are managed with Dimethoate 30 EC (10 ml/10 L) or Acetamiprid 20 SP (1.5 g/10 L), while whiteflies are controlled using yellow sticky traps (5 per acre) and Dimethoate 30 EC (33 ml/10 L). Bollworms are managed with Quinalphos, Spinosad, or Cypermethrin, and pink bollworm with pheromone traps, Neemark 300 ppm, deep ploughing, and heat treatment. Thirty yellow sticky traps and 2-3 light or pheromone traps per gin are suggested. Biopesticides like Neem 5%, Verticillium lecanii, and Beauveria bassiana are recommended in humid weather.

Plant Protection: Bacterial leaf blight is managed by treating seeds with Carboxin (1 g) and Thiram (3 g/kg), grey mildew with wettable sulphur (25 g/10 L) or Carbendazim (10 g/10 L), Myrothecium with Copper oxychloride (0.3%), Carbendazim (0.1%), or Mancozeb (0.25%), and Alternaria with seed treatment and Mancozeb (0.2%) sprays every 20 days. Para wilt is managed with a drench of 25 g Copper oxychloride and 150 g urea in 10 L of water.

Special recommendations include intercropping AKH-081 with green or black gram, spacing PKV DH-1 at 60x45 cm with 50:25:25 NPK (rainfed), and applying 2% urea (flowering) and 2% DAP (bolling) foliar sprays. For AKH-081 in shallow soils, 5 t/ha FYM and 25:12.5 N:P are advised. For pre-monsoon yield boost, 2.5 t FYM and 75:37.5:37.5 NPK/ha are applied.

Sugarcane

Sugarcane is planted during the Kharif season (June-July) with a duration of 12-15 months. It thrives best in well-drained deep loam soils with good water-holding capacity, avoiding saline or alkaline conditions. The climate should be warm and humid. Land preparation involves deep ploughing (1-2 times) followed by two cross harrowings, stubble and weed removal, and proper field leveling with drainage. Recommended varieties include CO-86032, CO-8014, CO-94012, VSI-434, and CO-M-0265, especially early-maturing ones. Healthy 9-10 month-old canes are selected for setts, taking the top two-thirds portion and avoiding flowering canes. The seed rate is 45,000-50,000 three-budded setts per hectare, approximately 6-8 tonnes. Before planting, setts are treated with 0.25% Bavistin or Carbendazim mixed with a 2.5% urea solution for 10-15 minutes.

Spacing varies: 90 cm for rainfed, 120 cm for irrigated or paired row trench planting, and 60 cm for High-Density Planting Systems (HDPS). Planting is done in furrows or trenches, with buds facing upward, covered lightly with soil. The fertilizer dose is 250:115:115 NPK kg/ha for irrigated crops and 200:90:90 NPK kg/ha for rainfed crops. At planting, 1/3 nitrogen (N) along with full phosphorus (P) and potassium (K) is applied, while the remaining N is split and applied at 45 and 90 days after planting (DAP). Fertilizers are placed in bands 8-10 cm deep and 10-15 cm away from the rows. Additionally, 25-30 t/ha of FYM or compost is applied before the final harrowing. Biofertilizers such as Azotobacter and PSB (2 kg/ha each) mixed with 100 kg of compost or FYM are added during planting. Intercropping with green gram, black gram, soybean, or groundnut is recommended during early stages. Light earthing up is done at 45-60 DAP, followed by full earthing up at 90-120 DAP. Trash mulching with cane trash after 60 DAP helps conserve moisture and control weeds.

For pest control, early shoot borer is managed by removing affected shoots, releasing *Trichogramma* (@ 50,000/ha/week), or applying Chlorpyrifos 20 EC (5 ml/L). Internode borer is controlled with Cartap hydrochloride 4G (10 kg/ha) or *Trichogramma* release. White grub management includes applying Phorate 10G (25 kg/ha) in moist soil. Red rot is prevented by planting resistant varieties, removing infected clumps, and treating setts with Carbendazim 0.1%. Smut is controlled by using disease-free setts, hot water treatment (50°C for 30 minutes), or fungicide dips. Wilt is managed through resistant varieties and crop rotation. For growth enhancement, 2% urea or 2% DAP is applied during tillering and grand growth stages if the crop appears pale or yellow. These practices ensure healthy growth and optimum yields.

PULSES

Soybean

Sowing of soybean is recommended between 20th June and 5th July, with a seed rate of 65 kg/ha and a spacing of 45 cm. Preferred varieties include MAUS-162, MAUS-612, PKV Amba, and PKV Yellow Gold. Seeds should be treated with a fungicide-insecticide combination like Azoxystrobin (10 ml/kg) and inoculated with Rhizobium and PSM (5 g/kg). For weed control, apply Pendimethalin 30% EC (3.25 L/ha) or Flumioxazin 50SC (250 ml/ha) as a pre-emergence herbicide, followed by

Imazethapyr 10% SL (1 L/ha) at 15-20 days after sowing (DAS) for post-emergence. Install sticky traps for whiteflies and monitor for hairy caterpillars, removing them manually if detected. Azadirachtin 1500 ppm (1 L/ha) is recommended as the first spray for *Spodoptera*, with additional insecticides as needed. For bacterial and fungal spots, apply fungicides at the first sign of symptoms. Nutrient application should follow the 25:60:40:20 NPKS kg/ha guideline, using 56 kg urea, 375 kg SSP, and 67 kg MOP. For stem fly, wilt, root rot, and fungal diseases, treat seeds with Azoxystrobin 2.5%, Thiophanate 11.25%, and Thiamethoxam 25% FS (10 ml/kg of seed). Maintain weed-free fields during the early growth stage, destroy host plants on bunds, and remove virus-infected plants promptly to prevent disease spread. Use 30-40 yellow sticky traps per acre to control whiteflies and sap-sucking pests. Apply balanced fertilizers to prevent excessive nitrogen, which attracts sap-sucking pests and promotes viral spread. For pest management, spray Imidacloprid in 10 L of water as required. To control whiteflies that transmit yellow viral disease, use a combination of Acetamiprid 25% + Bifenthrin 25% WG (5 ml/10 L water) or any recommended insecticide as per label instructions.

Pigeon Pea

In Maharashtra, recommended pigeon pea varieties include BDN-716, BSMR-736, PKV Tara, PKV Ashlesha, Vipula, Asha, and Vaishali (BSMR-853). Early varieties are sown in the first fortnight of June, while medium and late varieties are sown in the second fortnight. The seed rate for early varieties is 20-25 kg/ha with a row spacing of 45-60 cm, whereas medium and late varieties require 15-20 kg/ha with 60-75 cm spacing. For seed treatment, Thiram + Carbendazim or *Trichoderma viride* combined with *Rhizobium* and PSB culture is recommended. Alternatively, Carboxin + Thiram (3 g/kg) and *Trichoderma* (4 g/kg) can be used. Fertilizer application includes 25-30 kg N, 40-50 kg P_2O_5, and 30 kg K_2O per hectare as a basal dose, along with 20 kg of sulfur and 3 kg of zinc if deficiency is observed. Weed management involves the pre-emergence application of Pendimethalin at 0.75-1 kg a.i./ha, followed by two hand weedings at 20-25 and 45-50 days after sowing (DAS). Irrigation should be provided during critical growth stages such as branching, flowering, and podding if dry spells occur.

To manage wilt, seeds are treated with *Trichoderma viride* at 10 g/kg, with additional soil application. For Sterility Mosaic Disease (SMD), spray Fenazaquin (1 ml/L) at 45 and 60 DAS. Pod borers are controlled using Emamectin benzoate at 220 g/ha and pheromone traps, while pod fly infestations are managed with a 5% spray of NSKE at 50% flowering. Proper crop management ensures healthy growth and higher yield.

Mung Bean

Sowing should be done from the last week of June to the first week of July, following the onset of monsoon. To manage leaf crinkle, treat seeds with Thiamethoxam 70WS (5 g/kg) and spray Thiamethoxam 25WG (4 g/10 L) at 21 and 35 days after sowing (DAS). Recommended varieties include BM-4. Apply a 40 ppm Chitosan spray at 25 and 40 DAS. For Cercospora management, spray Metiram + Pyraclostrobin (0.3%) at the first sign of infection and repeat after 15 days.

Black Gram

Sowing is recommended from mid-June to early July with the onset of monsoon. Preferred varieties include TAU-1 and T9. Bio-prime the seeds with Rhizobium and PSB (25 ml/kg) for 12 hours before sowing. Apply 10:20 kg N:P_2O_5 per hectare, achieving a 50% saving in nitrogen and phosphorus. For pest management, spray Monocrotophos (12.5 ml/10 L) at the bud stage, followed by Chlorantraniliprole (2.5 ml/10 L) after 15 days.

FRUIT CROPS

Citrus (Mandarin)

Mandarin requires well-drained light to medium loam soil with a pH of 6.5-7.5, avoiding saline or alkaline conditions. It is planted during June-July (monsoon) or January-February (spring) with a spacing of 6 m × 6 m (277 plants/ha) or 5 m × 5 m in lighter soils. Pits (1 m^3) are prepared with topsoil, 20-25 kg FYM, 1 kg SSP, and 500 g Neem cake before planting. Recommended varieties include Nagpur Mandarin, PKV Shanti, PKV Nira, and PKV Garima. Young plants need light irrigation every 7-10 days, while bearing trees require irrigation at critical stages-flowering, fruit set, and fruit development-avoiding over-irrigation during flowering and monsoon. Fertilizer application starts with 100 g N, 50 g P, and 50 g K in the first year, gradually increasing to 500 g N, 250 g P, and 250 g K from the fifth year onwards, split between June-July and September-October. Apply 10-30 kg FYM per tree annually in June. Intercropping with cowpea, green gram, black gram, or marigold is recommended during the early years. For pest control, spray Dimethoate or Imidacloprid for citrus psylla and leaf miner; Neem oil or Acetamiprid for black fly and whitefly; poison bait or bagging for fruit-sucking moth; and Chlorpyrifos or kerosene for trunk borer. Canker is managed with a 1% Bordeaux mixture or Streptocycline (100 ppm) + Copper oxychloride (0.2%). For gummosis, scrape bark and apply Metalaxyl paste while ensuring good drainage. Greening disease is prevented by using disease-free budwood and controlling the psylla vector.

SPICES

Turmeric

Rhizome planting time: Mid-May to Mid-June (preferably with onset of monsoon or just before). Varieties: Suguna, Suvarna, Prabha. The land is prepared with the receipt of early monsoon showers. The soil is brought to a fine tilth by giving about four deep ploughings. Hydrated lime @ 500 kg/ha has to be applied for laterite soils and thoroughly ploughed. Immediately with the receipt of pre-monsoon showers, beds of 1.0 m width, 15 cm height and of convenient length are prepared with spacing of 50 cm between beds. Planting is also done by forming ridges and furrows. Treat rhizomes with a fungicide solution (like Mancozeb or Carbendazim) before sowing to protect against early diseases. You can also use bio-fungicides like *Trichoderma*.

Plant rhizomes at appropriate spacing (typically 20-30 cm between plants and 45-60 cm between rows). Ensure adequate moisture at the time of sowing. Depending on rainfall, you might need to provide initial irrigation.

FLD on Turmeric

Pest, Nematode, soil born pathogen: Biological control - At the time of planting, apply 25 g powdered neem cake and mix well with the soil in each pit taken at a spacing of 20-25 cm within and between rows or application of neem cake @2 t/acre is also desirable. Plan for timely weed control through manual weeding or appropriate herbicides as per recommendations.

LIVESTOCK MANAGEMENT

In Livestock shed use of 0.01 % Deltamethrin spraying for control of ecto and endo parasites 15 days intervals. Provide ample amount of clean and cold water to livestock to avoid Colitis disease. Use of white paint lime to drinking water tank. Vaccination of livestock should be done twice in a year against FMD. Livestock deworming should be done once in a six month. In case of buffalo wallowing should be done in summer season for enhancing the milk yield and to maintain the body temperature. Grooming of milch animal to avoiding the falling of loose hairs in the milk and to get the clean milk production and enhancing the blood circulation. Washing of animal specially in summer season remove the dirt and dust and maintain the body temperature and to avoid the heat strock. As per thumb rule provide animal feed should be 60 % green fodder and 40% dry fodder. In case of milch animal give 30 gm mineral mixture in case of cattle and 60 to 80 g in case of Buffalo should be given in the diet.

ENGINEERING

Use sub-soiler for deep ploughing. Cultivate parallel to slope. Tools used are Paddy transplanter, power weeder, Cono weeder. Size of farm pond: 20x20x3 m per 2 ha.

MARATHWADA REGION

Marathwada region of Maharashtra is comprised of Aurangabad, Jalna, Beed, Latur, Osmanabad, Hingoli, Parbhani, Nanded. The region has moderate rainfall (600-800 mm) and has medium to deep black soils. This region possesses state agricultural university viz., Dr. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

CEREALS CROPS

Maize

Maize should be sown at 75 x 20 cm or 60 x20 cm as per soil type by dibbling method with first onset of monsoon after receiving 75-100 mm rainfall. Improved and high yielding notified varieties or research hybrids should be used for sowing for achieving higher yield. Recommended dose of 100:75:75 kg NPK should be applied to maize out of which 50 % N and full P and K should be given at the time of

Maize observation in field

sowing while remaining 50 % N should be applied after 30 DAS. For the control of Fall Army Worm, treat the seed with 3 g/ Thiram per kg of seed, spray 5 % NSKE withing 30 days of sowing or at 5 % infestation. In addition, spray Emamactin Benzoate 5 % @ 4 g/ 10 L of water at 10-20 % infested plants. Earthing up should be done during dry spell for in situ moisture conservation.

COMMERCIAL CROPS

Cotton

Whitefly on cotton

Cotton should be sown after onset of monsoons or after 1st June only for effective management of pink bollworm. Well decomposed FYM should be applied to cotton @ 10 ton/ha before sowing. Recommended fertilizer dose of 120:60:60 kg NPK/ha should be applied to rainfed cotton out of which 40% N & complete P & K should be applied as a basal dose at the time of sowing. Remaining 30 % N should be applied after 30 DAS and 30 % after 60 DAS. Use of high yielding, short duration cotton variety like CICR-14, CICR-19, PKV-081, Suraj BT, Rajat BT, NH-1901,1902,1903,1904 etc. For irrigated cotton apply 150:75:75 kg NPK/ha out of which 20% N & complete P & K should be applied as a basal dose at the time of sowing. Remaining 40 % N should be after 40 DAS and 30 % after 60 DAS. Closer spacing and High-Density Cotton Planting (HDPS) should be adopted on medium and light soils respectively for higher yields by keeping plating distance of 90 x 30 cm for medium soils and 90 x 15 cm for light soils which will accommodate approximately 14000 and 29000 plants per acre respectively. Canopy management should be done by cutting monopodia at 45-50 DAS and nipping the tip at 90 DAS supported with one or two sprays of growth retardants if required under expert guidance. Earthing up should be done in cotton during dry spell in Kharif season to reduce evaporation losses of soil moisture. Follow IPM package for the control of pests and diseases in cotton as given below. Select short duration and sucking pest tolerant variety for sowing

a. Follow crop rotation avoid cotton sowing followed by tomato, chickpea, etc.
b. Sowing of intercrop or mixed crop like maize, cowpea, Black gram, green gram and use of trap crop like marigold, castor, etc.
c. Sowing of okra as a trap crop in cotton for the control of Pink Bollworm.
d. Avoid plant growth promoters and pesticides during first three months and use botanical pesticides or biopesticides
e. Spray of 5 % NSKE at 60 DAS
f. Install 40 pheromone traps per ha for mass trapping of pink bollworm.

PULSE CROPS

Soybean

The own seed of Soybean should be used for next Kharif season after testing its germination to save money as well as it will help to face the situation of seed shortage in the market. Seed germination should be tested before sowing and good quality seed with more than 70 % germination should be used for sowing only. Improved varieties like MAUS-162, MAUS-612, MAUS-725, Phule Durva, Phule Kimaya, PDKV Yellow Gold, PDKV Amba should be used for sowing. Soybean seed should be treated with Thiram @ 3 g/kg or *Trichoderma* @ 4 g/kg of seed and inoculated with *Rhizobium* and PSB @ 100 ml/10 kg of seed before sowing. Sowing of soybean should be avoided in the fields where soybean seed production was taken in the last summer season. Follow IPM package for the control of pests and diseases in soybean as give below:

a. Sowing should be completed before 15th July to avoid pest infestation.

b. Seed treatment of Thiram @2-3 g per kg or *Trichoderma* @5 g per kg of seed.

c. Seed treatment with Thiamethoxam 30 % @ 10 ml per kg of seed for management of stem fly.

d. Use border crop of castor and sunflower as a trap crop for *Spodoptera.*

e. Install 16 to 20 bird perches per ha.

f. For management of Spodoptera spray 5 % NSKE or *Beauveria bassiana* or *Numeria releyi* @ 40 g or *Bacillus thuringiesis* @ 20 g per 10 L of water.

Pigeon Pea

Wilt in Pigeon pea

The Sowing time for early varieties is first fortnight of June and medium/late: Second fortnight of June to first fortnight of July. Seed rate for early: 20-25kg/ ha spacing: 45X60cm R-R and Medium to Late: 15-20kg/ ha spacing: 60-75cm R-R. Use wilt and sterility mosaic resistant medium to early duration varieties like BDN-711, BDN-716, BDN-2013-41 (Godavari), PKV Tara, Phule Rajeswari, etc to ensure higher yield in adverse climatic conditions. Treat the seeds with biofertilizers and apply recommended doses of fertilizers as per recommendations of concerned universities Ensure arrangement of one or two protective irrigation wherever possible. Intercropping of Pigeon pea + Soybean with 1:2 or 2:4 ratio should be taken for higher yield and monitory returns. Install 5 pheromone traps per hectare for monitoring and spray 5 % NSKE at flowering stage for the control of *Helicoverpa*.

Green Gram and Black Gram

Sowing of green gram should be completed with first onset at minimum 80 mm of rainfall. Improved varieties of green gram like BPMR-145, BM-2003-02, Phule Chetak, etc and AKU-10-1 (Black Gold), AKU-15, etc of black gram should be used for

sowing. Seed of green gram and black gram should be treated with Thiram @ 2 g/ kg followed by seed inoculation of Rhizobium and PSB biofertilizers @ 10 ml / kg of seed. Green gram and black gram can be taken as intercrop in cotton at 1:1 ratio for higher yield and monitory returns.

FODDER CROPS

Sorghum

Improved varieties of Sorghum like CSV-20, CSV-23, CSV-27, PVK-801, PVK-809, CSH-25 (Parbhani Sainath), biofortified variety like Parbhani Shakti should be used for sowing. Seed should be treated with Thiram @ 3 g/ kg followed by seed inoculation of *Azotobacter* and PSB biofertilizers @ 10 ml / kg of seed. Kharif Sorghum should be sown at 45 x 12.5 cm spacing by using 7.5 kg seed rate per hectare. Recommended fertilizer dose of 80:40:40 kg NPK should be applied to Kharif Sorghum out of which 50 % N and full P and K should be given at the time of sowing while remaining 50 % N should be applied after 30 DAS. For the control of Stem Borer and Fall Army Worm, spray 5 % NSKE or Quninolphos 35 % EC @ 15 ml / 10 L of water within one week from sowing. Take another spray at the interval of 10 days if required.

Pearl Millet

Improved varieties like Shraddha, Saburi, AIMP-92901 and biofortified varieties like AHB-1200 Fe, AHB-1269 Fe should be used for higher yield. Recommended fertilizer dose of 60:30:30 kg NPK should be applied to Pearl Millet out of which 50 % N and full P and K should be given at the time of sowing while remaining 50 % N should be applied after 30 DAS. Seed should be treated with Thiram @ 3 g / kg of seed followed by Metalaxil 35 SD @ 5 g / kg of seed and then inoculate with *Azotobacter* and PSB biofertilizers @ 25 g / kg of seed.

COMMERCIAL CROPS

Sugarcane

Deep ploughing followed by harrowing and levelling; ensure proper drainage as the region is prone to waterlogging. Use high-yielding, disease-resistant varieties like Co-86032, Co-94012, Co-8014, Co-M-0265 (Phule-265), or Co-C-671. Ideal time for adsali (pre-kharif) planting is July-August; Kharif planting should be done in June-July. Use 3-budded setts from healthy, disease-free canes; dip in fungicide solution (e.g., Bavistin @1g/liter) before planting. Adopt 90 cm row-to-row and 30 cm plant-to-plant spacing for proper growth and aeration. Apply 250:115:115 kg NPK/ha in three splits (at planting, 45-60 DAS, and 90 DAS). Use organic manure or FYM @ 25-30 t/ha for better soil health. First irrigation immediately after planting, then every 8-10 days depending on rainfall and soil moisture. Perform 2-3 hand weeding/inter culturing at 30, 60, and 90 DAS. Use pre-emergence herbicides like Atrazine @ 1.5 kg/ha.

Pest & Disease Management:

Early shoot borer: Remove and destroy infested shoots; apply Chlorantraniliprole or Carbofuran granules in affected furrows.

Top shoot borer/ White grub: Apply *Trichoderma* or *Beauveria bassiana* in soil and spray Chlorpyrifos if needed.

Red rot: Use resistant varieties and avoid ratooning affected crops. First earthing up at 45-60 DAS; final at 90-120 DAS to provide support and prevent lodging. Mulch inter-row spaces with cane trash to conserve moisture and suppress weeds. Grow short-duration legumes (moong, urad) in early stage for additional income and nitrogen fixation.

FRUIT & VEGETABLE CROPS

Citrus

For new plantation of citrus (Sweet Orange and Lemon), well-drained soil with less than 10 % free lime should be selected. Use quality and disease-free planting material from registered nurseries for new plantation. Sweet Orange crop should be planted at 6 x 6 m spacing accommodating 277 plants per hectare. Only one bahar either Ambiya or Mrig should be taken based on water availability for higher yield and more life of sweet orange orchard. Irrigation management should be done in Ambia Bahar to citrus orchard. Take a spray of potassium nitrate @ 15 gm per litre of water. Application of Bordo paste (1:1:10) should be done on tree trunk before onset of monsoon to protect the crop from gummosis and dieback. Application of Trichoderma viride, Pseudomonas fluorescence, Glomas mycorrhiza @ 100 g each in 1 kg compost with 200 g Ferrous Sulphate and Zinc Sulphate to each gummosis affected plant. For management of fruit sucking moth, adopt Integrated Pest Management practice which include, destruction of weed host, applying smoke, collection and destruction of fallen fruits, use of light trap, use of poison baits, covering tree with nylon net of 0.5 mesh and spraying of Horticulture Mineral Oil @ 500 ml/ ha, etc.

Mango

Advisory services for Mango fruit orchard visit

Preferably Marathwada Keshar variety should be selected for plating in Marathwada region. Organic mulching should be done and the orchard should be irrigated during early in the morning, at evening or during night hours. To protect the mango fruits from the incidence of fruit fly, install "Rakshak fruit fly trap" developed by university @ 4 traps per hectare. Fallen fruits should be collected and destroyed to keep orchard clean. Fruit fly lays its eggs in the fruits below outer cover of the fruit when the fruit is about to mature. The larvae develop on the pulp of the fruit. Hence, the infested fruits should be destroyed. The soil should be ploughed below the tree. After harvesting of mango, one spray of Hexaconazole fungicide should be taken @ 10 ml/10 L of water for prevention of blight.

Banana

Sword suckers of 3-4 months age with 450 to 750 g should be used for plantation of Banana. For protection of banana orchard from hot air, make use of green net in southwest direction of orchard. Earthing up should be done in banana orchard. Provide shade to newly planted or small plants to protect them from high temperature. Organic mulching should be done in banana orchard. Irrigate banana orchard during early in the morning, at evening or during night time.

Grapes

Management of April pruning in grape orchard should be done as per availability of water. During rest period, provide only need based irrigation to protect the existing leaves from drying, and also contribute towards increasing the reserves of the vines through photosynthetic activity. Care should be taken to reduce/stop the water in case new growth is observed on the shoot. If rainfall exceeds 2.5 mm, no irrigation should be applied especially during rest period.

Custard Apple

Prefer improved varieties like Balanagar, Red Sitaphal, Arka Sahan, and NMK-1 for better yield and fruit quality. Kharif planting should be done in June-July, with the onset of monsoon. Adopt spacing of 5 m × 5 m or 6 m × 6 m (approx. 270-400 plants/ha). Dig pits of 60×60×60 cm and fill with a mixture of topsoil + 10-15 kg FYM + 1 kg neem cake + 100 g SSP.

Fertilizer Management (per plant/year): For fertilizer management, during the first year, apply 50 g of nitrogen (N), 25 g of phosphorus (P), and 25 g of potassium (K) per plant. For mature plants, use 500 g of N, 250 g of P, and 250 g of K, along with 20 kg of farmyard manure (FYM) per plant annually. Apply the basal dose of fertilizers in June-July and split the nitrogen dose by applying the second half after fruit set.

Pest and Disease Management:

Fruit borer: Collect and destroy infested fruits. Spray Spinosad @ 1 ml/L . Mealybug: Use neem-based sprays or release natural predators like ladybird beetles.

Leaf roller: Spray Dichlorvos or Quinalphos as needed. Anthracnose (fruit rot): Spray Copper oxychloride (3g/l) or Mancozeb at 15-day intervals. Avoid overcrowding and prune to improve air circulation.

Pomegranate

Ideal planting during June-July (Kharif) with the onset of monsoon for rainfed or semi-irrigated conditions. Varities recommended are Bhagwa, Ganesh, Arakta, Mridula, and Super Bhagwa for high yield and export quality. Spacing & Planting: Spacing of 5 m × 5 m (400 plants/ha). Use healthy, disease-free, 1-year-old saplings. Prepare pits of 60×60×60 cm and fill with topsoil + 15-20 kg FYM + 1 kg neem cake + 1 kg super phosphate. Although drought-tolerant, irrigation at 10-15-day intervals after monsoon ensures better flowering and fruit setting. Use drip irrigation to conserve water and ensure uniform moisture.

Fertilizer Management (per plant/year): In the first year, apply 250 g of nitrogen (N), 125 g of phosphorus pentoxide (P_2O_5), and 125 g of potassium oxide (K_2O) per plant. Starting from the third year, during the bearing stage, increase the fertilizer application to 625 g of N, 250 g of P_2O_5, 250 g of K_2O, along with 20-30 kg of farmyard manure (FYM) per plant. Apply the fertilizers in split doses, with the first application in June-July and the second after fruit set.

Pest and Disease Management:

Fruit borer & Thrips: Spray Spinosad @ 1 ml/l or Imidacloprid @ 0.3 ml/l.

Stem borer: Plug holes and apply insecticide paste.

Aphids & Mealybugs: Spray neem oil (3%) or Dimethoate @ 1.5 ml/l.

Bacterial blight: Apply Bordeaux mixture (1%) or Streptocycline + Copper oxychloride.

Papaya

Drenching of copper oxychloride 2 gm/litre or Bavistin 1gm/litre of water to carry out if newly emerged papaya seedlings affected by root rot /Pythium fungal disease.

Chilli

To avoid leaf curl infestation in chilli transplanting of seedlings should be done before 30th June. Pest resistant or tolerant varieties like like Pusa Jwala or Pusa Jyoti should be used for planting.

Tomato

Triple disease resistant varieties of tomato like Arka Rakshak or Arka Samrat should be used for higher yield.

Okra

For management of fruit borer in okra take a spray of 5 % NSKE or Chlorantraniliprole 18.5 % SC @ 2.5 ml or Cypermethrin 10 % EC @ 15 ml or Quinalphos 25 % EC @ 20 ml per 10 L of water. Harvesting of mature vegetables should be done early in the morning. Irrigation management should be done early in the morning, at evening or during night time in vegetable crops as per availability and requirement of crop. Management practices should be followed to protect the vegetable crops from hot air.

Brinjal

If incidence of shoot and fruit borer observed in Brinjal, collect and destroy caterpillar or Spray Neemark 4 % or Cypermethrin 25% EC 5 ml or Chlorpyriphos 20 EC 20 ml or Deltamethrin 1 % or Traizophos 20 ml per 10 litres of water.

Turmeric

Harvesting, boiling, drying, polishing operations are being carried out in turmeric crop. To save the crop from unseasonal rains or hailstorm, crop should not be stored in open place. The harvested turmeric crop should be covered by plastic paper so that it should not be damaged by rains.

Animal Protection

To protect the animals from high temperature, apply white paint to the roof of shade. Apply mulching on the roof of shade with the help of dry grass and trash of sugarcane which reduces the temperature in shade. If water is spry on mulches or use of foggers will cool down the temperature of shade. Precaution should be taken so that the harvested dry Stover of sorghum may not damage due to rainfall, if it happens the quality as well as storage capacity of dry Stover decrease and animals not prefer such type of fodder.

Protection with gunny bags

FODDER MANAGEMENT

Use Maize African Tall and new varieties of hybrid napier like Phule Gunwant, DHN-6, BNH-10 and Super Napier for round the year availability of green fodder. Excess green fodder should be converted into silage.

MILCH ANIMALS

Provide clean, hygienic and plenty amount of drinking water to milch animals. To reduce the stress of heat in farm animals, provide roughages by mixing with solution of 1% jaggery and 0.5% salt separately. Milch animals should be offered 50 gm of mineral mixture daily in two divided doses to maintain milk yield and to overcome the problem of anoestrous cycle. Cow teats should be dipped in 2 % solution of Potassium Permanganate after every milking to avoid Mastitis in milch animals. Regular deworming should be done after every two months for one year for good health and weight gain of calves.

Buffalo

Allow buffalo for wallowing in water as they have fewer sweet glands compared to cattle to maintain their body's thermo-equilibrium. Water-soaked gunny bag or other cloth should kept on a body to avoid occurrence of heat stroke.

Goat

Animals should be vaccinated before monsoon season for Enterotoxaemia and Peste des petes (PPR) ruminants' diseases to avoid great losses. Improved breeds like Osmanabadi should be used for higher income. Regular deworming should be done after every month to goat kids for six months for good health and weight gain.

Poultry

In the summer the poultry shed should be kept cool. Plants more trees around the shed. The roof of the shed should be covered with grass, so that the temperature remains under control. Exhaust fan should be kept in the shed, so that the hot air inside shed is thrown out. Use foggers, so the shade will cool down. Improved backyard poultry breeds like Grampriya, Shrinidhi, Kaveri, Giriraja and Vanaraja should be used to boost up the income of small and marginal farmers.

WESTERN MAHARASHTRA

Western Maharashtra is comprised of Ahmednagar, Pune, Satara, Sangli, Kolhapur, Solapur. The region has moderate rainfall and Black to medium black, well-drained soils. This region has state agricultural university viz., Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar.

CEREAL CROPS

Rice

In Western Maharashtra, nursery sowing for Kharif rice generally begins in late May to mid-June, aligning with the onset of monsoon. Recommended varieties include Phule Radha, Indrayani, Sahyadri, and Kolhapur-1, chosen for local adaptability and consumer preference. About 40-50 kg of seed per hectare of main field is required for a nursery area of 800-1000 m^2. Seeds are soaked in water for 24 hours, then incubated for another 24-36 hours to promote uniform germination. Treat seeds

with Carbendazim or *Trichoderma* to prevent fungal diseases. Use raised beds (1-1.5 m wide, 15-20 cm high) with good drainage to prevent waterlogging, common in clayey soils during monsoon. The soil should be well-pulverized and enriched with FYM (Farm Yard Manure) at 5-10 t/ha. Rice nurseries are typically raised in medium to heavy black soils with good water retention. Adequate but controlled irrigation is necessary to avoid overwatering.

Fertilizer Application: Apply urea, SSP, and MOP as a basal dose (e.g., 1 kg urea, 0.5 kg SSP per 100 m^2). Top-dress with urea 10-12 days after sowing.

Weed Management: Hand weeding after 10-15 days or pre-emergence herbicides (like Butachlor) can be applied carefully depending on weed load.

Pest and Disease Control: Monitor for early signs of blast, sheath blight, and stem borers. Use recommended insecticides/fungicides only when needed to avoid resistance. Use of Mat-Type Nursery (for Machine Transplanting) is recommended. In areas using mechanical transplanters, mat-type nurseries are promoted using plastic trays or polythene sheets.

Nursery production: The seedlings are usually ready for transplanting in 20-25 days when they reach 3-4 leaf stage and 15-20 cm height. Drain water 2-3 days before uprooting to harden seedlings and reduce transplanting shock. Use of organic amendments, biofertilizers like *Azospirillum* and phosphate solubilizing bacteria is gaining ground among progressive farmers. For transplanted rice, 30-35 kg seed per hectare is used, and for direct seeding, 75-100 kg per hectare is recommended. For dibbling method use the seed rate @50 to 60 kg/ha. Seeds should be treated with fungicide (like Thiram @ 2.5 g/kg seed) and biofertilizers such as *Azotobactor* and PSB @ 25 gm/kg of seed for better seed germination. The recommended dose is 120-150 kg Nitrogen, 60-75 kg Phosphorus (P_2O_5), and 50-60 kg Potassium (K_2O) per hectare. Zinc sulphate (25 kg/ha) and sulphur (15 kg/ha) may also be applied. Use pre-emergence herbicide Pendimethalin (1.0 kg a.i./ha) and post-emergence herbicides like Bispyribac-sodium. Manual weeding can be done if necessary.

Rice field should have a depth of 5-7 cm water during the growing period, especially during tillering, flowering, and grain filling stages. to prevent grain shattering or bird damage. For the management of stem borer, apply Carbofuron granules (Furadan 3G) @ 33 kg/ ha in standing water after 10 days of transplanting. Soaking of 1 ha seed (20-30 kg seed) in 25 litre water solution with 25 g bavistin and 2.5 g Streptocycline is done for 24 hrs. Treated seed should be covered with wet gunny bags for 24-36 hrs for getting germination of seeds. For organic control insect pest, apply need based biopesticides, *Trichogramma*, yellow sticky traps etc. Biocontrol agents like coccinellids, spiders, damsel flies should be conserved. Management of Stem borer is observed @ 4-5% in paddy field, spray with Quinalphos @ 32 ml in 10 litres of water.

Maize

In the Kharif season, the ideal sowing time is from June 15 to July 15, depending on the onset of monsoon rains. Apply 120 kg Nitrogen (N), 60 kg Phosphorus (P_2O_5), and 40 kg Potassium (K_2O) per hectare. At the time of sowing, apply half the nitrogen and the full dose of phosphorus and potassium. Apply the remaining nitrogen in two equal splits: one at 30 days and the other at 50 days after sowing. In case of micronutrient deficiencies, apply 5 kg/ha of Zinc Sulphate ($ZnSO_4$) and 5 kg/ha of Ferrous Sulphate ($FeSO_4$) at sowing and again 30 days after sowing. The first weeding should be done 20 to 25 days after sowing, and the second weeding around 45 days after sowing. To control weeds chemically, apply Atrazine 50% WP @ 1 kg/ha as a pre-emergence herbicide within 2-3 days of sowing. It should be applied uniformly on moist soil using a knapsack sprayer.

COMMERCIAL CROPS

Sugarcane

Well-drained deep loam with good water holding; avoid saline/alkaline soils; requires warm humid climate. Deep ploughing (1-2 times) + 2 cross harrowing; remove stubbles & weeds; level field with proper drainage. Varities like CO-86032, CO-8014, CO-94012, VSI-434, CO-M-0265 (early maturing recommended). Use 9-10-month-old healthy canes; take top 2/3rd portion; avoid flowering canes. Recommended seed rate is 45,000-50,000 three-budded setts/ha (~6-8 tonnes/ha). Treat with 0.25% Bavistin or Carbendazim + 2.5% urea solution for 10-15 minutes before planting. Avoid the use of infested Sets/seedlings. Paired Row planting system provides easy access for plant protection application. Judicious use of nitrogenous fertilizers to prevent infestation of sucking pests like Wooly aphids, Pyrilla, Scale insect, whitefly, etc.

Plant Protection: Remove and destroy the lower 4-5 leafs of cane to prevent infestation of Pyrilla and Scale insect. Use pheromone traps for the monitoring of Early Shoot Borer, Internode Borer and Top Borer and fortnight release of *Trichogramma* parasitoid insect (Trichocard 1.50 eggs/ha) to check the all-stem borer infestation. Preventive management of White Grub should be done by installing light traps in the field (1 trap/acre), collection and destroying beetles from bund trees during evening time. To control the initial infestation of white grub, apply *Metarhizium anisopliae* 15 kg or *Heterorhabditis indica* 7 kg per hectare as a biological insecticide in the month of June and repeat the application one month after first when incidence level is high. If the above treatments found unable to control follow the application of a mixed insecticide of Fipronil 40% + Imidacloprid 40% e at the rate of 15 ml per 10 litres of water. Also, if there is a high incidence of this pest, spray with Chlortraniliprole 18.50 SC @ 3-4 ml per 10 L of water. If symptoms of Rust disease observed, spray crop with Mancozeb 0.3% (30 g in 10 L of water) or Tebuconazole 0.1% (30 g in 10 litres of water). Regular monitoring of woolly aphids should be done, if colonies are found, they should be removed and destroyed, and predatory insects like *Conobathra, Micromus, Depha aphidivora* etc. should be conserved. For the Management of Smut disease spray the crop with Carbendazim 50 WP @ 10 g in 10 litre water. For the management of

Pokkah boing Disease spray the crop with Mancozeb 75 WP @ 30 g or Carbendazim 50 WP @ 10 g in 10 litre of water. For the management of Rust and Leaf spot diseases spray the crop with Mancozeb 75 WP @ 30 g or Tebuconazole 25 EC @ 10 ml in 10 litre water.

PULSE CROPS

Pigeon pea

Select proper sowing windows based on maturity groups. Early varieties can be sown in First fortnight of June and Medium/Late varieties in Second fortnight of June. Ensure flowering avoids low sunlight/cloudy weather to prevent poor pod formation. Use well-drained black cotton soil (pH 7.0-8.5). Adopt deep ploughing or BBF/Ridge & Furrow systems to improve drainage and aeration. Raised bed planting and appropriate row spacing (e.g., 4-5 ft) for better management and intercropping potential. Use quality seeds with appropriate seeding rates: Early: 20-25 kg/ha. Medium/Late: 15-20 kg/ha. Treat seeds with Trichoderma viride, Thiram + Carbendazim, and Rhizobium + PSB for disease prevention and better nitrogen fixation. Fertilization: Apply 25-30 kg N, 40-50 kg P_2O_5, 30 kg K_2O/ha at sowing. Incorporate Sulphur, Zinc, and Iron if soils are deficient. Follow soil test-based recommendations for precision nutrition. Irrigation & Drainage: Though drought-tolerant, apply 3 key irrigations during branching, flowering, and podding stages. Use ridge planting in poorly drained soils to avoid waterlogging. For weed Management: Pendimethalin (0.75-1 kg a.i./ha) as pre-emergence to suppress early weeds. Conduct two mechanical weedings before flowering (20-25 DAS & 45-50 DAS). Cropping and Intercropping Systems: Utilize inter-row space with short-duration crops: mung, urd, cowpea, , and recommended intercropping arwe Pigeon pea-Urd-Wheat, Pigeon pea-Sugarcane, Pigeon pea (early)-Potato-Urd bean.

Pest & Disease Management: Use resistant varieties (e.g., Asha, BSMR-853, JKM-189). Follow integrated pest management (IPM): pheromone traps, Neem products, timely chemical sprays (Emamectin, Indoxacarb).

Soybean

Soybean should be sown by the row-to-row spacing is 45 cm, and plant-to-plant spacing is 7 to 10 cm. A seed rate of 65 to 75 kg per hectare is sufficient, depending on the seed size and germination percentage.

Soybean should be treated with Thiram @ 3g/kg or *Tricoderma* @ 4 g/kg of seed inoculum like *Rhizobium* and PSB @ 100ml/10kg of seed before sowing. For higher production use new released high yielding varieties like Phule Sangam (KDS 726), Phule Kimaya (KDS 753), Phule Durva (KDS 992. Apply NPK @ 50:75:40 Kg/ha at the time of sowing. Use Broad bed furrow planter (BBF) for sowing. It will be beneficial during less rainfall situation and excessive rainfall. For chemical weed control, Pendimethalin at 1.0 kg active ingredient per hectare can be applied as a pre-emergence herbicide immediately after sowing. Imazethapyr at 75 grams active ingredient per hectare can be applied as a post-emergence herbicide at 15-20 days after sowing to control broadleaf and grassy weeds.

FRUIT CROPS

Pomegranate

Fruit cover in Pomegranate

For new plantations dug the pits at recommended planting distance. Procure seedlings or grafts from licensed fruit crop nursery. Pit filling may be completed before arrival of monsoon rains. Alternatively raised beds of 3 feet width and 1 feet height may be prepared at 15 feet apart. After two three showers of heavy rains go for transplanting of plants. High yielding and market acceptable varieties like Bhagwa, Super Bhagwa, Solapur Red are recommended. Soil application of bio-pesticides like *Pseudomonas* and *Trichoderma* is suggested as preventive measure against *Pythium, Phytophthora* and *Fusarium*. Inter crops of seasonal vegetables and flowers may be followed. In existing orchards remove water suckers. Foliar spray of Potassium Nitrate @5 g per liter of water is recommended. Ensure proper drainage of water. Spray *Verticellium lecanii* @ 40 gm per 10 L water for the control of mealy bugs.

Management of fruit spot/ rot problem spray Carbendazim 12% + Mancozeb 63% WP @ 500 gm in 200 litres of water during second week of June. During first week of July spray Copper oxychloride 400 gm +Streptocycline 20 gm in 200 litres of water for the management of bacterial spot. Spray Spinosad 0.4 ml per L of water or lambda cyhalothrin 10WP 1.25g per L of water during first week of May for the management of pomegranate butterfly.

Custard Apple

For new plantations dug the pits at recommended planting distance. Procure seedlings or grafts from licensed fruit crop nursery. Pit filling may be completed before arrival of monsoon rains. After two three showers of heavy rains go for transplanting of plants. High yielding and market acceptable like varieties Balanagar, Dharur, Daulatabad Selection are recommended. In existing orchards ensure proper drainage of water. Soil application of bio-pesticides like Pseudomonas and *Trichoderma* is suggested as preventive measure against Pythium, Phytopthora and Fusarium.

Guava

For new plantations dug the pits at recommended planting distance. Procure seedlings or grafts from licensed fruit crop nursery. Pit filling may be completed before arrival of monsoon rains. Alternatively raised beds of 3 feet width and 1 feet height may be prepared at 15 feet apart. After two three showers of heavy rains go for transplanting of plants. High yielding varieties like L49, Sardar, and Allahabad Safeda are recommended. In Guava fruit skirting bags may be used to cover fruits against sucking pest and sunburn injury. Avoid harvesting guavas during heavy rainfall, as the fruit may be damaged or its quality may be reduced. Store harvested guavas in a cool, dry place to prevent spoilage. During the flowering /fruiting stage, install

pheromone traps @ 18 - 20 per ha to control the fruit fly damage. For management of dieback spray zinc sulphate 2.0 kg + lime l.0 kg in 100 L of water and keep fruit fly trap to control fruitfly or spray Spinosad 0.4 ml per liter of water or lambda cyhalothrin 10WP 1.25 g per L of water. For management of Mealybug spray profenophos 1 ml + acephate 1 g + 10 g or soap powder Nematodes bio-control using nematode egg parasitic fungus Paecilomyceslilacinus @25 grams along with farm yard manure @ 100 kg, neem cake @ 250 g. For management of Fruitfly: Collect and destroy fallen and infested fruits summer ploughing to expose pupa. Use methyl eugenol lure trap (25/ha) to monitor and kill adults of fruit flies. Prepare methyl eugenol and Malathion 50 EC mixture at 1:1 ratio (take 10 ml mixture/ trap). Insecticides: Malathion 50 EC 0.05%. Bait spray combining molasses or jaggery 10g/l and one of the insecticides, Malathion 50 EC 2 ml/l, dimethoate 30 EC 1ml/L, two rounds at fortnight interval before ripening of fruits.

Grapes

Maintain a well-aerated canopy to reduce humidity within the vineyard and improve air circulation. Monitor for any nutrient deficiencies, particularly potassium, and apply appropriate fertilizers as needed. Keep the orchard clean by removing weeds and debris to prevent fungal and bacterial diseases. Ensure proper drainage and prevent waterlogging. The vigorous varieties of grapes the tendrils and the twins may be pruned. Management of April pruning in grape orchard should be done as per availability of water. During rest period, provide only need based irrigation to protect the existing leaves from drying, and also contribute towards increasing the reserves of the vines through photosynthetic activity. Care should be taken to reduce/stop the water in case new growth is observed on the shoot.

KHANDESH/ NORTHERN MAHARASHTRA

This region of Maharashtra is comprised of Jalgaon, Dhule, Nandurbar, Nashik). Rainfall of the region is 600-900 mm and it has Medium to deep black soils. This region has state agricultural university viz., Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (M.S)

COMMERCIAL CROPS

Cotton

Use medium to deep black cotton soils with good drainage for optimal crop performance. Prepare land with 1-2 deep ploughings followed by harrowing; adopt ridge-furrow or broad bed-furrow method. Treat seeds with *Trichoderma viride* or Carbendazim for fungal diseases and imidacloprid for sucking pest protection. Sow *Bt* cotton hybrids like RCH-2 BG II or NCS-855 BG II from mid-June to early July, depending on monsoon onset. Maintain spacing of 120 × 60 cm for hybrids and 90 × 45 cm for varieties; use seed rate of 450-500 g/acre. Apply basal dose of NPK @ 50:25:25 kg/ha based on soil test; supplement with FYM @ 5-10 t/ha. Apply zinc sulphate @ 25 kg/ha in zinc-deficient soils. Ensure field has proper drainage to prevent waterlogging, especially during early growth stages. Provide protective irrigation during long dry spells, particularly during flowering and boll development. Apply Pendimethalin @ 1.0 kg a.i./ha as pre-emergence herbicide;

follow with hand weeding at 20-25 DAS. Monitor for sucking pests (jassids, aphids, whiteflies); control using imidacloprid 0.3 ml/l or thiamethoxam 0.25 g/l.

Further, install 5 pheromone traps per hectare to monitor bollworms. If needed spray emamectin benzoate or flubendiamide as per threshold levels. Manage leaf spots and blights with mancozeb or copper oxychloride sprays as needed. Apply top dressing of nitrogen at 30 and 60 DAS for vigorous growth. Use plant growth regulators like NAA to minimize flower and boll drop, if observed. Harvest mature, dry bolls; avoid harvesting during or immediately after rain to prevent boll rotting.

PULSE CROPS

Soybean

The crop must be sown before 1st week of July, after good rain, with a spacing of 45×5?cm; depth <4?cm. the seed must be treated with Carboxin + Thiram 30g/10kg + Thiamethoxam 100ml/10kg. Give a hoeing at 15-20 DAS. Apply water at branching (30-35 DAS) & flowering (40-45 DAS).

Pigeon pea

Recommended varieties for sowing include Phule Trupti, BDN-711, and Renuka, with planting done before the first week of July. Suggested spacing is 60×20 cm, 90×20 cm, or 180×30 cm, depending on field conditions. Treat seeds with Trichoderma (5 g/kg) or a combination of Carboxin and Thiram (4 g/kg), along with Rhizobium and PSB at 25 g/kg each. Apply fertilizers at a rate of 25:50 kg N:P per hectare. The seed rate varies-12-15 kg/ha for normal spacing and 5-6 kg/ha for wider spacing. Intercropping is recommended with bajra, soybean, sorghum, cotton, moong, or urad for better land utilization. Irrigate at 30-35 days after sowing (DAS), 60-70 DAS, and during the pod-filling stage. Perform one hoeing at 15-20 DAS followed by hand weeding for effective weed control.

Black gram

The recommended seed rate is 15-20 kg/ha with a spacing of 30×10 cm. Seeds should be treated with Trichoderma at 5 g/kg along with Rhizobium and PSB at 25 g/kg each. Apply fertilizers at a rate of 20:40 kg N:P per hectare. Intercropping with pigeon pea and other kharif crops is advised for better resource utilization. Irrigation should be provided at critical stages such as flowering and pod filling to ensure healthy growth and yield.

FRUIT & VEGETABLE CROPS

Pomegranate (Mrig Bahar)

Pomegranate cultivation during Mrig Bahar requires pruning to remove diseased branches, followed by an application of 1% Bordeaux mix. Pre-flowering fertilization includes 700 g urea, 1600 g SSP, and 400 g MOP per tree. Dusting with 4% copper dust or bleaching powder helps in disease prevention. Regular pest control with Azadirachtin or alternate insecticides every 15 days is crucial. At the fruiting stage, apply 500 g DAP + 100 g MOP per tree at the lemon size stage, and 200 g 19:19:19 + 100 g MOP at the guava size stage.

Grape

After pruning, grapevines are treated with Hydrogen Cyanamide (30-40 ml/L) on the top 2-3 buds to encourage growth. GA sprays of 10 ppm are applied 17-18 days after pruning, followed by 15 ppm after 4-5 days. Mealybug control in September involves removing bark and spraying Methomyl 40 SP at 1 g/L

Banana

Banana is planted on raised beds with a paired row system, ideally after 2-3 monsoon showers. Varieties like Grand 9 and Basarai are recommended. Green manuring and proper drainage are crucial during heavy rains. Preventive soil applications of Pseudomonas and Trichoderma help manage diseases. Practices like de-navelling during fruiting, irrigation at fruit development, and spraying Propiconazole for leaf spot management are recommended for healthy crop growth. During flowering/fruiting stage, carry out de-navelling (removal of male inflorescences for nutrient diversion) practices for better growth of banana fruits. Apply irrigation at fruit development stage. At the time of planting treat the sucker with Mancozeb (3g/l) and Monocrotophos @ 2ml/l, apply *Trichoderma viride* @ 5 kg) + FYM @ 100 kg for management of soil borne diseases. For management of Sigatoka leaf spot disease in banana orchard, spraying of 0.5 ml Propiconazole 25 EC + Mineral oil 1% per litre of water.

Onion (Kharif)

For effective nursery preparation, raise beds enriched with FYM, copper oxychloride, and a balanced mixed fertilizer. Prior to sowing, treat seeds with Thiram or Carbendazim at 2-3g/kg to prevent fungal infections. Apply Basalin at 25ml per 10 L of water as a pre-emergence herbicide for effective weed control. At planting, use a fertilizer dose of 100:50:50 NPK, with 50:50:50 applied at sowing and the remaining 50?N at 45 days after transplanting (DAT). To manage fungal diseases, integrate Trichoderma along with regular fungicide sprays every 10-15 days. For thrips control, install sticky traps and use Profenofos, Fipronil, or Spinosad as required based on pest observation.

KONKAN REGION

Konkan Region of Maharashtra is comprised of Mumbai, Mumbai Suburban, Thane, Palghar, Raigad, Ratnagiri, Sindhudurg). The region has high rainfall (3000-4000mm) and has Lateritic, acidic, high organic matter. This region possesses a state agricultural university viz., Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli.

CEREAL CROPS

Rice

Rice nursery sowing should begin with the onset of monsoon showers, typically in the first to the second week of June. It is crucial to select suitable varieties like Ratnagiri-1, Karjat-3, Karjat-4, and Sahyadri based on local climatic conditions and market demand. For one hectare of the main field, approximately 60-75 kg of seed is required, and a nursery area of around 1000 m^2 should be prepared. Soak rice seeds in water for 24 hours, followed by incubation for 24-36 hours. Treat the seeds with fungicides like Carbendazim (2g/kg seed) or biocontrol agents such as *Trichoderma*

to prevent seed-borne diseases. In regions with heavy rainfall, wet bed nurseries are recommended, especially on low-lying lateritic or clay loam soils. Where drainage is poor, raised beds should be prepared. Select well-drained and fertile fields near water sources, avoiding waterlogged or saline areas. Apply 2 kg of urea and 1 kg of SSP per 100 m^2 of nursery, and incorporate well-decomposed FYM or compost (5-10 t/ha) during bed preparation.

Pre-germinated seeds should be uniformly broadcasted on nursery beds with light pressing to ensure proper soil contact. Maintain a shallow water level of 2-3 cm during the early growth stage, avoiding stagnation to prevent diseases. Weed pressure is generally low, but light raking or manual weeding should be done 10-12 days after sowing if required. To manage weeds effectively, spray Butachlor 50 EC @30 ml/litre water 2-3 days after sowing. Transplant 21-day-old seedlings with a spacing of 20×15 cm for normal varieties and 15×15 cm for short-duration varieties. At transplanting, apply 10 t/ha of Gliricidia leaves or 8 t + 50 kg of nitrogen for better puddling and root establishment. Give the second nitrogen dose (1 kg urea/guntha) 15 days after transplanting to boost growth. Replant damaged or gap areas promptly with healthy seedlings to maintain uniformity

Fertilization and Pest/Disease Control: Apply 3 kg of compost per m^2 of nursery bed before sowing. For mechanized farming, mat nurseries on plastic sheets or trays are recommended, with fertilizers applied at 2.2 kg urea, 3 kg SSP, and 0.8 kg MOP per guntha. For effective pest control, monitor the nursery for stem borers and use Quinolphos (150 ml/guntha) or Carbofuran (165 g/guntha) as needed. Crab control can be managed using toxic bait prepared with Acephate or Carbaryl mixed with cooked rice. Monitor for diseases like blast, brown spot, and root rot, and apply fungicides and insecticides as per local recommendations.

MILLET CROPS

Finger Millet (Nagli) & Proso Millet (Vari)

For effective nursery preparation, sow the rice seeds in rows on 10 guntha nursery beds using a seed rate of 6 kg per hectare. Fifteen days after sowing, apply Quinolphos at 15 kg/ha or Carbofuran at 16.5 kg/ha to manage early pest infestations. To prevent blast disease, spray Zineb at 2 kg or Copper Oxychloride at 1.25 kg mixed in 500 liters of water per hectare. Transplant healthy 4-5-week-old seedlings at a spacing of 15×20 cm, and ensure proper nutrient application with a recommended dose of 40:40 N:P_2O_5 kg/ha to promote vigorous growth and better yield.

OILSEED CROPS

Groundnut

Incorporate 5-7.5 t/ha of well-decomposed FYM during the final tillage to enhance soil fertility. At the time of sowing, apply 25 kg of Nitrogen and 50 kg of Phosphorus per ha using boronated SSP for better root development. Use 100-110 kg of seed per hectare from recommended varieties like Konkan Bhuratna and TAG-24. For effective disease control, treat seeds with Thiram at 5 g/kg along with Rhizobium culture at 25 g/kg before sowing. Follow a sowing pattern of 30 cm paired rows with

15 cm spacing between plants for optimal growth. Ensure proper weed management during the first 30-45 days to avoid competition and promote healthy crop establishment

FRUIT & VEGETABLE CROPS

Mango (New Planting)

For successful mango plantation, select well-drained sites and use raised beds if necessary. Prepare planting pits by filling them with a mixture of topsoil, compost, and 2 kg of SSP. Ensure the graft joint remains above the soil surface, and provide proper staking. Maintain orchard hygiene and consider 10-20% inter-varietal grafting for better cross-pollination. Before planting, dust pits with 100 g of Folidol 2% or Carbaryl 10% to prevent pests.

Use of Skirting bag in Mango

Cashew

Plant grafts from improved, disease-resistant varieties in pits enriched with compost and 1 kg of bone meal or SSP. When using polybag grafts, remove the bags carefully to avoid damaging the roots. After planting, remove any pegs or bands that might restrict plant growth for optimal development.

Coconut & Betel Nut

Maintain cleanliness in coconut and betel nut gardens by composting dry leaves and sticks. To control mildew in betel nut plants, apply a 1% Bordeaux mixture as a preventive spray.

For better yield, use improved seeds for gourds like padwal and dudhi, and train the vines on trellises for proper growth. For okra, select virus-resistant varieties such as Arka Anamika and ensure planting in well-drained soils. Brinjal and chilli should also be cultivated in well-drained areas with the application of 50 kg of nitrogen and 75 kg of phosphorus per hectare for optimal growth.

Pepper

For pepper cultivation, spray a 1% Bordeaux mixture on old vines to control fungal infections. Ensure proper drainage and provide adequate support for the climbing vines to promote healthy growth and prevent damage.

In animal husbandry, protect animals from stray dogs and rabies. Use rubber mats to improve cow comfort and enhance milk yield. Raise calves from high-milk-yielding cows and ensure the maintenance of genetically superior bulls. Rotate bulls every 3-4 years between villages to maintain genetic diversity.

For fisheries, in freshwater ponds, clean and remove debris after harvesting before restocking. In brackish water ponds, dry and apply lime post-harvest to prepare for the next shrimp culture cycle.

CEREAL CROPS

Paddy

Select high-yielding, disease- and insect-resistant rice varieties like RC Maniphou-13, RC Maniphou-14, RC Maniphou-15, and RC Maniphou-16. Treat seeds with Trichoderma or Pseudomonas (5-10 g/ha) to control seed or soil-borne diseases. Soak seeds in a recommended fungicide solution to prevent seed-borne diseases. The optimum age of seedlings for transplanting is 18-22 days for short-duration varieties, 25-30 days for medium, and 35-40 days for long-duration varieties. Transplanting should be done when seedlings are free from weed seedlings. Puddle fields with 5-10 cm of standing water after ploughing to break up clods and churn the

IPM in rice for management of leaf folder pest

soil. Clean the fields by destroying leftover nursery and removing weeds. Maintain bunds and level the fields to prevent water wastage and improve crop growth. Release T*richogramma japonicum* and *T. chilonis* at 1 lakh/ha upon appearance of yellow stem borer and leaf folder egg masses/moths. Conserve natural biocontrol agents like spiders, dragon flies, and parasitoid wasps. Install light and pheromone traps to monitor pest populations. Regularly collect and destroy pest-infested plant parts. For gall midge, apply Fipronil 5% SC (2 ml/L) in the nursery. For stem borer, apply Quinalphos 25 EC or Profenophos 50 EC (1000 ml/ha). For leaf folder, use Fenitrothion 50 EC (1000 ml/ha) or Quinalphos 25 EC (1000 ml/ha) based on economic thresholds. Apply Phorate 10G or Carbofuran 3G (1.5 kg a.i/ha) for gall midge control within 10 days of sowing. Ensure that fields remain weed-free up to 50 days after sowing to minimize competition for nutrients and water. Follow integrated pest management practices for effective weed and pest control.

Maize

Varietal demonstration in maize

Use high-yielding composite maize varieties like Vijaya Composite, RCM-75, RCM-76, and RC Manichujak-1, and hybrids such as All Rounder, Vivek QPM, HQPM-1, and HQPM-5 for better grain yield. Maintain a spacing of 75 cm x 18 cm. To manage stem borer and other pests, remove dead hearts and manually destroy white grubs and chaffer beetles during their adult emergence. Apply Trichocards @ 7-10 cards/ha or release *Trichogramma chilonis* @ 1,60,000/ha at 7 and 15 days after sowing; repeat if needed. Conserve natural enemies like *Trichogramma chilonis, Cotesia flavipes, Chrysoperla,* spiders, and wasps by minimizing chemical pesticide use. When pest pressure is high, apply recommended insecticides such as Quinalphos 25 EC @ 1000 ml/ha, Phosphamidon 40 SL @ 600 ml/ha, or Profenophos 50 EC @ 1000 ml/ha.

Millets

Grow millets like Jowar, Ragi, Bajra, and Sorghum as Kharif crops between June and November, especially as catch crops in areas affected by erratic weather. Use recommended high yielding ragi verities such as VL Madua 376, 379, and 380; sow seeds at 3-4 cm depth using 6-8 kg/ha for line sowing, or transplant 3-4-week-old seedlings at 25 cm x 8 cm spacing using 4 kg seed for 1 ha. Begin ploughing at monsoon onset to achieve fine tilth for good germination and moisture retention. For line sowing, use 6-8 kg seed/ha at a depth of 3-4 cm; for transplanting, use 4 kg seed in nursery (May-July) to cover 1 ha. Maintain 20-25 cm row-to-row and 8-10 cm plant-to-plant spacing in direct sowing. For transplanted crops, place 3-4-week-old seedlings (2 per hill) at 25 cm × 8 cm spacing, 2-3 cm deep. Treat seeds with Thiram, Carbendazim, or Mancozeb @ 2-3 g/kg to control seed-borne diseases. For specific disease prevention: use Carbendazim for Grain Smut and Ridomil MZ for Green Ear. Apply FYM @ 5-10 t/ha one month before sowing. Follow up with a fertilizer dose of

60 kg N, 30 kg P_2O_5, and 30 kg K_2O per hectare for optimal crop nutrition. Millets can be intercropped with soybean. Conduct three hoeings with a hand hoe during early growth stages for effective weed suppression. Spray Mancozeb (0.2%) at early crop stages if Blast, Brown Spot, or Rust symptoms appear. Rogue out diseased plants to manage spread and for armyworms, cutworms, and leaf-scraping beetles, apply Thiamethoxam @ 5 g/15 litres of water for effective protection.

PULSE CROPS

Blackgram

Varietal demonstration in blackgram

Conduct deep summer ploughing to expose and destroy the eggs, larvae, and pupae of major pests like pod borer, caterpillars, and weevils. Mix FYM/compost into the soil 10-15 days before sowing. Ensure the field is free from weeds for optimal crop growth. Use high-yielding varieties like PU 31 and LBG-20 (Teja). PU 31 is tolerant to Yellow Mosaic Virus (YMV) and well-suited for Kharif cultivation, while LBG-20 performs well in all seasons. Use a seed rate of 10-15 kg/ha (or 2.5-3.75 kg/sangam). Sowing can be done by broadcasting or dibbling at a spacing of 15 cm × 30 cm. If required, apply lime in the furrows at sowing, preferably every alternate year, based on soil test recommendations to manage soil acidity. Treat seeds with Carbendazim @ 2g/kg of seed before sowing to protect against seed-borne diseases and promote healthy germination. Apply 50 kg potash/ha to the crop raised with closer spacing (20X10cm) to reduce stem fly and pod borer incidence Treat the seeds with Carbendazim 50WP or Thiram@ 2g/kg of seeds or with Trichodermaviride@4g/kg of seeds before sowing. Install yellow sticky traps @ 10 traps/ha in the field to manage aphids. Spray Dimethoate 30EC @1ml/litre of water or Imidacloprid 17.8SL @ 0.5ml/litre of water for managing sucking pests.

OILSEED CROPS

Groundnut

Perform one ploughing with a soil-turning plough followed by two harrowings to achieve fine tilth up to 12-18 cm. Sow from 1st week of May to 1st week of June for optimal growth. Use ICGS 76 (semi-spreading, matures in 120-125 days) and JL 27 varieties. Treat groundnut seeds with Dithane M-45 or Thiram @ 3 g/kg to protect from seed and soil-borne diseases. For both soybean and groundnut, seed treatment is crucial under dry conditions. Keep the groundnut field weed-free for up to 50 days after sowing, as weed pressure is high due to monsoon rains. Timely inter-cultivation and weeding are essential for higher yields. Perform earthing up at 30-35 days after sowing in groundnut to promote pegging and pod development. Promote groundnut and soybean in foothill areas with limited irrigation, where rice cannot be grown, as climate-resilient and economically viable alternatives.

VEGETABLES N CROPS

Vegetables such as cucurbits (bottle gourd, bitter gourd, cucumber, ash gourd), tomato, beans, ginger, turmeric, palak, brinjal, chilli, okra, and others are well-suited for the kharif season and can be cultivated effectively. For tomatoes, select varieties like Arka Rakshak, Arka Samrat, and Arka Abhay, with spacing of 60 cm x 60 cm. Apply FYM at 15 t/ha and NPK at 120:80:80 kg/ha, with 400g of seeds for one hectare. For brinjal, use varieties like Pusa Purple Long and Arka Nidhi. Plant at a spacing of 60 cm x 45 cm and apply FYM at 15 t/ha and NPK at 120:80:60 kg/ha, using 800g of seeds for one hectare. Okra varieties such as Arka Anamika and Arka Nikita can be planted in May-June at 60 cm x 45 cm spacing, with FYM at 15 t/ha and NPK at 120:80:60 kg/ha. Ten kg of seeds will suffice for one hectare. For chilli, varieties like Arka Khyati and Arka Meghana should be planted in May-June at 60 cm x 45 cm spacing, applying FYM at 15 t/ha and NPK at 100:50:50 kg/ha, with 500g of seeds for one hectare.

Varietal demonstration in cabbage

King Chilli

For transplanting King Chilli, prepare the field well and apply well-rotted FYM or vermicompost in pits one week before transplanting. Space seedlings 1m apart both within and between rows, and use silver colour polymulch (25-30 Micron) for optimal growth.

FRUIT CROPS

Fruit crops like pineapple, banana, papaya, dragon fruit, citrus, and mango can be planted from May to July in pits, with mango and banana requiring pit sizes of 60 x 60 x 60 cm, citrus needing 75 x 75 x 75 cm, papaya requiring 45 x 45 x 45 cm, and pineapple being planted in trenches or raised beds instead of pits. Pit preparation should be done 15-20 days before planting. After digging, leave the pits open for a few weeks to expose the soil to sunlight. Fill the pits with a 1:1 mix of soil and compost. Regular hand weeding or the use of mulch (e.g., straw or black polythene) is recommended for pineapple. For bananas, bamboo stakes may be used to prevent lodging from strong winds and rain. For cucurbit crops, trellising with bamboo or nylon support helps reduce disease and improves fruit quality.

Kachai Lemon & Tamenglong Orange

In May, treat tree trunks with a 1% Carbaryl solution (20g/l) and shake branches to collect and destroy trunk borer adults. In June-July, apply Bavistin (1g/l) and

INM in Kachai Lemon

Imidacloprid on new flushes, followed by Copper Oxychloride (3g/l) after 15 days. Fertilize with a mixture of 650g Urea, 1220g SSP, and 450g MOP per tree. Apply a mixture of micronutrients (Zinc sulphate, Magnesium sulphate, Copper sulphate, and Manganese sulphate) at 0.25% on new flushes. In August-September, apply Bordeaux paste up to 60 cm on the trunk and repeat the spray schedule from June-July. For trunk borer grubs, clean the bored holes with iron wire, insert a petrol-soaked cotton swab, and seal with mud.

Banana Cultivation

Propagate with 4-month-old sword suckers for planting, with recommended characteristics such as weight between 1-2 kg and height between 80-120 cm. Prepare pits of 30 cm x 30 cm x 30 cm for planting, maintaining spacing from 2m x 2m to 3m x 3m based on soil fertility and management practices. At planting, apply 8-10 kg of FYM per plant and a fertilizer mixture of 180g N, 100g P_2O_5 and 250g K_2O per plant annually. Half the potassium and all the phosphorus should be applied during planting, with nitrogen applied in three splits over the following months. Remove daughter suckers until the mother plant flowers, and ensure proper propping with bamboo poles after flowering.

LIVESTOCK

Ensure optimal health and hygiene in livestock and poultry by adopting best practices in animal husbandry, including proper feeding, clean and dry housing, adequate ventilation, and access to clean water. Monitor livestock and poultry regularly, at least twice daily, for any signs of abnormal behaviour, posture, feed intake, rumination, or irregular urination and defecation. Implement strict biosecurity measures by limiting visitor access and preventing the introduction and spread of diseases on the farm. Dispose of carcasses responsibly using methods such as burning, deep burial, or designated disposal pits, in compliance with health regulations. Deworm animals and poultry routinely for both internal and external parasites, in consultation with a veterinarian, the State Animal Husbandry Department, or the Krishi Vigyan Kendra (KVK). Follow a comprehensive vaccination program for poultry (Ranikhet disease, IBD, Fowl Pox, and Marek's disease), pigs (Swine Fever), and cattle/buffaloes (FMD, Black Quarter, and Haemorrhagic Septicaemia).

FISHERIES

To ensure effective and healthy fish farming practices, proper pond preparation and management are crucial. Begin by applying lime (quick lime) at 200-300 kg/ha/year

Stocking fingerling

Breeding

Water Quality Management

to disinfect the pond and stabilize the pH, with half the dose applied initially and the remainder in monthly installments. Fill the pond with freshwater to a depth of 1-1.5 m and fertilize using a combination of organic manure (e.g., Raw Cow Dung and Poultry Manure) and inorganic fertilizers (urea and Single Super Phosphate). For breeding, start with common carp in February until April, and Indian Major Carp (IMC) from April to June. In nursery management, eradicate weeds and pests, check water quality, and ensure adequate natural food by applying lime and fertilizers. Stock 30-50 lac fry per hectare and follow a structured feeding schedule to maximize survival and growth, gradually increasing feed intake from 400% to 800% of initial body weight over the first 15 days, with harvesting on day 17. When stocking fingerlings, ensure the proper species ratio in composite fish culture, with carp fingerlings at a density of 8,000-10,000 per hectare. Regular feeding should be based on total fish biomass, with a daily feed mixture of rice bran and oil cake or sinking/floating pellet feed. Monitor water quality, maintain ideal pond conditions with frequent manuring, and always observe for signs of disease, keeping a detailed pond diary for all activities and inputs. Staying vigilant for abnormalities in fish behavior and taking prompt action is essential for maintaining healthy fish stocks.

CEREAL CROPS

Paddy

Varietal demonstration in paddy

Farmers are advised to prepare a nursery area of about 500-1000 sq. meters for raising seedlings of recommended kharif paddy varieties such as Megha SA-2, Lungnilaphou, CAU-R1, CR Dhan-310, and CR Dhan-311 to cover one hectare area. Use 40 kg of high-yielding variety (HYV) seeds per hectare. Incorporate FYM and vermicompost into the nursery beds to improve soil health and seedling vigor. For disease prevention, treat seeds with *Trichoderma harzianum* @ 5 g/kg of seeds and drench the nursery with *Trichoderma harzianum* @ 5 g/L of water prior to sowing. Additionally, mix *Trichoderma harzianum* @ 2.5 kg with 50 kg of FYM and apply it to the nursery soil 10-15 days before sowing. Prepare the main field with 2-3 ploughings using a power tiller, and mix FYM @ 5 t/ha during the last ploughing. Transplant 20-25 day-old seedlings at a spacing of 20 cm x 15 cm for optimal plant population. For pest management, apply neem oil spray @ 3 ml/L of water at 10 days after transplanting (DAT). Release *Trichogramma japonicum* @ 50,000 eggs/ha at 35 DAT to control stem borers biologically. At the boot leaf stage, spray *Beauveria bassiana* @ 7 g/L of water to manage leaf folder and other pests. For direct seeding, use 80-100 kg of seeds/ha, while for transplanting, use 35-40 kg of seeds/ha. Apply FYM @ 10-20 t/ha and follow a fertilizer schedule of N:P:K @ 60:60:40 kg/ha.

Maize

Farmers are advised to complete sowing of maize by the last week of May, using high-yielding varieties such as Megha Maize 1, Megha Maize 2, and RCM 1-3. Maintain a

spacing of 60 cm x 30 cm. Intercropping with Dwarf French bean (var. Pant Anupam) or soybean is recommended for better resource utilization and additional income. Treat maize seeds before sowing with *Trichoderma harzianum* @ 5 g/kg seed or *Azospirillum/ Phosphobacteria* @ 20 g/kg seed to improve germination and disease resistance. Carry out manual weeding and earthing up in early-sown maize to prevent lodging due to heavy winds. If any Fall Army Worm (FAW) infestation is observed, apply dry soil in the whorl of infected plants or spray neem oil (1500 ppm) as a first-line defense. For biological control, release *Trichogramma pretiosum* @ 50,000 eggs/ha and spray *Metarhizium anisopliae* @ 5 g/l of water into the leaf whorls 15-25 days after planting for effective FAW management.

MILLETS

Finger millet is a major dual-purpose crop grown during the kharif season for both grain and fodder. It is highly drought-tolerant and is usually sown with the onset of the monsoon. Farmers are advised to select suitable drought-tolerant varieties such as VL 376 (105 days), VL 379 (early maturity in 100 days), and VL 380 (mid-late maturity in 120 days). Transplanting of seedlings should be done 21 to 30 days after sowing in the nursery. Delayed transplanting beyond this period may significantly reduce tillering, resulting in lower yields. To ensure an optimum plant population, use 4-5 kg of seeds per hectare.

VEGETABLE CROPS

In-situ moisture conservation in cabbage

Farmers are advised to prepare the vegetable nursery for crops such as cucumber, bitter gourd, ridge gourd, bottle gourd, chilli, brinjal, and okra on raised bamboo structures, covering them with polythene to protect seedlings from heavy rain and hailstorms. Planting should be done in ridges and furrows with proper drainage channels to prevent waterlogging. It is essential to add farmyard manure (FYM) or vermi-compost in the nursery for healthy seedling growth. To conserve soil moisture, prevent soil erosion, and control weeds, mulching with locally available materials like paddy straw is recommended. Farmers can also make their own compost using the 18-day compost method, pit method, or by producing vermicompost to meet their manure requirements. For pest management, it is advised to make biopesticides using locally available materials such as leaves, garlic, and tobacco. For crops under protected cultivation, including high-value crops, frequent irrigation should be provided at 10-15 day intervals, based on the weather conditions.

SPICE CROPS

Ginger and Turmeric

Farmers are advised to complete the sowing of ginger (variety Nadia) and turmeric (varieties Megha Turmeric 1 or Lakadong) without delay. Use a seed rate of 15-20

quintals per hectare and maintain a spacing of 30 cm × 30 cm. Before sowing, treat rhizome seeds by dipping them in a solution of *Trichoderma viride* @ 4 g/litre of water for 5 minutes or *Trichoderma harzianum* @ 10 ml/litre to prevent rhizome rot. For already sown crops, carry out proper weeding and earthing up to promote healthy growth. Ensure planting in ridges and furrows with good drainage. Farmers may also opt for intercropping with crops like soybean, rice bean, French bean, finger millet, or maize for better resource use and income diversification. To conserve soil moisture and control weeds, mulch the beds using dry paddy straw or green leaves. For effective disease management, especially soft rot, spray *Trichoderma viride* or *Trichoderma harzianum* @ 10 ml/litre or neem oil (10,000 ppm) @ 2 ml/litre as a preventive measure.

LIVESTOCK

Piggery

Farmers are recommended to select pig breeds like Lumsniang or Hempshire cross; supplement mineral mixture (50-60g/day) and calcium for lactating/pregnant sows; use local feed alternatives like banana pseudo stem, colocasia, and sweet potatoes. Ensure adequate clean drinking water and proper feed. Deworm pigs with Albendazole/Febendazole (7.5mg/kg body weight every 3 months); vaccinate against Swine Fever; regularly provide 20g of mineral mixture per pig with feed; and isolate sick pigs in a quarantine shed until fully recovered. Maintain dry, clean pig sheds with proper roofing and walls; avoid waterlogging; disinfect farm entrances and exits with 1% formaldehyde or 2% NaOH; and ensure footwear and equipment are disinfected. Quarantine newly purchased pigs for 4 weeks before introduction. Implement strict measures for African Swine Fever (ASF) by quarantining infected farms, prohibiting the movement of animals and personnel between farms, and ensuring the proper disposal of carcasses (deep burial with lime/bleaching powder). Avoid swill feeding unless properly boiled; maintain proper records of animal health and visitors; and prohibit animal movement between farms to reduce disease risk. Report suspected ASF cases to veterinary authorities immediately.

Poultry

Vaccination in poultry

Farmers should maintain clean, ventilated poultry sheds with proper space (1½ sqft/bird); avoid overcrowding and heat stress in birds. Regularly change litter materials to prevent coccidiosis and maintain hygiene. Provide clean drinking water 3-4 times a day, occasionally adding electrolytes. Ensure the water is free from contamination and provide proper feed to maintain bird health. Backyard poultry breeds like Vanaraja, Shrinidhi, and Kuroiler can be reared in low-cost housing systems. Ensure the houses are clean, dry, and properly ventilated to prevent infections and diseases. Administer anticoccidial drugs in drinking water for 3-5 days

if red diarrhoea symptoms are observed. Clean the poultry house regularly with phenol (1 ml/l of water) to prevent infections. Vaccinate birds against diseases like Ranikhet, Marek's, Gumboro, and Fowl pox as per the vaccination schedule. Report any unusual deaths or illness to the nearest veterinary center immediately. Avoid waterlogging near poultry houses to prevent flies and mosquitoes, ensuring a clean and dry environment. Turn litter materials weekly to maintain hygiene and reduce disease risks.

Fishery

Farmers are advised to carry out de-silting of ponds to facilitate further fish farming, followed by the application of lime and repairs to ponds, dykes, and inlet-outlet systems. Pre-stocking management for composite fish culture includes clearing aquatic weeds and regularly netting out predatory and weed fish to maintain a healthy ecosystem. Any surplus common carp brood fish should be disposed of accordingly. It is also the breeding season for exotic carps and Indian major carps, so breeders should begin production of fish fingerlings. Farmers are advised to avoid exceeding a stocking density of 10,000 fingerlings per hectare. Fish stocking should follow a ratio of 3:4:3 (surface feeder: marginal feeder: bottom feeder) for optimal growth. Additionally, fish growers can prepare fish feed at home by mixing mustard cake, rice polish, and cooked rice. For paddy-cum-fish farming, land preparation should begin to ensure proper conditions for both crops.

MUSHROOM

Growing oyster mushrooms (*Pleurotus spp.*), especially *Pleurotus djamor* (pink oyster mushroom), indoors using paddy straw can provide additional income for farmers and improve the nutritional status of their diet.

SELF-HELP GROUP/FPOs

Women members in SHGs should establish Nutrition Gardens in each household to provide fresh vegetables rich in vitamins and minerals, enhancing immunity. Vegetables such as brinjal, capsicum, chili, and cucurbitaceous vegetables can be grown in the kitchen garden. Additionally, SHG members can make masks, hand gloves, and cotton clothes for their family members and the neighbouring community, ensuring safety while generating additional income. FPOs should begin their business by producing high-quality seeds and planting materials through organic cultivation of ginger, turmeric, and pineapple, along with value addition.

CEREAL CROPS

Maize

Drainage Management: Farmers are advised to create drainage channels around fields, especially in low-lying areas, to prevent waterlogging.

Varietal Selection: Suitable composite varieties include RCM-75, RCM-1-1, RCM 1-76, RCM 1-3, and Vivek Sankul. Recommended hybrid varieties are Vivek QPM-9 and HQPM-1. Local varieties such as Mimban and Mimpui are also good choices. However, tall varieties like MZM 11, Ganga Hybrid, and local Popcorn should be avoided in areas prone to heavy rainfall and strong winds, as they are more susceptible to lodging and crop damage.

Land Preparation and Sowing: Prepare the field with at least 3 deep ploughings before sowing. Sow maize seeds at the rate of 20-22 kg/ha, maintaining a spacing of 60 cm × 20 cm.

Pest Management (Fall Armyworm)**:** Install pheromone traps at the rate of 12 traps/ha during the 3rd to 4th week of May. For control, spray Emamectin Benzoate @ 0.4 ml/l, Spinosad @ 3 ml/l, or use other chemical options such as Spinetoram @ 0.5 ml/l, Lambda-Cyhalothrin + Thiamethoxam @ 0.25 ml/l, or Chlorantraniliprole 18.5% SC @ 0.4 ml/. Alternatively, apply ash or spray soap water into the whorls of affected plants. Avoid chemical sprays once tasselling begins.

Management of Fall Armyworm – FAW in Maize

Harvest physiologically mature cobs (intended for seed) as early as possible to avoid damage from predicted moderate to heavy rainfall.

Upland paddy

Upland rice cultivation

For rainfed upland paddy cultivation, farmers should begin by treating seeds with Carbendazim (2-3g/kg seed) to prevent fungal diseases and ensure healthy germination. The dibbling method is strongly recommended over broadcasting to optimize seed usage and improve germination rates. Farmers should select from improved drought-tolerant varieties such as Fazu-MZ UPR 4, Maibasa-MZ UPR 25, Bhadepui-MZ UPR 23, Biroin-MZ UPR 24, Sazukthau-MZ UPR 6, Lalron-MZ 28, Idaw-MZ UPR 11, Buhban-MZ UPR 2, and MZ UPR 33, which are specially developed for Mizoram's upland conditions. Implement critical weed management with first weeding by mid-May followed by a second weeding between the first week of June to second week of July. For soil conservation in jhum fields with slopes exceeding 30%, construct log wood or bamboo bunds across slopes and dig recharge pits (1×1×1 ft) to prevent severe soil erosion and retain topsoil.

Lowland Paddy

Nursery Preparation(2nd Week of June): Prepare raised nursery beds with finely tilled soil and apply 2 t/ha of Farm Yard Manure (FYM) along with 2 kg of *Azospirillum* per 1000 square meters. Two to three days before sowing, incorporate 10 quintals of well-decomposed FYM per 1000 square meters into the nursery beds. Use a seed rate of 3.5-4 kg per 100 square meters of nursery area to raise sufficient seedlings for transplanting in one hectare. For improved germination, treat the seeds with Zinc sulphate priming before sowing. After sowing, cover the seedbed lightly with a thin layer of soil or compost to ensure proper seed establishment.

Land Preparation (From 1st week of June): Begin puddling with the onset of monsoon and ensure proper levelling for uniform water distribution and to prevent water stagnation.

Transplanting (1st-3rd Week of July, Based on Variety): Uproot 25-30-day-old healthy seedlings for transplanting to ensure vigorous growth. For optimal plant density, follow these spacing recommendations: under the normal method, maintain 20 cm × 15 cm spacing with 2-3 seedlings per hill; for Integrated Crop Management (ICM), use 20 cm × 20 cm spacing; and for the System of Rice Intensification (SRI), adopt a wider 25 cm × 25 cm spacing to promote higher yields in smaller areas. Adjust seed rates accordingly-35-40 kg/ha for ICM and just 3-5 kg/ha for SRI-to maximize efficiency and productivity while conserving seeds. Root dip treatment with SSP/ Rock phosphate + Microbial consortium should be done overnight with uprooted rice seedlings prior to transplanting of rice to address phosphorus deficiency in acidic soils Recommended high yielding verities for irrigated lowland such as CAU R-1, CAU R-3,

local short duration var. Idaw, tai, Buhsakei are recommended for upland/Jhum cultivation with rich alluvial soil

Pest & Disease Management: To effectively control Gundhi bugs, deploy 100 rotten crab funnel traps per hectare during the critical milking stage of the crop. For organic pest management, utilize neem-based biopesticides, release Trichogramma egg parasitoids, and install yellow sticky traps to monitor and reduce pest populations. Additionally, conserve natural predators such as spiders, dragonflies, and ladybugs by minimizing chemical pesticide use and maintaining ecological balance in the field. Adopt SRI method in small areas for enhanced yields, conduct regular field monitoring for pests and nutrient deficiencies and maintain proper water management and spacing as per cultivation method.

OILSEED CROPS

Soyabean

Varietal Selection: RCS1-1, RCS1-9, RCS1-10, JS335, MAUS 71 is suitable option for Kharif cultivation in Mizoram.

Irrigation: Despite it is a rainfed crop in kharif, Supplemental irrigation is required depending on rainfall patterns. Flowering and pod filling stages are the critical stages of irrigation.

Relay cropping: Soybean can be grown as a relay crop with maize, planting between the rows of the maize crop is recommended.

Integrated nutrient management: Soybean being a leguminous crop does not require high dose of nitrogen, however 20 kg/ha is sufficient for healthy crop stand. A dose of 60 kg P_2O_5 (SSP) and 30kg K_2O (MOP) are recommended. FYM @ 5t/ha should also supplement the chemical fertilizers.

Integrated disease management: Seed treatment with Thiram at the rate of 4.5g per kg of seed will control fungal diseases like Leaf Blight, Leaf Spot, Seedling Rot, Frog eye spot and Rust.

Integrated pest management: Spray application of Nuvacron 1.25ml/L or Dimethoate (0.04%) can be used for effective control of leaf folder, stem fly and semilooper like pests. Seed treatment with Imidachloprid @7g/kg of seed reduces the problem of Leaf folder

Groundnut

For optimal groundnut production, farmers should complete sowing between 15th May and first week of June, using high-yielding varieties like ICGS 76, ICGV 86590, Girnar 4, TS 67 Before sowing, treat seeds with Bavistin (5g/kg seed) for disease prevention and apply Rhizobium + PSB culture for better plant growth. Prepare fields by incorporating lime to address soil acidity and use Butachlor (10ml/litre water) as a pre-emergence weedicide. Apply balanced fertilization at 20:60:40 kg NPK/ha, split into basal and top-dressing applications. To protect crops, spray Dichlorvos (2ml/L) against Blister beetles during flowering and implement monthly preventive sprays of Dichlorvos (2ml/litre) + Bavistin (2g/L) from 30 days after sowing. Ensure light

irrigation during flowering and pod formation if rainfall is inadequate, and perform manual weeding (20-25 DAS) and earthing up (35-40 DAS) for better yield.

VEGETABLE CROPS

Tomato

Farmers are recommended to grow indeterminate varieties Solan Lalima , Arka Rakshak and Arka Samrat. Prepare nursery beds by the first week of May by raising soil 10-15 cm above ground level, incorporating well-rotted FYM/compost. Treat beds with 0.1% Captan/Fytolan solution to prevent damping-off, cover for 2 days, then mix Malathion 5% dust for insect protection. Sow seeds thinly in 2.5 cm spaced furrows (1-2 cm deep) by second week of May, covering with sand-FYM mix. Prepare main field pits at 75×30 cm spacing 15 days before transplanting (June 2nd-3rd week), adding FYM and adjusting soil pH through liming. Apply 10t FYM, 75kg N, 60kg P_2O_5, and 60kg K_2O per hectare (half N basal, remainder top-dressed). Maintain irrigation (4cm every 18-20 days) and weed control (Metolachlor @1kg a.i/ha pre-emergence with grubber at 40 DAP). Manage diseases with 0.25% Mancozeb (late blight), 200ppm Streptomycin (bacterial wilt), and 0.3% Captan (fungal wilt). Regular monitoring and these integrated practices will ensure healthy tomato production.

Pumpkin

Recommended varieties include Arka Chandan, Arka Suryamukhi, and Pusa Biswas. These varieties are suitable for the region due to their high productivity, nutritive value, good storability, and transport qualities. Pumpkin grows best in slightly acidic sandy loam to loam soils with a pH of 5.5-6.0. It requires a long, warm growing season with an optimum temperature range of 18°C to 30°C. Sowing is typically done during April-May in hilly areas. The field should be ploughed 4-5 times, and farmyard manure (FYM) should be applied at the rate of 25-30 t/ha. Recommended fertilizers include Urea (145 kg/ha), DAP (130 kg/ha), and MOP (67 kg/ha). Apply the full dose of phosphorus and potassium and half the nitrogen during land preparation. The remaining nitrogen should be applied in three equal splits at 20, 40, and 60 days after sowing. To control termites and cutworms, apply Phorate 10G at 15-20 kg/ha during land preparation. Prior to sowing, soak seeds in Captan solution (2 g/L of water) for 3-4 hours. For off-season cultivation, seedlings should be raised in polythene bags under a polyhouse and transplanted by late January or early February, which enables an early harvest by 1-1.5 months compared to normal sowing. Harvesting is done 75-180 days after sowing, with expected yields ranging from 250 to 400 quintals per hectare. After harvesting, fruits should be cleaned and damaged ones discarded. Grade the produce based on shape, color, and maturity. Mature pumpkins can be stored for 4-6 months in a well-ventilated storage chamber.

Carrot

Recommended varieties include Pusa Rudhira, Pusa Asita, and Pusa Vrishti. These varieties are generally suitable for sowing in the late summer and early fall. Well-drained loamy soil with an ideal pH of 6.5, though sandy soils are preferable for early

crops. Prepare the field by thoroughly tilling the soil and incorporating 10-15 t/ha of farmyard manure. Apply balanced fertilizers at 60:60:90 kg NPK/ha, using urea (80kg), DAP (130kg), and MOP (150kg), with urea split into 2-3 applications at two-week intervals. Implement pest control by spraying Diamethoate (0.05%) for leaf hoppers and drenching soil with Chlorpyriphos (0.1%) for cutworms. Expect yields of 15-30 t/ha, though fresh carrots maintain quality for only 3-4 days under normal storage conditions.

LIVESTOCK

Poultry

Improved Housing Structure

Farmers are encouraged to begin rearing improved dual-purpose chicken breeds starting from the second week of May, which can contribute to both egg and meat production. For effective disease prevention, administer Ascal feed supplement (20-60 ml per 100 birds) for 10 days. Follow a strict vaccination schedule, starting with the Marek's and Infectious Bursal Disease (IBD) vaccines from May 1st, and the Ranikhet (Lasota strain) vaccine at 4-8 weeks of age (1,000 doses in 20 liters of drinking water). Additionally, maintain biosecurity by regularly disinfecting equipment and the poultry environment using Kohrsolin or Germex spray. For proper nutrition management, provide broilers with starter feed containing 22-23% protein for the first six weeks, followed by finisher feed with 18-20% protein until they reach market age. To enhance feed efficiency and reduce costs, incorporate 30% *Azolla* with 70% concentrate feed. It is also essential to store feed properly to prevent spoilage and fungal contamination.

Piggery

To maintain healthy and productive pig herds, farmers should implement strict biosecurity measures by regularly cleaning pens every 2-3 days using 1% sodium/calcium hydroxide or 2% caustic soda solution, while disinfecting all equipment and vehicles with 0.03% sodium hypochlorite, 1% formaldehyde, or Virkon S/B-904 (1:100 dilution). Farm workers must disinfect their shoes, clothes, and tools before contact with pigs, and animals should be provided with cooling water baths during peak heat along with clean drinking water refreshed at least thrice daily. Critical health interventions include vaccinating against Swine Fever by the 3rd week of May, administering Ivermectin (200 mcg/kg BW) and Albendazole (5-10 mg/kg BW) for deworming, giving piglets 1ml iron injections on days 4 and 14, and supplementing feed with Ascal (10ml twice daily for 10 days). Nutritional management requires age-appropriate rations: starter (20-22% protein), grower (17-18%), and finisher (14-16%) feeds, ensuring freshness by avoiding mold and not storing beyond 3 months. Additional measures include weekly cypermethrin/deltamethrin sprays (1-2 ml/L) for ectoparasite control, maintaining

proper drainage, and providing immune boosters with cool baths to mitigate heat stress. Regular monitoring and these integrated practices will enhance productivity while preventing disease outbreaks in your piggery operations.

Fisheries

Farmers are advised to prepare their ponds by maintaining a maximum depth of 1.75 meters, which is ideal for growing fry into healthy fingerlings (10-15 cm). Begin by applying an initial dose of cow dung manure at 10,000 kg/ha, followed by regular applications of urea and superphosphate (40-80 kg/ha every 15 days) to promote plankton growth, while maintaining optimal water quality through lime application at 250 kg/ha. For stocking, introduce fry at a density of 1 lakh/ha using recommended polyculture ratios of either 1:2:2 or 3:4:3 for Catla, Rohu, and Mrigal species, progressing to fingerling stocking at 5,000-8,000/ha in a 30:30:40 ratio as the fish mature. Farmers are advised to practice Happa breeding for common carp between June 1st and July 31st, and begin stocking of locally produced fingerlings from the first week of July to ensure better survival rates and disease-free stock. For feeding, provide commercial pellets at 2% of body weight, or alternatively, use a nutritionally balanced 1:1 mixture of rice bran with either mustard oil cake or palm oil cake when pellets are unavailable.

CALENDAR OF OPERATION FOR REJUVENATION OF KHASI MANDARIN

Trunk borer control - carefully clean infested holes with an iron wire before applying treatment either by inserting a cotton swab soaked in petrol or Dichlorvos, or by injecting 5 mL of 0.2% Dichlorvos solution (prepared at 2ml/L of water) and sealing the hole with mud to effectively eliminate grubs. As spring arrives, continue proper nutrient management by applying the annual dose of 30 kg FYM per tree along with balanced chemical fertilizers (650 g urea, 1220 g SSP, and 450 g MOP per tree). Implement comprehensive plant protection measures including: application of Bordeaux paste on tree trunks up to 60cm height; foliar spraying of Multiplex (2.5g/L) on new leaves; a protective spray of Bavistin (1g/L) combined with Monocrotophos (1mL/L) on new flushes; Micronutrient supplementation through foliar application of Zinc Sulphate (0.5%), Magnesium Sulphate (0.2%), Copper Sulphate (0.4%), and Manganese Sulphate (0.4%). For management of bark-eating caterpillars, inject 0.1% Dichlorvos directly into their tunnels. Complete these spring operations by mulching the basin area to conserve soil moisture and regulate soil temperature.

CEREAL CROPS

Paddy

Lowland Paddy: Prepare a nursery for kharif paddy on an area of 500-1000 sq. meters to raise seedlings for one hectare with a seed rate of 40 kg/ha. Use Farm Yard Manure (FYM) and Vermicompost in nursery beds for healthy seedling growth. Choose hybrids or high-yielding varieties that are tolerant or resistant to insect pests and diseases, such as Sahsharang, RC Maniphou-14, RC Maniphou-15, and RC Maniphou-16. Prepare the paddy field with 2-3 ploughings using a power tiller, incorporating 5t/ha of FYM. Transplant 20-25-day-old lowland rice seedlings by mid-June at a spacing of 20 x 15 cm. Ensure timely nursery sowing in May and transplanting in June for better grain quality, water efficiency, and reduced stem borer buildup. For effective weed management, conduct regular manual weeding operations as needed. Rogue out off-type plants during flowering and at maturity, and remove plants affected by disease. At least two manual weedings are required. Apply *Azolla* to enhance organic matter and supply nitrogen. To control zinc deficiency, apply 60 kg of zinc sulphate heptahydrate (21%) or 40 kg of zinc sulphate monohydrate (33%) per hectare during puddling, especially if the previous crop in the field showed zinc deficiency symptoms. If deficiency is noticed in the growing crop, apply zinc sulphate as soon as possible.

Upland Paddy: Treat seeds of direct-seeded upland rice with Carbendazim @ 2-3 g/kg of seed to protect against seed-borne diseases. Adopt the dibbling method of sowing instead of broadcasting to ensure assured germination and a uniform crop stand. Carry out at least two intercultural operations or manual weedings-first at 25 days after sowing (DAS), ideally from mid-May, and second between the first week of June and the second week of July. Construct logwood or bamboo bunds across slopes and dig recharge pits (1x1x1 ft) in jhum fields with slopes over 30% to reduce soil erosion and enhance water retention. Rogue out off-type and diseased plants during

the flowering and maturity stages to maintain varietal purity and reduce disease spread.

Pest and Disease Management of Paddy: Install yellow sticky traps, light traps, and pheromone traps in the field. For organic pest control, apply biopesticides like *Trichogramma*, conserve biocontrol agents (e.g., coccinellids, spiders, damsel flies), and use *Trichoderma harzianum* with FYM before sowing. Spray neem oil at 10 DAT and *Beauveria bassiana* at boot leaf stage. For stem borer control carry out deep summer ploughing to expose the pupae to predators and disrupt the insect life cycle. Release Trichogramma spp. @ 50,000/ha one month after transplanting, followed by 3-4 releases at fortnightly intervals to parasitize stem borer egg masses. To control Gundhi bug, monitor and manually collect nymphs at the tillering stage using sweep nets. Install improved Indigenous Technical Knowledge (ITK)-based crab traps during the milky stage of paddy to reduce unfilled grains. For blast disease management, ensure proper field sanitation and treat seeds with Pseudomonas fluorescens and Trichoderma viride @ 10 g/kg of seed. Upon disease onset, apply copper oxychloride 0.25% @ 2.5 g/L of water, repeating at 7-10 day intervals until the disease subsides.

Maize

Farmers are advised for 2-3 deep ploughings followed by sun drying of the field before the onset of rains to prepare for kharif maize cultivation. Use high-yielding composite varieties like Vijaya Composite, Vivek Sankul, RCM-1-1, RCM 1-3, RCM 75, RCM 76, and DMRH 1301, or hybrid varieties like All Rounder, Vivek QPM, VLQPM 45, VLQPM 59, HQPM-1, HQPM-5, and HQPM-7. For short to medium maturity duration (85-110 days), especially suitable for re-sowing after hail damage, choose varieties like HQPM-1, HQPM-5, RCM-76, and Vivek 27. Sow maize @ 20-22 kg/ha with a spacing of 60 cm × 20 cm to achieve an ideal plant population of 60,000-65,000 plants/ha. Apply FYM or compost @ 5 t/ha and NPK @ 120:60:40 kg/ha. Apply nitrogen in three splits: at sowing, knee-high stage, and tasselling stage. Perform green manuring using Daincha, Sunhemp, or cowpea to improve soil fertility. Carry out earthing up twice (at 35-40 DAS and 60-65 DAS) to prevent lodging, and maintain a weed-free crop for the first 30-45 days. Ensure proper drainage during heavy rains to avoid waterlogging. Under drought conditions, irrigate at the knee-high, flowering, and grain-filling stages

Varietal demonstration in maize

Fall Armyworm in maize

for optimum crop performance. Harvest mature cobs promptly to prevent spoilage. For enhanced yield and soil health, adopt intercropping with soybean, kholar, or other legumes.

Management of Fall Armyworm: Sowing maize after the onset of rains reduces insect infestation. Regularly hand-pick and destroy egg masses and larvae by crushing or immersing in kerosene water. Apply sand or ash into the whorls of affected plants. Use pheromone traps @ 15/acre to trap male moths, and spray neem-based formulations (NSKE 5% or neem @ 4 ml/L) at early infestation stages. Apply a whorl spray of Metarhizium anisopliae @ 5 g/L at 15-25 DAS, followed by 1-2 sprays at 10-day intervals. For effective control of late instar larvae, use *Bacillus thuringiensis var. kurstaki* @ 2 g/L, Spinosad @ 0.3 ml/L, or prepare poison bait using rice bran, jaggery, and Thiodicarb.

MILLET

Prepare the field with 2-3 harrowings followed by leveling. Sow the crop in March to utilize early soil moisture or in August to benefit from residual moisture after the kharif season or late monsoon rains. Use a seed rate of 8-10 kg/ha, sown at a depth not exceeding 3 cm, and maintain a line spacing of 25 × 8 cm for optimal plant population and intercultural operations. Farmers are suggested to select local varieties such as Shongtak, Langjai, Buyan, Tansho, Senyak, Anong, Yempang, Shonye, and Phuknyak, or recommended improved varieties like SiA 3085 and SiA 3156 for higher productivity and adaptability. Apply 10-15 tonnes of well-decomposed FYM per hectare. Keep the crop free from weeds through one or two manual weedings during early growth stages. Treat seeds with Bavistin or Captan @ 2-3 g/kg to control seed-borne diseases. Rogue out off-type and diseased plants at flowering and maturity stages to maintain genetic purity and reduce disease spread. For neck and finger blast, spray Pseudomonas fluorescens twice-once at flowering and again 10 days later. Foxtail millet generally does not face major insect issues; however, field sanitation and timely removal of diseased plants will help maintain crop health.

OILSEED CROPS

Soybean

Select high-yielding soybean varieties such as JS-95-60, JS-97-52, JS-2093, RVSM-1135, and MACS-1460 for better yield potential. Sowing should be completed between mid-June and the first fortnight of July in well-drained loamy or sandy loam soils, free from water stagnation. Treat seeds with *Rhizobium* and *Phosphotika* @ 20 g each per kg of seed to improve nodulation and nutrient uptake. Use line sowing with a spacing of 45 cm between rows and 5 cm between plants for optimal plant population and crop management. Maintain a weed-free crop up to 60 days after sowing (DAS). Conduct at least two intercultural operations-first at 25 DAS and the second at 45 DAS-to support healthy crop growth and suppress weed competition.

Varietal demonstration in soyabean

Groundnut

Sowing of Groundnut should be completed from fortnight of May to June first week using high yielding variety like ICGS 76, Dharani, KDG-123 and Girnar 4. Before sowing, treat seeds with *Rhizobium* and *PSB* culture for better growth and yield, and control blister beetles on groundnut flowers by spraying Dichlorvos @ 2 ml/litre of water.

Rhizobium and PSB culture in groundnut

PULSE CROPS

To manage pest infestations, collect and destroy skeletonized leaves, egg clusters, and larvae of Spodoptera litura and hairy caterpillars; use light traps or bonfires to control adult moths; intercrop with pearl millet or sorghum; apply entomopathogenic fungi like *B. bassiana or M. anisopliae* @ 5 g/L; and spray neem oil @ 5 ml/L to control aphids.

SPICE CROPS

Ginger

The rhizome should be sown by 1st to 3rd week of May in the fields with a spacing of 25 cm row to row and 25 cm plant to plant. Earthing up should be done during July to protect Rhizome fly infestation.

Management of Rhizome Rot Disease: Maintain raised beds or ridges and ensure proper drainage to prevent water stagnation and water logging. Apply mulch (green leaves/straw) to retain soil moisture and suppress pathogens, incorporate neem cake (2-5 tons/ha), apply *Trichoderma harzianum* to soil at 10-15 day intervals during early crop stages, and spray *Pseudomonas fluorescens* @ 5 g/L every 15 days for effective disease management.

Turmeric

Sowing of turmeric var. Megha turmeric 1 or Lakadong should be completed immediately with seed rate of 15-20 q/ha and 30*30 cm spacing. Earthing up should be done during July to protect Rhizome fly infestation. Planting in ridges and furrows and provide proper drainage coli, lettuce etc.

Sprouted rhizome ready for transplanting

Turmeric rhizomes

Large Cardamom

Regular weeding should be carried out in June and again in August to effectively manage large cardamom fields. Plant healthy disease-free large cardamom suckers and replace the old diseased plants. A mature tiller with 2-3 vegetative buds are advised to plant during May-June. For insect pest management, spray neem oil (1500 ppm) at a rate of 3 ml/L every 20 days, with a minimum of four applications. Suckers are treated with Pseudomonas fluorescens at a concentration of 0.5% to prevent blight diseases

VEGETABLE CROPS

Chilli/Naga King Chilli

Transplant seedlings at the 4-5 leaf stage (½ ft tall) during May-June when soil moisture is adequate, irrigate immediately after transplanting, carry out regular weeding, and monitor fields for timely rouging and removal of diseased plants. Gap filling is advised.

Tomato

Grow seedlings on raised nursery beds or pro-trays to prevent damping off, use disease-resistant, high-yielding varieties like Arka Rakshak and Arka Samrat. Protect nursery beds with polythene covers and prefer poly-house cultivation of tomatoes during peak monsoon to prevent rain damage. Intercultural operations such as manual weeding, earthing up and particularly staking at 25-30 days after transplanting (DAT) are very important. Subsequent weeding and earthing up as and when required.

Cucurbits

Construction of chungs/ pandals (bamboo made structure) for the cucurbit seedlings. Optimum moisture level should be maintained in the field by providing proper irrigation as dry conditions may lead to poor pollination and thus drop in yield of the crop.

Control of Red Pumpkin Beetle: Collection and destruction of the adults and larvae during early stage of the crop helps in reducing the population of the insects. Incorporation of neem cake during land preparation is effective in controlling the larvae. Treatment with entomopathogenic fungi Beauveriabassiane@ 2g/litre of water helps in the reduction of the beetle infestation.

Control of Fruit Fly: Installation of sex attractant cue lure for monitoring and mass trapping for fruit fly @ 25 traps /ha. Field sanitation and removal of damaged fruits daily to minimise pest infestation and burying them deep into the soil to break the reproduction cycle and population increase.

Control of Downy Mildew: Avoid overhead irrigation and spraying in the evening hours as it creates leaf wetness favourable for pathogen development. Promote good air circulation by adopting wider spacing. Spray of Bordeaux mixture 1% or Metalaxyl or Mancozeb 0.4% and reapplied at 5-7 days interval.

Citrus Plants (ORANGE/ACID LIME/LEMON)

Legumes (Pea, Cowpea, Green gram, Rice bean etc) and vegetable crops can be raised as an intercrop during pre-bearing stage to get additional income. Monitor for Trunk borer infestation during this month. Advise to inject petrol/diesel into the tree trunk holes and plug it with mud balls.

Khasi Mandarin

Locate the trunk borer and seal the holes with mud after inserting cotton soaked in petrol/kerosene. Shake the tree to manually kill the adult trunk borers. Install a light trap to capture adult trunk borers or pick them by hand. Use a spike to hook and kill the grubs of the trunk borer. Cut and burn the dried parts of the plants, as they harbor grubs and pupae. Generate smoke in the orchard for 2-3 hours after nightfall to control fruit-piercing moths. For controlling leaf miners, mix neem oil at a rate of 10 ml/liter of water and apply it during bud burst, repeating the application after 10 days if necessary. Prune the branches that are severely affected. To control bark-eating caterpillars, gummosis, and foot rot, keep trunks clean, apply Bordeaux paste up to 60 cm height in winter and early summer, and for caterpillars, insert cotton soaked in petrol or kerosene into tunnels and seal with mud.

For rejuvenation of Khasi Mandarin: In May, collect and destroy trunk borer adults by shaking the branches 2-3 times at 10-day intervals. Apply Carbaryl paste (20g/L of water) on the trunk up to 6 feet from the ground level. To prevent excessive fruit drop, spray NAA at 50 ppm (Planofix 0.5 ml/L). During June and July, spray a mixture of Zinc Sulphate (0.4%), Magnesium Sulphate (0.2%), Copper Sulphate (0.4%), and Manganese Sulphate (0.4%) on the new flushes. Apply fertilizers at the rate of 400g Urea, 1000g SSP, 400g MOP, 200g Zinc Sulphate, and 50g Borax per tree. After 15 days, spray Bordeaux mixture (1%) or Blitox-50 (3g/L). In August, apply Bordeaux paste on the tree trunk up to 60 cm height from the ground. Spray Copper Oxychloride (3g/L of water) and Dimethoate (1.5 ml/L of water). Drench the soil in the basin area with Mefenoxam, Fosetyl, or Ridomil (2.5g/L of water). For trunk borer management, clean the bore holes using an iron wire, insert a cotton swab soaked in Dichlorovos solution (2 ml/L of water) or inject 5 ml of the solution into the holes, and then seal with mud. Additionally, apply fertilizers at 400g Urea, 1000g SSP, and 400g MOP per tree. To prevent fruit fly infestation, spray Malathion (2 ml/L of water) over the fruits and install pheromone traps.

FRUIT CROPS

Banana

Select healthy suckers, dry them in direct sunlight for 3-4 days, dip in cow dung slurry and ash to prevent rhizome weevil, and periodically remove dried leaves to maintain clean cultivation. Prune the side suckers every month which attracts rhizome weevil and pseudo stem weevil. Proper disposal off the banana plant after harvesting and do not dump infested materials into manure pit. Apply neem cake @ 1 kg/plant to prevent rhizome and pseudo stem weevil infestations, plant until May, ensure proper drainage to avoid water stagnation, and prop banana plants with bamboo to prevent lodging due to heavy winds.

Kiwi

Provide protection to kiwi plants using 50% shade net for reducing flower and fruit drop due to hail storm. Regular weeding should be carried out, especially after early monsoon showers. Apply mulch (straw, dry leaves) around the base of kiwi plants to conserve soil moisture and suppress weed growth. Ensure proper drainage around plants to prevent waterlogging and fungal infections due to high humidity during the

monsoon. Deep ploughing should be carried out on clear, sunny days in May and June, ensuring that the vineyard is exposed to sunlight for at least two to three weeks to control soil insect pests

Persimmon

Canopy management for persimmon involves light pruning after harvest (February-March) to maintain tree structure, while excessive vegetative growth should be controlled during the monsoon season. Apply well-rotted Mithun manure 10 kg/plant before the onset of monsoon.

LIVESTOCK

Piggery

Pig shed management after farrowing

Construct the piggery shed on dry, raised ground to avoid waterlogging, marshy areas, and regions prone to heavy rainfall. Ensure that the shed is well-ventilated and provides sufficient open space for each animal to thrive. Mark newly purchased pigs with suitable identification methods like ear notching or tagging. Vaccinate these animals against infectious diseases and keep them under observation for at least two weeks before integration with the existing herd. Provide an adequate amount of concentrates in the feed, ensuring that sows receive the necessary vitamins and minerals, especially during pregnancy to increase litter size. Ensure clean drinking water is always available. Deworm pigs using Albendazole or Febendazole at a dosage of 7.5 mg/kg body weight every three months. In areas with heavy infestations, deworming may need to be repeated every two months. Pay special attention to pregnant sows one week before farrowing. Ensure that they have adequate space, feed, and water. Clean and disinfect the farrowing pens 3-4 days before the expected farrowing date, and place the sow in the pen after proper bedding. Install guard rails in farrowing pens to prevent the crushing of piglets by the sow. Clip the needle teeth of piglets immediately after birth to reduce the risk of injury. Castrate male piglets that are not selected for breeding to avoid boar odor in the meat and promote better weight gain. Sell piglets based on market demand, and develop an appropriate marketing strategy in consultation with local animal husbandry department officials.

Poultry

Regularly clean and ventilate the poultry shed to ensure proper air circulation. Provide clean drinking water 3-4 times a day and occasionally add electrolytes. Disinfect movable equipment like feeders, waterers, and hovers to maintain hygiene.

Use suitable litter material such as sawdust or paddy husk, spread to a 5 cm depth. Stir the litter regularly to prevent caking. Due to high humidity and frequent rainfall, change the litter frequently to prevent Coccidiosis infections. Store poultry feeds properly to avoid fungal growth, especially in hot and humid weather conditions that promote mold. Deworm poultry with Piperzine (100 mg/kg body weight) for roundworms, Albendazole (10 mg/kg body weight) for other worms, and Praziquantel (5 mg/kg body weight) based on the bird's age. Clean the poultry house regularly with a phenol solution (20 ml/l of water) to prevent infections. Backyard poultry breeds such as Vanaraja, Srinidhi, Rainbow Rooster, and Kuroiler can be reared in low-cost housing. Ensure that the shed is designed for easy management and proper ventilation. Follow a proper vaccination schedule and implement biosecurity measures to prevent diseases. Vaccinate poultry against Ranikhet disease, Marek's disease, Gumboro, and Fowl pox as per the recommended schedule.

Rabbits

Farmers are advised to select breeds like New Zealand, Grey Giant and Soviet Chinchilla suitable for NEH Region. Construct rabbit houses in elevated areas to ensure proper drainage. The area should be shaded to reduce heat stress and provide protection from wind, promoting a comfortable living environment for the rabbits. Mate rabbits in the morning or evening for optimal breeding success. It is recommended to mate the female rabbit twice for higher chances of conception. Provide extra bedding materials like gunny bags and paddy straw inside the rabbit house before kindling to ensure a comfortable and safe environment for the doe and her kits. Supplement pelleted feeds with a mineral mixture, vitamins, and salt. Additionally, provide fresh green fodder to support optimal weight gain. Avoid storing feed in damp conditions, and discard any moulded feed to prevent aflatoxicosis. Offer fresh green plants like beans, alfalfa, berseem, grass, and root vegetables such as cassava, yams, carrots, beets, and turnips, as well as inedible portions of cabbage and cauliflower, to ensure a balanced and nutritious diet for the rabbits.

Mithun

Mithun farmers should begin feeding concentrate mixtures at the rate of 2 kg per mithun per day to enhance body weight gain. The concentrate feed should be prepared using locally available ingredients. To prevent deficiency diseases, farmers should provide 40-50 grams of mineral supplements per day and ensure adequate water availability, especially during the lean season. Paddy by-products such as rice bran and straw can be used as alternative feed resources. Establishing an agroforestry system with fodder trees is recommended to avoid fodder scarcity. Regular deworming is essential to improve productivity. Administer Ivermectin injections to control ectoparasite infestations effectively. Follow a proper vaccination schedule to prevent disease outbreaks. Mithuns should be vaccinated every six months against Foot and Mouth Disease (FMD) to avoid significant economic losses. Implement rotational grazing in forest areas to optimize forage use and ensure sustainable land and fodder management. Farmers are also encouraged to adopt Mithun-based Integrated Farming Systems (IFS) to maximize resource utilization and improve profitability. Additionally, milking mithuns for their highly nutritious milk and processing it into products like paneer, curd, and lassi can enhance income and promote value addition.

Fishery

During Shallow Water in Ponds Due to Insufficient Rains/Inflow: De-silting, repair of bunds of existing ponds, rain water harvesting, liming and adopt low stocking density, deepening of ponds by 1.5 -2metres, restrict use of Manures and fertilizers, Channelizing water to pond if possible, Maintain proper water quality. Integrated farming, air breathing fish to be practiced, avoid fertilization and manuring on supplementary basis, feeding should be minimum to avoid organic loading, short term aquaculture with medium and minor carps, Maintain proper water quality. Prepare pond for the next crop after early harvest, Maintain proper water quality

At the Time of Salt Load Build up in Ponds / Change in Water Quality: Rain water harvesting, deepening, desilting of existing water bodies and removal of debris. Restrict feeding and manure to avoid waste accumulation and eutrofication.

Agro-advisory services are very crucial for Odisha state as the state is heavily reliant on agriculture and allied sectors. Moreover, due to its geographical location, Odisha is vulnerable to climate change like droughts, floods, cyclones, hail storms, uncertain rainfalls etc. Agro-advisories can help timely management of different agri-operations and thus, can protect agri-produces ensuring food security and farmers' livelihoods.

Be updated with the regular weather advisory on thunderstorm associated with high rainfall and accordingly, take appropriate crop management practices for standing field and horticultural crops during pre-monsoon season. Take up summer ploughing with the receipt of summer rain. For transplanted kharif rice, dhaincha green manure seeds may be broadcast about 45-50 days before transplanting. Transplanting of vegetables should be done in the afternoon hour to avoid high temperature. Dry out the fish ponds and plough down the pond bottom, apply lime and sow dhaincha seeds for green manuring. It is the time for planting of root crops, tuber crops and rhizomes before onset of monsoon. Be aware of weather advisory and accordingly, avoid spraying plant protection chemicals during rainy days. Use protective covers while undertaking spraying of pesticides as safety measures. Adopt soil test-based fertilizer scheduling for improving nutrient use efficiency and reducing cost therein.

CEREAL CROPS

Rice

Drill seeded direct seeded rice (DSR) method may be adopted for which seeds may be sown during last week of May till onset of monsoon. For transplanted rice, timely sowing will result higher productivity. Rice nursery may be prepared with onset of monsoon using certified seeds. For medium to shallow lowland transplanted rice, varieties like Hasanta, CR 1009 sub-1, MTU 1075, CR Dhan 310, DRR 44, CR Dhan 801, CR Dhan 404, Upahar, Swarna, Pooja, Swarna sub-1 and BPT

5204 are suitable. For costal saline soils, farmers are advised to grow salt tolerant varieties such as CR Dhan 405, CR Dhan 403, CR Dhan 412 and Lunishree. Suitable varieties for upland situation are-Khandagiri, Vandana, Nabanna, Kolab, CR Dhan 202 and Sahbhagi dhan. Use herbicides for control of weeds for which pre-emergence herbicides such as Pretilachlor with safener@1500 ml/ha, pyrazosulfuron@200 g/ha, Pretilachlor 6% + Bensulfuron methyl 0.6% GR @ 10 kg/ha at 0-3 days of sowing or transplanting and post-emergence application of Fenoxaprop-ethyl @ 1300ml/ha + Ethoxysulfuron @ 100 ml/ha, Bispyribac sodium @250 g/ha, Triafamone + Ethoxysulfuron@90 g/ha, cyhalofop butyl+penoxsulam@2250 ml/ha at 15-20 days after transplanting/sowing may be used. Algal bloom is a major problem in transplanted rice. To control it, spray Copper oxychloride@ 3 g/litre of water or apply 10 kg $CuSO_4$/ha in soil. Install pheromone traps with scirpolure (5 no./ha) to monitor incidence of yellow stemborer. Tricho cards (50000 eggs/ha releas for 4 times) are recommended to manage the pests like yellow stemborer and leaf folder.

PULSE CROPS

Use suitable varieties of green gram- Virat, Sikha, IPM 2-14; black gram- PU 9, Sashi and IPU 2-43; and arhar- LRG 52 and BRG 2. For management of yellow mosaic vein virus in green gram/black gram, seed treatment with Thiamethoxam 30 FS or Imidachloprid 600 FS @5 ml/kg seed, installation of yellow sticky traps 50 no./ha 30 DAS along with need-based spray of neem oil 1500 ppm @1500 ml/ha alternately with Flonicamide@120 g/ha may be undertaken. Treat the seeds with *rhizobium* and *PSB* biofertilizers @25g each/kg seeds along with ammonium molybdate@ 3 g/10 kg seed mixing with jaggery and water before planting. To manage weeds Pendimethalin 30% as pre-emergence herbicide @2500 ml/ha or Quizalofop ethyl 5% @1000 ml/ ha as post-emergence herbicide may be used.

OILSEED CROPS

Groundnut

Cultivate suitable groundnut varieties like Kadiri Lepakshi, Dharani and Smruti. Soil application of 20 kg N, 40 kg P_2O_5, 40 kg K_2O/ ha at sowing and Gypsum @ 250 kg/ha at the time of hoeing should be applied to improve productivity. Tobacco caterpillars can be controlled with the spray Indoxacarb + Nuvaluron @ 625 per ha or Chlorpyriphos 50% + Cypermethrin 5% EC @ 1000 ml/ha or Fipronil 5SC @ 1000 ml/ha. Harvest the crop when plants turn yellow and leaves start drying. If no rain is received, apply light irrigation 2-3 days before harvesting. Dry the pods properly after harvest so as to reduce the moisture content to 8-9 % before storing.

COMMERCIAL CROPS

Sugarcane

Cultivate high yielding sugarcane varieties like Sabita, Nilamadhaba and Charchika. Carry out wrapping and propping as the crop attains 4-5 months age in medium and late duration varieties. Spray Lamba cyhalothrin @2 ml/L of water to minimize infestation of top shoot borer. Avoid ratooning in red rot affected areas and sett treatment to be done with Azoxystrobin 18.2% + Difenconazole 11.4% @ 0.1% per kg sett.

VEGETABLE CROPS

Ridge and furrow methods or furrow irrigated raised bed methods may be adopted allowing sufficient drainage of rain water to save the crop from damage. Use trellis system of cultivation for ridge gourd, pointed gourd, bitter gourd and similar vegetable crops to obtain better yield and quality of fruits. Quality vegetable seedlings may be produced in protrays using cocopeat and vermicompost. Treat the seeds with Trichoderma viride 2g/100 g seeds or Carbandazim @ 1g/100 g seeds before sowing in nursery or protrays to manage fungal diseases. For management of fruit and shoot borer in brinjal, alternate spraying of Chlorantraniliprole 18.5 % SC @ 180 ml/ha, Emamectin benzoate 5 SG @ 200 g/ha or Fenpropathrin 30% EC @ 165 ml/ha or Spinosad 45%SC@ 175 ml/ha will be useful. Seedling root dipping with Rynaxpyr @ 0.5 ml/L water for three hours before transplanting may be followed for better control. Fruit fly in cucurbits causes great losses which can be managed by use of food bait @100 ml/bait prepared by mixture of 1 kg cucumber fruit pulp + 50 g gur + 100 ml cow urine + 0.5 L water, diluted in 5 L water and added with 10 ml malathion along with installation of Pheromone trap with Cuelure @ 20 nos/ ha. Sucking insect pest are seen in many vegetable crops for which spraying of Thiamethoxam 25% WG @ 80 g or Acetamiprid 20 SP @ 125 ml/ha will keep the population under control. During rainy season, wilting is observed in solanaceous crops which can be controlled by spraying and soil drenching with 3 g Copper oxycloride+1 g Plantomycin per litre of water.

SPICE CROPS

Turmeric

Suitable varieties are Roma, Rashmi, Lakadong, Rajendra Sonia. Treat the rhizome with Trichoderma viridae @ 10 g/kg of seed to save the crop from diseases. Apply bio-consortia (*Azotobacter, Azospirillum* & *PSB*) @ 12 kg/ha mixed with FYM at the time of planting for improving germination and productivity.

Ginger

Cultivate suitable ginger varieties- Suprabha, Suruchi and Suravi with seed rate of 1800-2000 kg/ha. Select high loamy land for cultivation. Raised bed of size 1 m width, 15 cm height and of convenient length may be adopted along with making channels for draining excess rain water. Before sowing dip rhizomes in a slurry of 1 g Carbendazim, 3 g Mancozeb and 1 g Plantomycin for half an hour and dry in the shade.

Banana

Banana crop should be planted during June with receipt of rain. Tissue culture plants and high- density planting may be followed for banana cultivation for higher productivity. In bearing plants of coconut, make circular pit of 30 cm deep 3 ft away from the trunk, apply 60 kg compost, 500 g urea, 1 kg SSP/300 g of DAP, 1 kg MOP and 200 g borax per bearing plant in the pit and cover with soil.

LIVESTOCK

Don't allow domestic animals to graze outside during 11 PM to 3 PM as ambient temperature remains high this time. Provide sufficient clean drinking water to cattle and keep their sheds clean. Provide vaccination at regular interval. Cultivate and

supplement azolla @ 1-1.5 kg in daily ration of cattle to reduce the feed cost by 20%. Provide supplementary feeding such as broken rice, paddy, cooked rice, azolla etc. to the backyard poultry birds during continuous rain. It is preferable to expose the feed ingredient sacks/bags under sun every week to prevent the feeds getting more moisture. Wash the cattle shed with phenyl (dilution 1:20 ratio with water) and sprinkle bleaching powder around the shed at weekly intervals. Mastitis is a common problem in high yielding cows in rainy season. Keep the cattle shed clean and dry. Clean the udder in soap water daily before milking. Apply Mastilep® ointment over the udder after each milking.

Fishery

Raise the height of the pond dykes, repair the damaged dykes, if necessary and keep proper outlet to drain out excess water. Put net in the lower dyke or outlet to avoid escape of fish from the pond. Test the water quality parameters mainly pH and alkalinity, and apply lime, fertilizers and manures consulting fishery officers, scientists and extension functionaries. In weed infested ponds, stock some grass carp yearlings (500 no/ha) along with Catla, Rohu and Mrigal to control weeds. Stock yearlings of Indian Major Carps @ 5000 per ha at a ratio of 1500 Catla, 2000 Rohu /Jayanti rohu and 1500 Mrigal at a ratio of 3:4:3 having 2 metres water depth. Adopt sample netting using cast net at every 2-months intervals to check the growth and health of fish. Utilize the seasonal /shallow ponds in villages for fish fingerling production. Rise in water temperature expedites decomposition of organic matter which accumulates at the pond bottom and generates gases. These gases are toxic to the fishes. To overcome the problem, zeolite @ 20 kg per acre should be applied after mixing it with one bag (30 kg) of dry river sand.

Punjab's agriculture is characterized by the cultivation of wheat and rice, which together dominate over 80% of the state's total cropped area. Other significant crops include sugarcane, maize, oilseeds, cotton, and various fruits and vegetables. The state has a high crop intensity, with many fields being sown multiple times annually, contributing to its status as a major food producer in India. Punjab's agriculture faces several challenges, including monocropping, depletion of water resources, excessive use of pesticides and fertilizers, etc. These issues contribute to environmental degradation, economic stress for farmers, and ultimately impact crop production. There is upmost need to educate the farmers with agro-advisories regarding advanced techniques in cultivation of field crops, vegetable & fruit crops, agroforestry and livestock management in order promote the scientific cultivation along with conservation of natural resources. The following agro-advisory highlights the important points to be followed by the farmers during kharif season to sustain the productivity of field crops, horticulture crops, agroforestry and livestock.

SOIL TESTING

Soil testing is the best tool to ensure optimum and balanced use of nutrients. Improper use of fertilizers leads not only to imbalanced nutrition but also deterioration of the environment. For collection of soil sample scrap away surface litter and make a V-shaped cut with a spade or a khurpa to a depth of 6 inches. Remove about 1" thick uniform slice of soil from one side of the cut. Similarly, collect samples from 7 to 8 places in the field of uniform texture and uniform fertility. Put the samples in a clean bucket, tray or cloth and mix it thoroughly. Take approximately half kg of soil in a cloth bag and label it with information such as field number, name of the farmer, address, date of sampling etc. If the samples are wet, dry them in shade before putting into the cloth bag. Soil and water samples are tested by Soil Testing Laboratory, Deptt. of Soil Science, Punjab Agricultural University, Ludhiana and Soil Testing Laboratory of all KVK's.

Use of farmyard manure (FYM) in kharif crops

Farmyard manure (FYM) is a valuable resource for improving soil health and enhancing crop production, especially for kharif crops. FYM helps in improving soil structure and biomass, and it increases soil organic carbon, nitrogen, phosphorus, and potassium, crucial nutrients for plant growth. It also enhances water-holding capacity and microbial activity, contributing to a healthier soil ecosystem. Apply farmyard manure (FYM) in adequate quantities to the soil ensures good tilth and improves soil water-holding capacity.

CEREAL CROPS

Rice

Selection of varieties: To save water and for ease in management of paddy straw, grow PAU recommended short duration varieties. i.e. PR 132, PR 131, PR 130, PR 129, PR 128, HKR 47, PR 127, PR 126, PR 122, PR 121, PR 114, PR 113.

Time of nursery sowing: Restrict to timely sowing of nursery (20 May-20 June) and timely transplanting (20 June-10 July) schedule for better grain quality, water saving and low build-up of stem borers.

Transplanting: Use 30-35 days old nursery for medium duration varieties and 25-30 days nursery for short duration variety (PR 126). Transplant seedlings in lines at 20 x 15 cm (33 hills/sq m) and put 2 seedlings per hill.

Water management: Keep water standing in paddy field only for 2 weeks after transplanting and thereafter apply irrigation 2 days after the ponded water has infiltrated into soil.

Fertilizer management: Apply fertilizers as per soil test. Omit phosphorus application in rice following wheat that received recommended dose of phosphatic fertilizer. Use nitrogen judiciously based on Leaf Colour Chart (LCC). To obtain higher yield of PR 132, apply 25% less nitrogenous fertilizers than other varieties

Zinc deficiency: Due to zinc deficiency the lower leaves of crop become rusty brown near the base and ultimately dry up. To control this malady, apply 25 kg of zinc sulphate heptahydrate (21%) or 16 kg zinc sulphate monohydrate (33%) per acre at puddling in case previous crop in this field had shown the symptoms of zinc deficiency.

Plant protection: To control false smut disease, initiate the spray of recommended fungicides at boot stage of the crop. Plant hoppers feed at the base of rice plants and are often overlooked. Their damage is noticed only when the crop is hopper burnt. Hence, regular monitoring of the insect population is necessary. Use of synthetic pyrethroids leads to increase in the population of rice planthoppers. Hence, these insecticides should not be used for the control of rice insect-pests.

Basmati Rice

Selection of varieties: Pusa Basmati 1121, Pusa Basmati 1509, Punjab Basmati 5, Punjab Basmati 7, Pusa Basmati 1718, Pusa Basmati 1847 and CSR 30 are the most suitable varieties.

Time of nursery sowing and transplanting: For Basmati varieties Punjab Basmati 7, Punjab Basmati 5, Pusa Basmati 1847, Pusa Basmati 1121 and Pusa Basmati 1718,

the optimum time of nursery sowing is 1st fortnight of June and transplanting time is 1st fortnight of July, whereas, for CSR 30 and Pusa Basmati 1509, the optimum time of nursery sowing is 2nd fortnight of June and transplanting time is 2nd fortnight of July.

Seedling Treatment: To control Foot rot, smear the seeds with talc formulation of Trichoderma harzianum @ 15 g per kg of seed immediately before sowing and seedling root dip for 6 hrs with T. harzianum @ 15 g per litre of water before transplanting. Alternatively, treat the seed with Sprint 75 WS (carbendazim + mancozeb) by making slurry of 3 g fungicide formulation in 10 ml water for one kg seed before sowing to manage other seed borne diseases of rice.

Method of Transplanting: Transplant two seedlings per hill in lines at 20 x 15 cm (33 hills/sq. metre) during the optimum period in a well puddled field.

Nutrition management: Skip phosphorus application if the recommended dose of phosphorus has been applied to the preceding wheat crop. However, in phosphorus deficient soils, apply 75 kg of superphosphate per acre before last puddling. Apply 45 kg/ha urea for CSR 30, 90 kg/ha urea for varieties Punjab Basmati 5, Punjab Basmati 7, Pusa Basmati 1718 and Pusa Basmati 1121, and 135 kg/ha urea for Pusa Basmati 1509. Apply urea in two equal splits at 3 weeks and 6 weeks after transplanting.

Direct Seeded Rice

Suitable soils: Sow DSR only in medium to heavy textured soils. It cultivation is not successful in light textured soils due to severe iron deficiency and lower crop yields

Suitable varieties: Short and medium duration varieties of rice and Punjab Basmati 7, Pusa Basmati 1718, Pusa Basmati 1121 and Pusa Basmati 1509 for basmati

Sowing time: Sowing should be done in the first fortnight of June for rice and second fortnight of June for basmati rice

Seed rate and seed treatment: Use 8-10 kg seed per acre. Imbibe the seed by dipping in 2% potassium nitrate solution (prepare solution by dissolving 200 g KNO_3 in 10 litre water for 8 kg seed) for 12 hours. Dry the seed in shade and treat with 3 g Sprint 75 WS (mencozeb + carbendazim) per kg seed.

Direct seeding in tar-wattar fields: Divide the field into kiyaras of desirable size after laser levelling and apply Rauni irrigation. When the field comes to tar-wattar (sufficiently high but workable soil moisture) conditions, prepare field kiyara-wise with shallow cultivation followed by 2-3 plankings with load of 3 sandbags on planker and sow immediately. Seed should be placed at 3-4 cm depth in 20 cm spaced rows. Avoid field preparation and sowing during noon hours for better results.

Direct seeding in dry fields: Treated seed should be placed 2-3 cm deep in rows spaced at 20 cm in a dry field and irrigation is applied immediately after sowing.

Weed Control

Pre-emergence: Spray 1.0 litre per acre Stomp/Bunker 30 EC (pendimethalin) or PEPE 25 SE (penoxsulam 1% pendimethlin 24%) in 200 litres of water for control of annual grass weeds and some broadleaf weeds.

Post-emergence: If fields are infested with Swank, paddy mothas, Nominee Gold 10 SC (bispyribac sodium) @ 100 ml per acre should be sprayed at 15-25 days after

sowing (2-4 weed leaf stage). For swank, chinigha, broadleaf weeds, paddy mothas, gandiwalamotha,,Novlect 12 EC (fenoxaprop-p-ethyl) @ 500 ml per acre should be sprayed at 20-25 days after sowing (2-4 weed leaf stage). For madhana, chinigha, chirigha, takrigha, Ricestar 6.7 EC (fenoxaprop-p-ethyl) @ 400 ml per acre should be sprayed at 20-25 days after sowing (2-4 weed leaf stage). For broadleaf weeds, paddy mothas, gandiwalamotha, Almix 20 WP (chlorimuron ethyl 10% + metsulfuron methyl 10%) @ 8 g per acre should be sprayed at 20-25 days after sowing.

***F*ertilizers management:** Apply 130 kg urea per acre in three equal splits at 4, 6 and 9 weeks of sowing and for basmati rice, apply 54 kg urea per acre in three equal splits at 3, 6 and 9 weeks after sowing.

Irrigation

Direct seeding (flat/raised beds) in tar-wattar fields: Apply first irrigation at around 21 days after sowing. After that, apply irrigations at 5-7 days interval depending on soil type.

Direct seeding in dry fields: Apply first irrigation immediately after sowing and second irrigation at 4-5 days after sowing. Subsequent irrigations should be applied at 5-7 days interval depending on soil type.

Maize

Improved varieties: PMH 17, DKC 9144, Bioseed 9788, PMH 14, PMH 13, ADV 9293, JC 12, PMH 11, PMH 1, JC 4, PMH 2. JC 12 & JC 4 variety is recommended for kandi areas of the state.

Time of Sowing: Last week of May to end of June. In fields, which are prone to damage through water stagnation, sow the crop in end of May to early June, so that the crop gets firmly established before the rains.

Seed rate and Method of Sowing: Use 10 kg seed per acre for other varieties. Sow the seed 3-5 cm deep in lines with a maize planter or seed-cum-fertilizer drill, provided with a planting attachment. The row to row spacing should be kept at 60 cm whereas plant to plant spacing to be maintained at 20 cm. A four-row pneumatic planter with provision of bed making can be used for maize sowing.

Weed management: Give two hoeings about 15 to 30 days after sowing with khurpa/ kasaula/ wheel-hoe/ triphali/ tractor-drawn cultivator. Spray 800 g per acre Atrataf/ Atragold/ Masstaf/ Atari/Traxx 50 WP (atrazine) on medium to heavy textured soils and 500 g per acre in light soils within ten days of sowing, using 200 litres of water Alternatively, spray 105 ml per acre Laudis 420 SC (tembotrione) in 150 litres of water at 20 days after sowing provides effective control of mixed weed flora. For the control of dila/ motha, apply 400 mL per acre 2,4-D amine salt 58 SL as post emergence 20-25 days after sowing in 150 litres of water.

Fertilizer management: Apply 110 kg urea/acre, 55 kg DAP/150 kg SSP per acre and 20 kg MOP/acre. If maize follows wheat, which had received the recommended dose of phosphorus, omit its application to maize. When 27 kg of DAP is used, reduce the urea dose by 10 kg and when 55 kg of DAP is used, reduce the dose of urea by 20 kg. To all recommended varieties, drill one-third of nitrogen and the entire quantity of phosphorus and potassium at the time of sowing. Top dress one-

third of nitrogen at the knee-high stage and the remaining one-third at the pre-tasseling stage.

Insect pest management: Regularly monitor the crop for the attack of fall armyworm. Use recommended insecticides for control of maize borer within 2-3 weeks of sowing. Control maize borer using Trichogramma cards on 10 and 17 days old crop.

MANAGEMENT OF FODDER CROPS

Follow recommended time of sowing, seed rate, treat the seed before sowing and Use fertilizers in balanced amount. To get better quality of fodder, cut the fodder crop at proper stage. In summer months, Irrigate the fodder crop one week before cutting especially to sorghum and bajra to minimize anti-quality factors. Avoid use of un-recommended agrochemicals on fodder crops as this may be harmful to dairy animals. Plants attacked by any insect-pests should be uprooted and destroyed. Do not grow fodder crops on soils high in selenium. It is advisable to grow fodders, whenever possible, as mixtures rather than as monocultures. Crop mixtures, which combine a non-legume, such as maize, jowar, and bajra with a legume, such as cowpea and guara provide a balanced diet for animals because legumes are important source of proteins and non-legumes are rich in energy. Harvest the fodder mixture when maize is in the milk-ripe to dough stages, when sorghum has one half to one-third heads out and when bajra shows the emergence of ears from the flag leaves. An adequate supply of quality fodders round the year can be ensured by preserving the fodder as silage and hay.

Silage making

Non legume kharif fodders, such as maize, sorghum, bajra, which are rich in soluble sugars and low in protein possess excellent qualities for conserving as silage. Harvest the crop for silage making when nutrient contents are at their peak stage and it has enough dry matter. A crop with 30-35 per cent dry matter conserves into a high-quality silage. Chop the harvested crop to the length of 2 to 3 cm and press the chopped crop in the trench thoroughly with a tractor and raise it to 1 metre above the ground level, to create proper anaerobic conditions to make quality silage. About 6-7 quintals of green fodder should be pressed in 1 m^3 area. Cover the fodder with polythen sheet and put the mud on it and finally mud-plaster. See that the silo-trench is completely air-tight. Silage will be ready within 45 days.

Hay making

The fodder crops such as berseem, lucerne and cowpea having soft stems are suitable for hay-making. Harvest the fodder crops at pre-flowering stage. Chop the fodder to a length of 5 to 8 cm and spread it in a 10-15 cm thick layer on a hard-surface to dry it in the sun. The usual threshing floor can also be used for this purpose. To speed up the drying process, stir the fodder with a rake after every 2 to 3 hours during the day. When thoroughly dried (usually 2-3 days depending on the frequency of stirring), collect the dried material for storage. A kilogram of dried hay containing 90 per cent dry matter is equivalent to about 6 kilograms of green fodder containing 15 per cent dry matter.

COMMERCIAL CROPS

Cotton

Selection of varieties: To obtain higher yield, grow Bt cotton variety PAU Bt 2 and PAU Bt 3 and other Bt hybrids recommended by PAU, Ludhiana. Among the non Bt hybrids/varieties, grow F 2228, LH 2108 and desi cotton varieties LD 1019, LD 949 and FDK 124.

Sub Soiling: Cross sub soiling at 1.0 m spacing should be done before preparing the field with tractor drawn sub-soiler (chiseler) to the depth of 45-50 cm. This will help in breaking the hard pan, increasing water infiltration rate and better root development of cotton plants.

Time of Sowing: Sow the crop during 1 April to 15 May. Sowing during this period ensures better yield and escapes the attack of insect pests and diseases.

Pre-sowing irrigation: Apply heavy pre-sowing irrigation preferably with canal water for good germination and early crop establishment.

Seed rate: For Bt varieties PAU Bt 2 and PAU Bt 3, use seed rate @ 4.0 + 1.0 (refuge) kg/acre, for Non-Bt varieties F 2228 and LH 2108, 3.5 kg/acre and for recommended Bt hybrids, use two pouches of 475 g each (in which refuge Already mixed in seed)

Seed treatment: Soak the cotton seed in a solution of 0.5 g succinic acid in 5 litres of water for 2-4 hours for acid delinted seed or 6-8 hours for non-delinted seed. To prevent attach of jassid at early stage, smear the seed with 5 g Gaucho 70 WS (imidacloprid) or 7 g Cruiser 30FS (thiomethoxam) per kg seed. To remove the fuzz of non-delinted seed, rub these seeds with fine earth, cow-dung or ash.

Planting geometry: Sow the seeds with cotton sowing drill or cotton planter with line to line spacing of 67.5 cm. Maintain plant to plant distance of 30 cm for variety PAU Bt 2 and PAU Bt 3; 45 cm for desi cotton varieties; 60 cm for non-Bt hybrid/varieties and 75 cm for Bt hybrids by thinning out extra plants after first irrigation.

Weed management: Hoe the crop two or three times. The first hoeing should be done before first irrigation. For control of weeds particularly itsit, madhana/ makra, apply 1.0 litre per acre Stomp 30 EC (pendimethalin) as pre-emergence within 24 hours of sowing. In situations where weeds emerge after first irrigation or with the rain shower, Stomp 30 EC can also be applied as post-emergence after first irrigation in 200 litre of water. Alternatively, spray 500 ml per acre Hitweed Maxx 10 MEC (pyrithiobac sodium 6% quizalofop ethyl 4%) by dissolving in 150 litres of water after first irrigation, in moist soil, to control annual grass and broadleaf weeds. This herbicide also provides effective control of lapeta (guara) vel (Ipomoea sp.) when weed plants are at 2 to 5 leaf stage.

Fertilizer Application: Apply urea @162.5 kg to non-Bt varieties, 200 kg to Bt variety (PAU Bt 2 and PAU Bt 3) and 225 kg to all Bt and non-Bt hybrids, DAP @ 67.5 kg or SSP @187.5 kg per ha. Omit phosphorus (DAP or SSP) application to cotton when it follows wheat which had received recommended dose of phosphorus. Reduce the dose of urea by 25 kg when 67.5 kg DAP is applied to cotton. Apply 50 kg muriate of potash and 25 kg zinc sulphate heptahydrate (21%) or 16.25 kg zinc

sulphate monohydrate (33%) per ha to cotton in light soils. Apply 62.5 kg/ha of magnesium sulphate. Apply full dose of phosphorus, magnesium sulphate, muriate of potash and zinc sulphate at sowing. Apply urea in two splits at thinning and the appearance of flowers.

Foliar application of nutrients: To get higher yields, give 4 sprays of 2% potassium nitrate (13:0:45) at weekly interval starting at flower initiation.

Irrigation and Drainage: The first irrigation should be given 4 to 6 weeks after sowing and the subsequent ones at interval of two or three weeks. The crop must not be allowed to suffer from water stress during the flowering and fruiting stages. Cotton during its early growth is very sensitive to water stagnation.

Sugarcane

Sugarcane can be successfully grown on all types of soils ranging from sandy loam to clay loam and it is semi-tolerant to sodicity and salinity. Cross sub-soiling at 1.0 m spacing should be done once in three to four years, before preparing the field. This will help in breaking the hard pan, increase water infiltration rate and better penetration of roots.

Selection of varieties: Grow PAU recommended varieties i.e., early maturing-CoPb 95, CoPb 96, Co 15023, CoPb 92, Co 118, CoJ 85, CoJ 64, mid-late maturing- CoPb 98, CoPb 93, CoPb 94, Co 238, CoPb 91, CoJ 88.

Time of sowing: Mid-February to the end of March is the optimum time for planting sugarcane in the Punjab. Do not plant early maturing varieties after March. Do not plant the crop in a field where the preceding crop was infected with red rot or wilt.

Selection of seed and Seed rate: The seed should be free from red-rot, wilt, smut, ratoon-stunting and grassy shoot diseases. Use 20 thousand three-budded setts or 15 thousand four-budded sets or 12 thousand five-budded setts per acre. Use only the top two-third portion of the selected canes for planting.

Seed treatment: To improve the germination, soak the setts in ethrel solution overnight. To prepare the solution, dissolve 25 ml of Ethrel 39 SL in 100 liters of water. Alternatively, soak the setts in water for 24 hours before planting

Weed management: Two or three hoeings can be done with a triphali or tractor mounted tiller or tractor operated rotary weeder.

Chemical Control: Pre-emergence application of 800 g per acre Atrataf/Solaro/Masstaf/ Markazine 50 WP (atrazine) or Sencor 70 WP (metribuzin) or Karmex/Klass 80 WP (diuron) or 1000 g per acre Authority NXT 58 WP (sulfentrazone+clomazone) in 200 litres of water within 2-3 days of planting effectively controls the broadleaf weeds and annual grasses. For control of hardy weed like Bans Patta, use only Sencor 70 WP or Karmex/Klass 80 WP. Alternatively, post-emergence application of 1200 g per acre Triskele/Trishuk(2,4-D sodium salt 44% + metribuzin 35% + pyrazosulfuron ethyl 1.0%) WDG or 1000 g per acre Sindica (2,4- D sodium salt 48% + metribuzin 32% + chlorimuron ethyl 0.8%) WDG in 200 litres of water at 3-5 leaf stage of weeds provides effective control of seasonal grass, sedge and broad leaf weeds. For fields infested with dila, post-emergence application of 800 g per acre 2, 4-D sodium salt 80 WP in 200 litres of water is recommended. In

fields infested with Ipomoea spp. (lapetavel) and other broadleaf weeds, apply 800 g of 2,4-D sodium salt 80 WP or 400 mL per acre 2,4-D amine salt 58 SL by dissolving in 200 litres of water when these weeds are at 3 to 5 leaf stage.

Prevention of Lodging: To prevent the crop from lodging, earth up heavily the flat-planted as well as the trench-planted crop at the end of June, before the onset of the monsoon. Prop up the crop in the end of August or in the beginning of September. Do not apply excessive dose of nitrogen than recommended. Over dose will cause lodging of the crop, resulting in poor cane yield and quality.

Ratoon management: Do not harvest the crop to be ratooned before the end of January. Remove the trash and irrigate the field. Do not ratoon a diseased crop. Harvest the canes as close to the ground as possible to promote better sprouting. Also remove late tillers or water-shoots, as they inhibit full sprouting of the stubbles. Interculture the crop with tractor drawn tillers or rotary weeder to control weeds during early stages of growth. Alternatively, adopt chemical control measures. The stand of the ratoon crop can be improved by planting the gaps with three budded setts in the beginning of March.

Insect-pest management: Do early sowing to reduce damage by early shoot borer. Use Tricho-cards for the control of borers. Do not plant sugarcane for one year and three years for control of red rot and wilt, respectively in diseased fields. To control red rot diseases, use seed from absolutely disease-free seed plot. Rogue out and bury the diseased canes. Uproot the entire clumps and not merely the affected stalks. Do not ratoon the diseased crop.

FRUIT CROPS

Kinnow

To ameliorate zinc and manganese deficiency in kinnow, spray the plants with zinc sulphate (4.7 g/litre of water) + manganese sulphate (3.3 g/litre of water) during mid August. Foliar application should be given to the fully developed flushes. A gap of one week should be kept between the foliar application of Bordeaux mixture and zinc sulphate and manganese sulphate solution. Manage fruit drop by spraying GA (10 mg /litre of water) + Copper oxychloride 50 WP (3 g per litre of water) in August and September. Collect and destroy the mummified fruits on the trees as well as the fallen fruits by deep burying. Three foliar sprays of 1.0 % potassium nitrate (10 g/litre of water) can be given at the end of May, June and July to improve fruit size and increase yield. Citrus Psylla which is a vector for Citrus Greening disease can be managed by spraying 200 ml Crocodile/ Confidor 17.8 SL (imidacloprid) or 160 g Actara/ Dotara

Pathological fruit drop in kinnow

Gummosis/foot rot in kinnow

Scab in kinnow

25 WG (thiamethoxam) or 6.25 litre MAK HMO (Horticulture Mineral Oil) in 500 litres of water per acre in the first week of September. Even spray of Soybean oil @ 10 litres or 10 litres of cotton seed oil + 1.25 kg of detergent powder in 500 litres of water is equally effective. There should not be any water stress in the orchard at the time of spray of MAK HMO, soybean oil and cotton seed oil. During extreme hot months spray should be done in the evening hours. To manage fruit flies, regularly collect and bury the infested fruits. Fix PAU fruit fly traps @16 traps/ acre in the second week of August and recharge the same if required. Spray soybean oil @ 10 litres or 10 litres of cotton seed oil + 1.25 kg of detergent powder in 500 litres of water per acre in May-June and August-September as soon as mite population is observed on the underside of leaves. To manage Foot Rot/ Gummosis, avoid flood irrigation. Do not allow irrigation water to stay in direct contact with the tree trunk. Avoid deep hoeing. Avoid injuries to the trunk bark and roots. Give two applications of Curzate M 8 as paint (2 g/100 ml of Linseed oil) to the infected trunk portion and drench (25 g/10 litres of water/ tree) the soil at the base of the tree in July-August. During last week of June to August, apply three sprays of Bordeaux mixture (2:2:250) or 50 % Copper oxychloride (3 g per litre of water) at 20 days interval to manage scab which appears as small, dark brown, rough, irregular, raised lesions mostly on under-side of the leaves, do clipping of infected leaves in July Give light and frequent irrigations in May-June and avoid water stress to combat problem of fruit cracking.

Guava

Apply Farmyard manure in May. Application of 20 kg Paddy straw manure can be used as a substitute of Farm Yard Manure to full grown guava plants. To full grown guava trees, apply urea @ 1.0 kg/plant, SSP @ 2.5 kg/plant and MOP @ 1.5 kg/plant. Half of the inorganic fertilizers should be applied in May-June and the remaining half in September-October. Correct Zinc deficiency by spraying guava trees with zinc sulphate (1 kg of zinc sulphate + 1/2 kg of unslaked lime in 100 litres of water). Give 2 or 3 such sprays at fortnightly interval between June to September. Typical symptoms of Zinc deficiency are narrowing of leaves; interveinal chlorosis and twig die back. For weed management, apply paddy straw @ 4.0 t/acre as mulch after application of recommended dose of organic manure and inorganic fertilizers in May under the tree canopy. Guava gives two crops in a year. Winter season crop is superior in quality than rainy season crop, as rainy crop may get infested with fruit flies. Those farmers who intend to get only winter season crop, can spray urea 10 per cent (100 g

Fruit Fly in Guava

Anthracnose in Guava

/ litre of water) or naphthalene acetic acid (NAA) @ 600 mg/litre during May, when maximum flowers have opened. Withhold irrigation during May and apply fertilizers during June to encourage growth in July-August for getting maximum flowering during August-September for winter season crop. Manage fruit flies by covering the rainy season mature green guava fruit on tree with white non-woven bags at the end of June to middle of July. Regularly remove fallen fruits from the ground and bury the infested fruits at least at 60 cm depth. Fix PAU fruit fly traps @16 traps/acre in the first week of July and recharge the same if required. To manage Fruit rot/ Anthracnose and dieback, rain or irrigation water should not be allowed to stand in the basin around the tree. After pruning, spray the trees with Bordeaux mixture (2:2: 250) or 300 g Blitox in 100 litres of water. The rotten and mummified fruits which fall on the ground should be buried deep into the soil. Two foliar sprays of 2.0 % potassium nitrate (2 kg/ 100 litres of water) during August and September improve fruit size and increase yield.

Mango

A spray of 10 g sodium salt 2, 4-D in 500 litres of water in the first week of May controls the pre-harvest fruit drop in Dusehri and Langra cultivars. 2, 4-D should be dissolved in a small quantity of alcohol or spirit and then the required volume of water be added. It must be ensured that the spray pump is washed thoroughly with washing soda before and after the spray. Do not repeat the spray of the 2, 4-D solution. To manage fruit flies, regularly remove fallen fruits from the ground and bury the infested fruits at least at 60 cm depth. Fix PAU fruit fly traps @16 traps/acre in the third week of May and recharge the same if required.

Pear

Iron deficiency in Pear

In pear, Zinc deficiency appears on younger leaves as diffused interveinal chlorosis, reduction in leaf size and tendency of the leaf edges to curl upward. To correct its deficiency, spray the plants with 3 kg zinc sulphate + 1.5 kg unslaked lime in 500 litres of water per acre. Iron deficiency, which appears on apical leaves as interveinal chlorosis may be corrected by spraying 0.3 per cent ferrous sulphate (300 g in 100 litres of water). Pear trees need frequent irrigation after transplanting. The interval of irrigation may be 5 to 7 days during summer months and 15 days in July-August. Irrigation should be restricted after fruit harvest. Management of fruit flies involves regular removal of fallen fruits from the ground and burying the infested fruits at least at 60 cm depth. Fix PAU fruit fly traps @16 traps/acre in the first week of June and recharge the same if required.

Litchi

Litchi should be carefully irrigated at all stages of development. Irrigate young plants twice a week during May-June. In bearing trees, irrigation need is critical during fruit

Litchi Nut Borer

Anthracnose in Guava

development which occurs from the second week of May to the end of June. Twice a week irrigation during this period reduces cracking of fruits to a great extent and helps in proper size development. After the withdrawal of monsoon young orchards should be irrigated at weekly/ fortnightly intervals from September onwards. The bagging of litchi fruit bunches with white and pink polypropylene non-woven bags at 25-30 days after fruit set provide physical protection against fruit nut borer, sun burning, cracking and also improves pericarp color and fruit quality. To manage litchi nut borer follow clean cultivation by removing fallen fruits (mummies) from the orchard and ploughing destroys the carry-over of pests to the next crop.

Peach

In peach, fruit development period starts after fruit set and continues upto June till maturity depending upon the variety. This is the critical period of irrigation for the trees. Trees should not suffer from any moisture stress particularly 25-30 days before maturity of fruit, because the maximum weight gain is during these days. Correct iron deficiency by spraying ferrous sulphate @ 0.3 per cent (3g/litre of water) in June and August. To manage fruit fly infestation, fix PAU fruit fly trap @ 16 traps/acre in May.

Ber

Prune ber trees during second fortnight of May when the trees are dormant. Pruning by heading back to 8 buds of previous year's growth gives higher yield of better quality fruits. To fully grown ber plants, apply farmyard manure @ 100 kg/tree in May-June. Urea @ 1.0 kg/plant may be split up in two parts-one part to be applied during the rainy season in July-August and the other soon after the fruit set.

VEGETABLE CROPS

Cucurbits (Pumpkin, Bottle Gourd, Bitter Gourd, Sponge Gourd, Ash Gourd, Round Gourd)

For cucurbits, sow pumpkin in June-July on 2-2.5 m wide beds with 60 cm spacing, using a seed rate of 1.0-1.5 kg/acre, while Bottle Gourd, Bitter Gourd, Sponge Gourd, Ash Gourd, and Round Gourd should also be sown in June-July on 1.5-3 m wide beds with 45-90 cm spacing and a seed rate of 2.0 kg/acre. Apply 8-15 tonnes of FYM per acre; for pumpkin, add 40 kg N (90 kg Urea) in two splits, and for the others, use 28-40 kg N (60-90 kg Urea), 20 kg P_2O_5 (125 kg SSP), and 20 kg K_2O (35 kg MOP) per acre, with N applied in two splits. Recommended varieties include Punjab Nawab,

PPH-1, and PPH-2 for pumpkin; Punjab Bahar, Punjab Barkat, and Punjab Komal for Bottle Gourd; Punjab Karela-15 and Punjab Jhaar Karela-1 for Bitter Gourd; Punjab Nikhar and PSG-9 for Sponge Gourd; PAG-3 for Ash Gourd; and Punjab Tinda-1 for Round Gourd. Irrigate every 6-7 days in summer, totalling 8-10 irrigations, but reduce frequency before harvest to prevent fruit rot. For fruit fly management, install 16 traps per acre in the 3rd-4th week of April for spring crops and the 4th week of June for rainy season crops, or use a bait spray of Malathion 50 EC at 20 ml plus 200 g Gur in 20 L water at 15-day intervals on the lower side of maize plants grown as a trap crop in rows 8-10 m apart. Manage fungal diseases with a mixture of Bavistin 1 g and Mancozeb 2 g per litre of water, and control sucking pests with Imidacloprid at 0.5 ml per litre. Additionally, control whitefly using 1200 ml of PAU Neem extract in 100-125 litres of water per acre, as recommended by Punjab Agricultural University.

Okra (Bhindi)

Okra should be sown in the North Indian plains as a rainy season crop in June-July, using varieties like Punjab Suhawani, Punjab-8, Pusa Kranti, Varsha Uphar, or A-4 at a seed rate of 4-6 kg/acre with a spacing of 45 × 15 cm. To control jassid and whitefly, apply 1-2 sprays of Ecotin (Azadirachtin 5%) at 80 ml or PAU Neem extract at 2000 ml in 100-125 litres of water per acre. During the rainy season, when jassid attacks are severe, use chemical control with 40 g Actara 25 WG, 560 ml Malathion 50 EC, or 40 ml Confidor 17.8 SL in 100-125 litres of water per acre. Manage spotted bollworms by spraying Coragen 18.5 SC (Chlorantraniliprole) or Sumipleo 10 EC (Pyridalyl) at 50 ml in 100-125 litres of water per acre. Red spider mites, a serious issue during dry, hot summer weather, can be controlled with PAU Dharek extract at 1600 ml in 100 litres of water per acre or with 150 ml Oberon 22.9 SC in 100 litres of water per acre. Monitor for Yellow Mosaic Virus (YMV), rogue out affected plants, and spray Thiomethoxam 25WG at 60 g/acre to control its vector, whitefly.

Cauliflower

For cauliflower, sow the nursery in May for the Kharif season and transplant by mid-June using early group cultivars like Pusa Deepali, Pusa Kartiki, and Pant Gobhi-3 with a spacing of 45 × 30 cm and only use early group cultivars avoid physiological disorders for Kharif season to like buttoning. Apply 10-15 tonnes of FYM, 50 kg N (110 kg Urea), 25 kg P_2O_5 (155 kg SSP), and 25 kg K_2O (40 kg MOP) per acre, with full P_2O_5, K_2O, and 1/3 N at sowing, and the remaining N as top-dressing four weeks after transplanting. Irrigate every 6-7 days, totalling 9-11 irrigations, while avoiding over-flooding. Add Borax at 8 kg/acre to manage browning in cauliflower. To manage leaf spot, blight, and downy mildew, spray Mancozeb at 0.2% or Copper Oxychloride at 0.3%. Control stem borer and fruit borer with Spinosad 45 SC at 80 ml/acre in 200 litres of water, ensuring a waiting period of 5-7 days before harvesting.

Cowpea

Sow cowpea as a rainy season crop in June-July using the variety Cowpea 263 with a spacing of 45 × 15 cm, applying 45 kg Urea, 100 kg SSP, and 16 kg MOP per acre at sowing, along with seed inoculation using Bavistin and Rhizobium culture. Control sucking pests like aphids and whitefly with alternate sprays of Neem-based pesticide 1500 ppm at 600 ml/acre and Imidacloprid 17.8 at 70 ml/acre. Manage fungal diseases by treating seeds with Carbendazim at 0.2%, Thiram at 0.3%, or Captan at 0.3%.

AGROFORESTRY

Poplar

Leaf spots in poplar

Irrigate poplar at 7-10-day interval during summers as it requires a lot of water during its growth period from April to October. However, standing water for long period, especially in heavy soils, is harmful for Poplar, therefore proper arrangement for drainage must be ensured during monsoon. Apply urea to plants according to their age: 170 g for 1-year-old, 260 g for 2-year-old, 350 g for 3-year-old, 430 g for 4-year-old, 520 g for 5-year-old, and 610 g for 6-year-old plants. Distribute the total yearly dose evenly, applying one-third in May, one-third in July, and the final third in September. For 1-year-old plants, apply in a 1 m diameter ring; for 2-year-old plants, in a 2 m diameter ring; and for 3-year-old plants, in a 3 m wide strip (1.5 m on each side of the tree row). Adjust the dose by reducing 25% in high nitrogen (N) soils and increasing 25% in low N soils.

Zinc defiency in Poplar

Zinc defiency in Poplar

For management of Zinc deficiency in Poplar, apply 100 g, 200 g and 300g Zinc Sulphate Heptahydrate (21%) OR 60g, 120g and 180g Zinc Sulphate Monohydrate (33%) for 1st, 3rd, & 5th year of poplar, respectively, in 1 m diameter during 1st year, 2 m diameter ring around tree during 3rd year and 3 m wide strip during 5th year, after harvesting of the Rabi intercrop. Mechanical removal of weeds or intercultural operations with tractor drawn implements can be followed to keep the field weed free. Avoid the spray of herbicides such as Atrazine, Metribuzin, Diuron, 2,4-D, recommended for control of broadleaved weeds in inter-crops like sugarcane & maize, as these may result in mortality of poplar. Poplar Stem Borer damages the tree by making tunnel in the stem and branches, and hollows out the trees. Prune the infected branches in August-September before entry of larvae into main stem. Plug all the holes on trunk with wet clay, except the lowermost hole. Inject kerosene in this lowermost hole and then plug it with wet clay. Leaf spots in poplar generally appear after onset of monsoons, and result in blight like appearance and early leaf fall, thus affecting the growth of poplar. This can be managed by 3-4 sprays of Bordeaux mixture (0.8%) at 15 days interval. During Kharif season, except Paddy, crops like Maize, Sorghum, Bajra, Cowpea, Moong, Mash, Mentha, Arvi, etc., can be successfully cultivated as intercrops during the first three years of plantation. Avoid pruning of poplar trees during rainy season as this is the

growth period of poplar and there are chances of fungal infection if the cut is not made properly. Pruning should be done during winter season, after shedding of the leaves.

Eucalyptus

Eucalyptus can be planted during August-September or February-March. Plant the trees at a spacing of 4x2 m or 3x3 m for block plantation and 2-3 m for boundary plantation. Eucalyptus requires frequent but light irrigation during first year for better establishment. Irrigate the eucalyptus trees 2-3 times per month during summers, up to first three years. Flooding should be avoided as it may result in uprooting of plants during strong winds. Apply Urea, SSP, and MOP fertilizers to plants according to their growth year: 65 g of Urea, 120 g of SSP, and 35 g of MOP for the 1st year; 130 g of Urea, 250 g of SSP, and 65 g of MOP for the 2nd year; 200 g of Urea, 375 g of SSP, and 100 g of MOP for the 3rd year; 260 g of Urea, 500 g of SSP, and 135 g of MOP for the 4th year; 325 g of Urea, 625 g of SSP, and 165 g of MOP for the 5th year; and 390 g of Urea, 750 g of SSP, and 200 g of MOP for the 6th year. Apply MOP only if there is a deficiency of Potash in the soil.

Apply the fertilizers in 1 m diameter ring around the tree during 1st and 2nd year. From 3rd to 6th year, the fertilizers should be applied in 2 m diameter ring around the tree. Whole SSP and MOP should be applied in April, however Apply Urea in three equal doses ($^1/_3$ of the mentioned dose in April, $^1/_3$ in July and remaining $^1/_3$ in October). Eucalyptus Gall Wasp attack results in formation of galls on leaf midrib, petioles and stems, multiple shoot formation and reduction in leaf size. For its management, neem oil or castor oil @ 30 ml/litre of water can be sprayed.

AGRI-ENGINEERING

For successful mechanical paddy transplantation, a mat-type nursery is essential. The following points should be kept in mind by the farmers while raising mat type nursery in their fields. Choose a nursery location with assured irrigation for optimal growth and close to the transplanting field to minimize transport. Ensure that the soil of mat type paddy nursery location should be fertile. The field should be preferably laser levelled and 20 m away from tubewell and trees. It is better to mix farmyard manure before harrowing the fields. Prepare the fields at proper moisture. Spread 50-60-gauge polythene sheet of 90 cm wide with 1.0-2.0 mm diameter perforations over it. Polythene sheet weighing 270 g, about 15 meters long, is enough to prepare seedlings for around 150 mats required per acre. Place iron frames with compartments measuring 58*28*2 cm for self-propelled paddy transplanters and 45x21x2 cm for engine-operated paddy transplanters.

The number and dimensions of compartments may vary based on machine specifications. Fill soil in the frames uniformly up to the top surface. The soil is lifted from both sides of the frames by making shallow furrows/channels. Care must be taken at the time of sowing that there are no hard stones in the soil, which is filled in the frame. Spread 50-60 g of pre-germinated seeds evenly in each compartment to ensure a uniform density of 2 or 3 seeds/cm^2 in the mat. To ensure uniform seed distribution, use nursery sowing seeder and its length should match the frame width with 1 cm diameter opening along the full length of the roller. Approximately 10-12 kg of paddy seed is enough to sow around 150

Manually raising of mat type nursery at farmers' field

Sowing of mat type nursery with PAU tractor operated mat type nursery seeder

Germinated mat type nursery sown with tractor operated mat type nursery seeder

mats needed for transplanting one acre. Gently cover the seeds with thin layer of soil and sprinkle water with sprayer to ensure proper soil settling. Lift frames and put at next place. Repeat the above steps for, as many mats required. Two persons can sow seedlings for about 3-4 acres in a day.

After sowing, slowly flood the field to prevent seeds from being washed away. Ensure that the seedling mats remain consistently moist. Spray the paddy seedlings at the rate of 200 g urea dissolved in 15 litres of water per 150 mats in the irrigated field after 10 days of sowing. The seedling mats are ready after about 20-25 days of sowing. Drain the water completely from the field a few hours before the nursery uprooting. Iron deficiency problem in paddy nursery can be tackled using two sprays of 0.5% ferrous sulphate at one week interval. This deficiency can also be controlled by keeping standing water in paddy nursery. Completely drain the water from the field a few hours before uprooting the nursery. The seedling mats are uprooted by a cut with sharp edge blade/sickle along the boundaries of the mat. One person can uproot the mats required for transplanting about 5-6 acres per day. Manual cutting of paddy nurseries requires to adopt awkward postures leading to physical strain and fatigue among farmers. To address these challenges, PAU nursery cutter having cutting capacity of 325-425 mats per hour with uniform cutting can be used.

The uprooted mats are transported to the field for transplanting. In order to mechanize the sowing operation of raising mat type nursery, PAU Ludhiana has developed a tractor operated seeder for mat type paddy nursery. This machine lays a

1.0 m wide perforated polythene sheet (50-60 gauge) over 1.0 m wide soil bed with simultaneous uniform seed placement over the soil bed for raising mat type nursery for mechanical paddy transplanters.

LIVESTOCK

Shelter Management

Ventilation: Facilitate adequate air circulation in shelters by utilizing exhaust fans, roof ventilators, or open-sided structures.

Cooling Systems: Implementing sprinkler or misting systems can alleviate heat stress, while applying whitewash to roofs may enhance sunlight reflection or spreading of straw on roof top also gives relief from heat.

Drainage: Ensure adequate drainage around shelters to avoid water accumulation, which may result in mosquito proliferation and associated diseases.

Washing of shed: Clean the sheds monthly using a 5% phenyl solution. During the rainy season, the washing frequency should be increased to twice a month. For katcha floors, a layer of 1-2 inches of soil may be excavated and substituted with a layer of clean soil.

Foot bath: Make a footbath outside the livestock unit that should carry a mixture of 4-5% Formaldehyde. This helps to avoid the entry of infectious agents in the shed.

Feeding Practices

Green Fodder: Employ Kharif crops such as maize, bajra, and sorghum as green fodder. Consider multicut varieties for bajra and sorghum, such as the Napier Bajra hybrid and Pb Sudex Chari No.4, which are both nutritious and abundantly available during this season. Additionally, incorporating leguminous fodders like guara and cowpea with the aforementioned non-leguminous fodders will aid in reducing the reliance on expensive concentrate mixtures. Rate of feeding of fodder should be around 40-50 Kg/animal/day.

Silage Preparation: Produce silage from excess green fodder such as maize, bajra, and sorghum to guarantee feed supply during scarcity. Small-scale farmers can utilize polypropylene bags and drums for silage preparation. It is advisable to feed silage post-milking to prevent any smell in the milk.

Spreading of straw on shed roof

Vaccination of animals

Balanced Diet: Fortify green fodder feeding with a concentrate mixture (having mineral mixture and salt) at a rate of 1 kg per 2 liters of milk produced in buffaloes and 1 kg per 2.5 liters of milk produced in cattle to fulfill their nutritional needs. Keep in mind that animals usually consume dry matter @ 2.5-3.5% of their body weight. Feeding of Uromin lick is beneficial to alleviate the nutritional deficiencies.

Avoid Spoiled Feed: Elevated humidity levels may result in the development of mould in stored feed and silage. It is essential to conduct regular inspections and remove any spoiled feed and silage. Silage affected by fungus can be utilized in the production of vermicompost.

Non-Conventional feed resources: Azolla cultivation is quite a prospective technology for use as non-conventional feed resource.

Feed Supplements: Supplement diet with buffers (1% in concentrate mixture) and yeast to combat the effect of heat. Frequent freshening/hand mixing of feed/fodder lying in manger (Pushing-up the of ration) in order to release the entrapped heat reduces refusal by animals and improves the feed intake.

Water Management

Clean Water Supply: Ensure a constant supply of fresh and clean drinking water. Utilize shaded water troughs to maintain cooler temperatures. Adding lime to the water troughs not only provides a source of calcium but also helps prevent fungal growth in the cemented trough. Water used for bathing, cleaning the shed and other operations should be managed carefully, with a maximum limit of 100 liters per animal per day.

Electrolytes: Incorporate electrolytes into drinking water during periods of extreme heat to avert dehydration and sustain electrolyte equilibrium.

Health Care

Deworming: Implement screening/faecal analysis based deworming to avert parasitic infections, particularly common in humid environments. It is essential to deworm pregnant animals using Fenbendazole, preferably. Additionally, pay close attention to coccidia infestations during faecal analysis.

Vaccination: Administer vaccinations for prevalent diseases such as foot and mouth disease, Hemorrhagic septicemia, lumpy skin disease, and black quarter prior to the arrival of the rainy season.

Control of ectoparasites: Topical acaricide (Butox, Taktik etc.) used for spray on animal body should be sprayed in all cracks/orifices in shed too (@2ml/ltr water). Take care that feed the animal well before application of acaricide and apply muzzle to avoid licking of the drug. Topical acaricide application on animal and in shed should be repeated thrice at a gap of one week.

Screening: Screening for diseases like mastitis (through California Mastitis testing), brucellosis, TB should be carried out regularly, this increases the success rate of prevention and treatment.

Heat Stress Monitoring: Be vigilant for indicators of heat stress, including excessive panting, drooling, or decreased appetite. Administer prompt care if any symptoms manifest. Avoid bathing of animals in common village ponds as this may lead to spread of infections.

Wound care: Use ointments like Himax/Lorexene/Ectosep for infestation of flies on wounds and facilitate healing.

Hygiene and Sanitation

Regular Cleaning: Daily maintenance of shelters, feeding zones, and water troughs is essential to mitigate the risk of aflatoxin contamination.

Manure Management: Properly dispose of manure to minimize the risk of disease, greenhouse gas emissions, and odour issues. Alternatives such as vermicomposting and biogas plants are also effective methods for waste management.

Fly Control: Utilize fly repellents or traps to reduce the annoyance and health hazards associated with flies.

Breeding Management

Avoid Heat Stress: Plan breeding activities during the cooler times of the day or season to enhance conception rates. Ensure a gap of 12 hrs between signs of heat and insemination.

Pregnancy Care: Ensure that pregnant animals receive exceptional care, which includes a diet rich in nutrients and an environment free from stress.

Disaster Preparedness

Flood Management: In case of heavy rainfall, it is essential to provide livestock with access to higher ground to prevent waterlogging.

Emergency Feed Stock: Store dry fodder and concentrates as a contingency for unexpected weather disruptions.

Rajasthan is predominantly a kharif cropping state due to vast area under rainfed cropping and crops. The diverse crops are grown during Kharif season. During May and June preparations for sowing of different crops like maize, bajra, green gram, cowpea, guar, moth bean are completed by the farmers. The sowing and nursery raising of cotton, groundnut and rice are done under varying situations and climatic conditions. To harness the potential of the crops, an appropriate technology along with management practices are inevitable. Therefore, a proper agro-advisory is need of the day to be issued for the use of the farmers for different agricultural operations. It will help in increasing the productivity and profit from agriculture and empower the farmers while helping in sustainable management of natural resources and applied inputs. The agro-advisories related to different activities and operations in agriculture conducted by the farmers during May-June are discussed in following para:

Soil Analysis

After the harvesting of rabi season crops in March and April and before sowing of kharif crops is the best time for taking soil samples from the farmers' fields for their analysis for physical, chemical and biological properties. The farmers are advised to take soil samples from 5 places of their fields, mix it properly and take them to nearby KVK or district soil testing labs for analysis. The sampling should be done from 0-30 cm soil depth. Attempt should be made get the soil sample analysed before sowing of kharif crops. The nutrient status as evidenced from soil sample analysis will help to decide right and balanced application of fertilizers and avoid extra application. It will also help in enhancing the nutrient use efficiency and saving of cost of cultivation while maximising the profit to farmers.

Summer Deep Ploughing and Application of Gypsum

May and June are the best time for summer deep ploughing and application of Gypsum in the field. The summer deep ploughing is process of solarization of the soil

profile which helps management and decomposition of crop residues, weeds, and unwanted plants in the soil. The deep ploughing in summer also kills the harmful insects, their eggs, larvae, and pupae as well as reduces the pathogens responsible for soil borne disease. Gypsum application is very important for Rajasthan soil which have by and large pH more than 8 and 8.5. The application of gypsum is decided based on the soil testing report. The farmers need to adequate quantity of gypsum which is decided on the basis of soil pH. Gypsum improves the soil reaction and brings to pH toward neutral range. It also helps in increasing the availability of plant nutrients such as sulphur and calcium. Gypsum is the cheapest source of sulphur and calcium. As Rajasthan is major R&M and Groundnut growing state, the increased availability of sulphur due to gypsum application will also enhance the yields of R&M in following season. The improvement in pH also helps in increasing the availability of all plant nutrients leading to higher production and quality improvement in kharif crops especially in oilseed and pulses.

Green manuring of Dhaincha

In salt affected soils alike of Rajasthan, green manuring with bulky organic matter crops like Dhaincha is the best option to improve the soil physical and chemical properties and soil fertility. This will also add nutrients in soil and help minimising over dependence on chemical fertilizers. Wherever irrigation facilities are available and farmers can afford to it, sowing of dhaincha for green manuring should be done in April-May. In rainfed areas, it should be done at the onset of monsoon. The seed rate of 60 kg/ha should be used for green manuring. The green crop of about 35-40 days stage (before flowering) should be ploughed down and incorporated in the soil with the help of rotavator or mouldboard plough. The optimum moisture in soil conditions should be maintained at the time of dhaincha incorporation in soil.

Arrangement of Quality Seed

Seed is the basic input for crop production. The farmers should arrange the quality seed of improved varieties or hybrids before the onset of sowing season. While purchasing the seed from any seed agency the labels of certification (foundation/certified /truthfully label) should be verified and ensured. Farmers are advised to contact and purchase quality seed from their nearby KVKs, Agricultural Research Stations, SAUs, different ICAR Institutes and State Seed Corporations and Cooperative societies. The new seed purchased authorised seed producing and marketing agencies are treated with fungicides and insecticides. Attempt should be made to purchase the treated seeds only. In case the seed is not treated, the same should be treated in the sequence of fungicide-insecticide -rhizobium (FIR) System before sowing.

Water Management

Rajasthan is a water-stressed state and water is the most critical natural resource for crop production. The land levelling using laser leveller in canal areas helps in enhancing uniform application of water wherever surface irrigation. This is the appropriate time for Laser land levelling. Farmers in canal network areas of Hanumangarh, Sriganganagar and Hadouti Region of Rajasthan are advised to go for land levelling through laser land leveller during the months of May and June.

The farm ponds with plastic surface lining to control the seepage losses of stored water is the best solution for collection of excess rainwater during monsoon and recycling the same for life saving irrigation at different critical crop growth stages, in case rainfall deficiency or prolong dry spell conditions occur. These two months are the most appropriate time for construction of on-farm water ponds and their plastic lining. This will provide a semi-permanent solution to farmers for several years against moderate drought like situations in rainy season and protect field crops water stress.

Integrated Farming System and Organic Farming

The farmers adopting organic farming, should arrange all the organic inputs like FYM, organic manures, biofertilizers, etc. in advance. Apply organic manure and FYM at least 15 days in advance of sowing. Care should be taken to use only well decomposed organic manure. Raw dung and undecomposed organic manure may lead to attack of termites and other insects. The organic farming work plan should be prepared for kharif season. The nearby KVK may help the farmers in providing proper advisory and guidance on organic farming and appropriate IFS Models as per availability of farm resources and infrastructure and marketing opportunities.

CEREAL CROPS

Bajra

Time of Sowing: Mid-June to late July depending upon the onset of monsoon and pre-monsoon showers. In case of patchy plant stand or low plant density, transplant healthy seedlings about 2-3 weeks after sowing in the gaps.

Seed Treatment: To prevent seed- and soil-borne diseases, treat seeds with *Trichoderma harzianum* (4 g/kg seed) or with Thiram 75% WP dust (3 g/kg seed) before planting. To control smut, treat seed with fine sulphur (300-mesh) @ 4 g/kg. To remove ergot (sclerotia) from seed, soak the seeds in a 20% salt (NaCl) solution for about 5 minutes and discard any floating grains (these may be ergot-infected). Rinse the remaining seeds, dry them, and then treat with Ceresan (Carboxin) or Thiram (1-2 g/kg seed) as a protective fungicide.

Seed Rate: Use about 4-5 kg of seed per hectare. Adjust the rate upward on light, sandy soils or with late sowing to ensure an adequate plant population.

Recommended Varieties: Use high-yielding hybrids and composites tolerant to downy mildew and have bird-resistant spike bristles as: Raj-171 (composite), RHB series: 154*, 177, 223, 233, 234 (hybrids), MPMH series: 17, 21, 35, 42, Other hybrids: HHB-67 (Improved), HHB-299, PC-701, Dhanshakti, ICMH-356, GHB-905, Other recommended varieties: RHB-90, RHB-121, RHB-127, RHB-173; CZP-9802; MBC-2; GHB-538; GHB-719; GHB-744; GHB-732; HHB-197.

*Note: RHB-154 is specifically recommended for regions with very low rainfall (<400 mm per year).

Nutrient Management: Low rainfall (<600 mm): Apply 40 kg N/ha + 20-30 kg P2O5/ha. High rainfall (>600 mm): Apply 90 kg N/ha + 30 kg P2O5/ha. On light sandy loam soils, apply half the nitrogen at sowing and side-dress the remaining N

25-30 days after sowing; apply the full phosphorus dose at sowing. On zinc-deficient soils, apply zinc sulphate at 25 kg/ha (21% Zn) or 15 kg/ha (33% Zn). Alternatively, spray 0.5% zinc sulphate (33% Zn) once at the tillering stage. During prolonged dry spells, skip the nitrogen top-dressing and instead spray a 2% urea solution as a foliar feed.

Water Management: If irrigation is available, apply water during critical growth stages: at tillering, flowering, and grain filling. This is especially important under extended dry periods to avoid moisture stress.

Weed Management: Two hand weeding (hoeing) at 20 and 25 days after sowing (DAS). This removes competing weeds and helps conserve soil moisture. Otherwise, apply Atrazine 50% WP at 0.5 kg/ha as a pre-emergence herbicide, and follow with one hand-weeding later.

Pest and Disease Management: Termites and White Grubs: Apply Fipronil 0.3G (granular insecticide) in the seed furrow at sowing (12 kg/ha) to protect young seedlings. Downy Mildew: Treat seeds with Mancozeb (e.g., Dithane Z-78 or M-45) at 2 kg/ha (as a seed dressing) before planting to prevent seed-borne infection. Smut: Treat seeds with Ceresan (Carboxin) or Thiram at 1-2 g/kg or with fine sulphur (300-mesh) @ 4 g/kg to prevent kernel smut.

Maize

Time of Sowing: Last week of May to end of June. In fields, which are prone to damage through water stagnation, sow the crop in end of May to early June, to allow the crop gets firmly established before the rains.

Seed Treatment: Seed treatment with Carbendazim 50% WP or Thiram 75% WP @2.0-2.5 g/kg of seed or Captan @2g/kg seed will help against seed-borne and soil-borne fungal diseases. Seed treatment with Imidacloprid 600 FS @5ml/kg seed controls the early shoot fly or termites. Seeds are treated with *Azospirillum* (600 g) and *Phosphobacterium* @200 g/10 kg seed to enhance the availability of nitrogen and phosphorus.

Improved Varieties: Pratap QPM Hybrid Maize- 1, HQPM Hybrid -1, HQPM Hybrid -5, Bio-9682, Bio-9544, Pratap Raj Hybrid Maize-1095, Mahi Dhawal, DHM 117, Pratap Hybrid Maize-3, Pratap Maize-9, PEHM-2, Pratap Hybrid-1, DHM-121, IQMH -203, IMHB-1532, DMRHP-1402, LPCH-2, LPCH-3, GM-6, Mahi Kanchan, Madhuri, Pratap Kanchan, Pratap Maize Hybrid -6

Seed Rate and Spacing: Sowing of 20-25 kg seed per ha is advised with 60 cm row to row spacing and 25 cm plant to plant spacing. In high rainfall area sowing in ridge - furrow is recommended.

Nutrient Management: Apply 10-15 t/ha organic manure/compost to improve soil structure and nutrient availability. Apply 90-120 kg of nitrogen and 40 kg of phosphorus per ha under irrigated conditions. In rainfed conditions, apply 60-90 kg of nitrogen and 35-30 kg of phosphorus per ha. Apply one-third nitrogen and a full dose of phosphorus 10 cm deep in soil at the time of sowing. The remaining half dose of nitrogen 30 days after sowing, and the third dose after the emergence of tasselling and well mixed in soil. Care should be taken to ensure no direct contact of fertilizers with seed at the time of sowing.

Water Management: Adequate water-supply is essential throughout the crop season particularly during the pre-tasselling, silking and grain filling stages, if no rain during this stage.

Weed management: Spray 1-1.5 kg a.i. atrazine 50 WP (atrazine) per ha on medium to heavy textured soils immediately after sowing using 500 litres of water followed by Tembotrione 42 SC 120 g a.i. per ha in 500 litre of water after 25-30 days after sowing hoeing/interculture at 15 to 30 days after sowing. For the control of broad leaf weed, apply 900 g per ha 2,4-D ester 38 EC in 450 litres water at 30-35 days after sowing.

Plant Protection: Fall armyworm: Spray the crop with chlorantraniliprole 18.5 SC @ 200 ml or spinetoram 11.7 SC 250 ml or emamectin benzoate 5 SG 200 g in 500 litres of water per ha, for crop up to 20 days old. Maize stem borer: Apply Phorate 10 G or carbofuran 3% granules @ 7.5 kg per ha in the shoot of the plant after 16 to 30 days after sowing. Alternatively, spray 10% solution of neem leaves/kernels after 10-20 days of germination. Armyworm and grasshoppers: Apply Methyl Parathion 2% power @25 kg per ha, summer ploughing in fallow land is advised. Aphids: Apply methyl demeton 25 EC @1 liter per ha in 500 litre of water at the time tasseling. Maydis leaf blight: Spray mancozeb or propinab or carbendazim 0.2 percent solution, repeat the spray in 10-15 days.

Rice

Time of Nursery Sowing: The ideal window for paddy nursery sowing in Rajasthan is 20 May to 20 June.

Seed Rate and Seed Treatment: 20-25 kg/ha seed is sufficient for transplanting. Treat the seed with Sprint 75 WS (carbendazim + mancozeb) by making slurry of 3 g fungicide formulation in 10-12 mL water for one kg seed (24 g fungicide in 80-100 mL water for 8 kg seed) before sowing.

Nursery Raising: Prepare 1.0-1.5 m wide nursery beds. Generally, 400-500 m2 nursery area is sufficient for transplanting in one ha area. Paddy nursery can be raised in second fortnight of May and 24-25 kg seed is sufficient for transplanting in one ha area. In nursery paddy seed should be covered properly with sand or with mixture of sand and manure, nursery bed should be always moist without standing water.

Suitable Varieties: PR-126, PR-106, PR-1121, BK-190, PB-1718, PB-1509, PB-1885. These varieties offer a mix of high yield, stress tolerance, and market preference.

Transplanting: Manual transplanting: Transplant the seedlings in lines, 2-3 seedlings per hill at a spacing of 15 x 15 cm, Depth of transplanting should not be more than 2-3 cm. Mechanical transplanting: Done by paddy transplanter in puddled and un-puddled conditions. Raising of mat type nursery is required

Fertilizer Management: Medium duration varieties & Hybrids (e.g., PB-1718, PB-1509): 150 kg N, 60 kg P_2O_5, 60 kg K_2O, 25 kg Zinc sulphate per hectare. Early Duration Varieties (e.g., PR-126): 120 kg N, 60 kg P_2O_5, 60 kg K_2O, 25 kg Zinc sulphate per hectare.

Application Schedule: Apply the full dose of P, K, Zn, and one-third of N at the time of puddling. The remaining two-thirds of N should be top-dressed in two equal splits at 3 and 6 weeks after transplanting. Incorporate 15 tons of well-decomposed FYM/ha before transplanting.

Weed Management: Apply 30 kg butachlor or 15 kg thiobencarb granules/ ha in 4-5 cm deep water at 2-3 days after transplanting. Apply 3.0-liter butachlor 50 EC or thiobencarb EC or 1325 ml Anilophose 30 EC or 2.0-liter Pretilachlor 50 EC or 125 g oxydiazon 80 % WP after mixing with 150 kg sand and broadcast in standing water at 2-5 days after transplanting. Apply 20 g ready mix of metsulphuron and chlorimuron or 125 g ethoxysulphuron 15 % WG or 1 kg 2,4-D ester at 20-25 days after transplanting for the control of broad leave weeds. Broad leaved weeds can also be managed by application of 93.75 ml/ha in 500 liters of water phenoxulam 24 % SC at 8-12 days after transplanting. Apply 250 ml bispyribac sodium 10 % SL/ha in 500 litres of water at 15-25 days after transplanting to manage mix weeds flora in rice.

Plant Protection: Coragen (Chlorantraniliprole) 18.5 SC @150 ml/ha, Fame (flubendiamide) 480 SC@ 50 ml/ha for rice stem borer and leaf folder. Ulala (flonicamid) 50 WG @ 150 g/ha and Osheen (Dinotefuran) 20 SG @ 200 g/ha for plant hoppers. Nativo (trifloxystrobin+tebuconazole) 75 WG @200 g/ha in 500 L of water for BLB. Awancer Glow (azoxystrobin 8.3 % + mancozeb 66.7 %) 75 WG @ 1.5 kg/ha for sheath blight. Amistar Top (azoxystrobin + difenoconazole) 325 SC @ 500 ml in 500 L water per ha for blast.

Jowar

Time of Sowing: Optimum period of sowing is mid-June to mid-July; Early green fodder- 2nd fortnight of March- 1st fortnight of April.

Improved Varieties: Hybrids: CSH 1,5,6,9,10,11, Varieties: SPV 96, 245, 462, 475, CSV 15, 17, 23, Pratap Jowar 1430, Fodder purpose: (i) Multi-cut: MP chari, SSG 59-3, (ii) Single cut: Raj Chari 1, 2, and Pratap Chari 1080

Seed Rate & Spacing: Grain purpose: 12-15 kg/ha at 45 cm line spacing. Fodder Purpose: 35-40 kg per ha at 25-30 cm line spacing.

Fertilizer Application: Apply 50 kg of N and 20 kg P_2O_5 per hectare in rows at the time of sowing under rainfed and low rainfall conditions. Apply 50 kg of N and 20 kg P_2O_5 per hectare at the time of sowing and another 50 kg N per hectare about one month later under irrigated conditions.

Plant Protection: Seed treatment with Slayer (thiamethoxam) 30 FS @10 ml/kg seed for the control of shoot fly. Seed treatment with Sulphur dust @ 4 g/kg seed for grain smut.

PULSE CROPS

Mung bean

Sowing Time: Last week of June to first week of July depending upon the rainfall and moisture in the soil profile.

Seed Rate & Spacing: Seed rate of 15-20 kg/ha is recommended. Row to row spacing should be maintained at 25-30 cm and plant to plant at 10 cm.

Seed Treatment: Prior to sowing treat seed with Thiram @3g/kg, Imidacloprid @5ml/kg. Also treat with T*richoderma* or *Pseudomonas*@5-10g/kg seed, then inoculate with *Bradyrhizobium*@25 g/kg seed.

Improved Varieties: MH-1142, MH-421, IPM-410-3 (Shikha), IPM-205-7 (Virat), GM-7, GM-6 & GM-4.

Fertilizer Management: Fertilizers and micronutrients should be applied based on the soil test. In case of soil tests are not available, apply 15-20 kg N, 40-50 kg P_2O_5, 20 kg K_2O, 20 kg S per ha at the time of sowing as basal application. Zinc sulphate @25 kg/ha should be applied at every 2-3 years, and 0.5 g/kg sodium molybdate.

Water Management: Irrigate once or twice if dry spells prevail for 10-15 days especially between flowering and pod formation and grain development stages. Light irrigation is recommended. Critical stages for irrigation are flowering and early grain formation/pod filling stages.

Weed Management: The critical weed control period is 15-35 DAS. Hand weeding at 20-25 DAS and 35-40 DAS, or using hand hoes/mechanical weeders, is effective. Apply Pendimethalin 30% EC (1.0-1.25 kg a.i./ha) as pre-emergence within 2 days of sowing for broadleaf and grass weeds, and Imazethapyr 10% SL (75-100 g a.i./ha) as post emergence at 15-20 DAS for 2-4 leaf stage weeds.

Plant Protection: Whitefly can be managed by growing barrier crops (maize, sorghum), using 10 sticky traps/acre, removing weed hosts (Parthenium, Croton), and spraying Thiamethoxam 25 WG (100 g/ha) or Imidacloprid 17.8 SL (0.3 ml/litre) at early infestation. Aphids' population can be minimised by spraying with Neem oil 2% as a preventive bio-insecticide or Dimethoate 30 EC @ 1 ml/litre. Jassids/ leafhoppers control by spray with Acetamiprid 20 SP @ 0.2 g/litre or Imidacloprid 17.8 SL @ 0.3 ml/litre at ETL. Thrips managed by avoiding dense sowing and spraying Spinosad 45 SC (0.3 ml/litre) or Fipronil 5 SC (1.5 ml/litre). For pod borer management use of pheromone traps (5/acre for adult moths), spray of Emamectin benzoate 5 SG @ 0.4 g/litre or Spinosad 45 SC @ 0.3 ml/litre at flowering to pod formation stage is recommended.

Disease Management: For yellow mosaic virus, control the whitefly vector by spraying Thiamethoxam 25 WG (100 g/ha) or Imidacloprid 17.8 SL (0.3 ml/litre) at early infestation. To reduce the Cercospora leaf spot & Anthracnose incidence, spray of Mancozeb (0.25%) or Carbendazim (0.1%) at first symptom appearance, or treatment of seeds with Thiram/Captan @ 2.5 g/kg is beneficial. To control Root rot and Wilt, crop rotation with non-host crops should be taken and seed treat with Trichoderma viride (4 g/kg seed) or carbendazim is recommended.

Urd bean

Time of Sowing: Urd bean is advised to be sown with the onset of the monsoon, ideally between mid-June and early July, but can be extended until end of July in case of delayed rains.

Seed Rate & Spacing: For sole cropping, a seed rate of 15-20 kg/ha is recommended, while for intercropping, use 8-10 kg/ha. The ideal spacing (R x P) is 30-40x10 cm to optimize growth and yield.

Improved Varieties: Mukundra Urd-2, Kota Urd-4, Kota Urd-3, KU 96-3 (Azad Urd-3), Pratap Urd-1, Pratap Urd-2.

Fertilizer Management: Apply 20 kg nitrogen and 40 kg phosphorus per ha before sowing; use half the dose in rainfed conditions. For zinc-deficient soils, apply 25 kg/ha zinc sulphate or spray 0.5% zinc sulphate with 0.25% lime at 30 and 45 days after sowing. Use 250 kg/ha gypsum before sowing, and apply potassic fertilizers based on soil tests in potassium-deficient soils. A foliar spray of NPK (18:18:18) at flowering boosts yield.

Weed Management: Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix product) @ 0.75 kg a.i./ha (commercial dose: 2.3 liters/ha) can be applied before crop germination for effective weed control. Imazethapyr 10% SL @ 55 g a.i./ha can be sprayed 15-20 days after sowing when adequate soil moisture is available for post-emergence weed control. Sodium Acifluorfen 16.5% + Clodinafop Propargyl 8% EC (ready mix product) @ 187.5 g a.i./ha (commercial dose: 750 ml/ha) controls both broad leaf and narrow leaf weeds effectively when applied 15-20 days after sowing.

Plant Protection: Yellow Mosaic Virus can be managed by growing resistant varieties and controlling whiteflies using Thiamethoxam 25 WG @ 100 g/ha or Imidacloprid 17.8 SL @ 150 ml/ha. Powdery Mildew is controlled by spraying Sulphur 80 WP @ 2.5 kg/ha or Karathane @ 0.1%. *Cercospora Leaf Spot* is effectively managed by spraying Mancozeb 75 WP @ 2.5 g/L or Carbendazim 50 WP @ 1 g/L. Root Rot and Wilt are controlled by seed treatment with *Trichoderma viride* @ 4 g/kg seed and soil drenching with Carbendazim @ 1 g/L. Whiteflies, aphids and thrips can be effectively managed by spraying Thiamethoxam 25 WG @ 100 g/ha, Imidacloprid 17.8 SL @ 150 ml/ha, Fipronil 5 SC @ 1 L/ha or Dimethoate 30 EC @ 500 ml/ha. Pod borer (Helicoverpa armigera) can be managed with Spinosad 45 SC @ 75 ml/ha or Indoxacarb 15.8 EC @ 333 ml/ha.

Pigeonpea

Time of Sowing: Sowing begins in May and continues till August, but late sowing increases pest and disease risk. June month is the optimal time for sowing.

Seed Rate & Spacing: For sole cropping, use 12-15 kg seed/ha; for intercropping, 6-7 kg/ha of seed can be used. Maintain 40-50 cm row spacing for early and 50-60 cm for late-maturing varieties.

Improved Varieties: Prabhat, PAU-881, IPA-203, Pant Arhar-6, AL-882, ICPAL-88039, ICPAL-87.

Fertilizer Management: Apply 20 kg/ha N, 60 kg/ha P as basal application with sowing and 5 t/ha FYM. Treat seeds with Rhizobium and PSB. For better yield, apply 60 kg sulphur per and 25 kg zinc sulphate heptahydrate (21% Zn) per ha or 15 kg monohydrate (33% Zn) per ha in deficient soils.

Weed Management: For effective weed control, apply Pendimethalin @ 0.75 kg a.i./ha pre-emergence. Perform manual weeding at 20-25 and 45-50 days after sowing. Use Imazethapyr @ 100 g a.i./ha post-emergence at 20-25 days to control broadleaf and grassy weeds.

Plant Protection: Pod borer: Apply chlorantraniliprole 18.5 SC @ 150 ml/ha followed by flubendiamide 480 SC @ 125 ml/ha or Spinosad (150 ml/ha) at

flowering and pod initiation. Blister beetles: Deep ploughing, field sanitation, light traps, and neem-based products (NSKE 5% or Azadirachtin 0.03% WSP @ 2500-5000 g/ha).

Disease Management: Sterility mosaic virus: Use resistant varieties and remove infected plants early to limit virus spread. Spray Neem oil (5 ml/litre) or NSKE 5% every 15 days. Seed treatment with Imidacloprid 70 WS (5 g/kg seed) helps protect seedlings. *Alternaria* blight: Mancozeb (2.5 g/litre) or Carbendazim (1 g/litre), planting on raised beds for better drainage, and using resistant cultivars. *Phytophthora* blight: seed treatment with Metalaxyl (8 g/kg), maintaining good drainage, minimizing stem injury, and using resistant genotypes.

Moth bean

Time of Sowing: Ideal time of sowing of mothbean is first week of July after the onset of monsoon rains in rainfed areas. Apply 25 kg/ha Quinolphos 1.5% in termite-affected fields.

Seed Rate & Spacing: Sowing done by using 12-15 kg/ha of seed. Before sowing treat seed with Thiram/Captan (3 g/kg), Imidacloprid (5 ml/kg) and *Rhizobium + PSB* (5-7 g/kg) by mixing well and dry in shade, and sow with 30x15-20 cm spacing (RxP) for early varieties and 45x15-20 cm for late varieties.

Improved Varieties: RMO-257, RMO-225, RMO-435, RMO-423, RMO-40, RMO-2251, CAZRI Moth-2, CAZRI Moth-3, CAZRI Moth-4, CAZRI Moth-5 etc.

Manure & Fertilizers: Incorporate 4-5 t/ha well decomposed FYM one month before sowing; at the time of sowing use of basal dose of 15-20 kg N and 35-40 kg P_2O_5/ha is recommended. Spraying of 1% NPK and 500 ppm thiourea at flowering improve podding of crop.

Water Management: Mostly, it grown in arid/rainfed areas; irrigate once at pod development during dry spells. In irrigated areas, two irrigations at branching/flowering and pod formation can be given to enhance productivity.

Plant Protection: Termite: Apply quinalphos/chlorpyrifos dust @20-25 kg/ha at ploughing and treat seeds with Chlorpyrifos @2 ml/kg. Apply Methyl Parathion 2% dust @20-25 kg/ha against cutworms. Jassids- spray Imidacloprid @500 ml/ha is advised. Pod borer: Apply malathion 50 EC, or quinalphos 25 EC @ of 0.5 liters per ha, or broadcast quinalphos 1.5% dust at 20-25 kg per hectare.

Disease Management: Yellow mosaic virus: control whitefly vector by spray of Dimethoate 30 EC or Metasystox (Oxydemeton-methyl) at 0.5 liters per ha along with 0.5 liters of Malathion per ha, using 500 liters of water for uniform coverage. Bacterial bacterial spot: spray a solution of 200 grams of Agrimycin/ha, mixed with 500 liters of water. Soak seeds in 100 ppm *Streptocycline* for one hour, then treat with 2 g/kg *Streptocycline* before sowing. For stem blight, spray a solution of 2 kg of Mancozeb dissolved in 500 liters of water per ha is effective. For leaf curling disease, spray a solution of 750 ml of Dimethoate 30 EC or Methyl Demeton 25 EC dissolved in 500 liters of water per hectare. A second spray should be applied 15 days later. For control of angular leaf spots, spray a solution of 500 grams of Carbendazim dissolved in 500 liters of water per ha. Prior to sowing, treat the seeds with 3 grams of Captan

or 2 grams of Carbendazim per kilogram of seed. To control dry root rot, treat seeds with 2.0 g of Carbendazim or Thiophanate Methyl (70 WP) per kg of seed. Mix 10 g of *Trichoderma* per kg of seed along with 8-10 kgs of *Trichoderma* mixed with 400 kgs of moisture-rich farmyard manure. Keep mixture in shade for approximately 72 hours, and then apply it to the soil at a rate of per hectare.

Cluster bean

Time of Sowing: Under rainfed conditions, sowing should coincide with the onset of the monsoon, ideally within the first two weeks of July. Delays beyond first fortnight of July may lead to a noticeable decline in yield. In irrigated areas, sowing can be extended until the end of July.

Seed Rate & Spacing: Seed rate of 15 kg/ha is recommended, prior to sowing treat seeds with *Trichoderma* @ 4 g/kg or fungicides such as mancozeb or carbendazim @ 2 g/kg of seed, followed by chlorpyrifos @ 2 ml/kg of seed to deter termite attacks.

Improved Varieties: RGC 1038, RGC 1017, RGC 936, RGC 1002, RGC 1003, RGC 1033, RGC 1055, RGC 1066, Karan Guar 1 (RGr 12-1), Karan Guar 14 (RGr 18-1), and Karan Guar 15 (RGr 20-15). These varieties are suitable for semi-arid conditions and have high gum content.

Fertilizer Management: Application of 2.5 t/ha of compost or FYM 15 days before sowing. At sowing, apply 10 kg N and 20 kg P_2O_5/ha as basal application.

Water Management: Lifesaving irrigation during flowering and seed formation should be given if rainfall is deficient. Spraying with 0.1% thiourea at 25 and 45 DAS can boosts yield under moisture stress.

Weed Management: Two manual weeding at 25 and 45 DAS are usually sufficient. Apply Pendimethalin (2.5-3.3 L/ha) within 2 days of sowing as pre-emergence, and Imazethapyr (400 g/ha) at 20-25 DAS as post-emergence for effective weed control.

Plant Protection: For termites' control in standing crops, mix Chlorpyriphos @ 1.25 L/ha or Fipronil 0.3% GR @ 20-25 kg/ha with irrigation water. Application of Imidacloprid, Dimethoate, or Malathion @ 0.75-1.25 ml/L of water effectively controls sucking pests like jassids, aphids, and whitefly.

Disease Management: To manage bacterial blight effectively spray with *Streptocycline* @ 5 g or *Plantomycin* @ 50 g in 100L water per ha at 35-40 days after sowing is beneficial. For *Angular leaf spot* and *Anthracnose* management, spray of Zineb @ 2kg in 500L water per hectare at 15-day intervals, at least twice is recommended. Powdery mildew can be controlled by spraying wettable sulphur (e.g., Sulfex) @ 2-3kg/ha, dusting sulphur powder @ 20-25kg/ha, or spraying Dinocap @ 1.5 ml/litre of water.

OILSEED CROPS

Groundnut

Time of Sowing: Rainfed Groundnut: Sowing with the onset of monsoon in the last week of June or in the first week of July. Irrigated Groundnut: Sowing to be done around 20th June or 10-12 days before the onset of monsoon with a pre-sowing irrigation.

Seed Treatment: Treat seed with fungicide Thiram @3 gm or carbendezim @1 gm + Thiram @2 gm or Mencozeb @ 2 gm per kg of seed. For control of termite seed treatment with chlopyriphos 20EC @ 4 ml per kg seed. For seed treatment *Trichoderma* @10 g or *Carbendazim* 50 WP @2 g or Tebuconazole 2 DS/kg @ 1.5 g seed kernel may be used before sowing for soil & seed borne disease. Seed should be inoculated with proper strain of Rhizobium culture particularly in those places where groundnut is to be grown for the first time.

Improved Varieties: GJG-37, RG-559, GJG-32, GJG-19, TCGS-1043 (Dharani), HNG-123, RG-425, RG-510, JL-501, Mallika (ICHG-00440), HNG-69, GJG-31, GJG-9, RSV-87, RS-138, JL-524, RG-141 are cultivated mostly.

Bio-fortified Varieties: Girnar-4 & Girnar-5 (Rich in Oleic acid).

Seed rate & Spacing: Spreading Type Varieties-80-100 kg/ha (45x10 cm); Bunch Type varieties-100-110kg/ha (30x10 cm)

Manure & Fertilizer: Apply FYM or compost @ 10-15 t/ha about 15-20 days before sowing. N:P: K @ 20:60:30 kg/ha. Basal application of fertilizers i.e., placing the fertilizers about 4-5 centimeter in the side of the seed and 4-5 centimeter below the seed at the time of sowing. Apply gypsum @ 375 kg/ha for proper development of pods and kernels.

Water Management: Pod development stage of groundnut is the most critical for water stress. Farmers should avoid moisture stress at this stage. In case drought or no rainfall, one irrigation should be given at pod development stage.

Weed Management: Major weed in Groundnut are *Amaranthus viridis, Digeria arvensis, Euphorbia hirta, Cyperus rotundus, Dactyloctenium aegypticum, Trianthema portulacastrum, Phyllanthus niruri*. To control these weeds following weed management practices should be adopted.

Pre Emergence: Pendimethalin 30% EC @1-2 Litre/ha, Oxiflorophen @ 0.25- 0.50 g a.i. per hectare and Diclosulam 22-26 g a.i. per hectare in 500-600 Litre water. Fluchloralin (Basalin) @ 1 kg a.i. per hectare dissolved in 800-1000 litres of water can also be used as pre-planting spray.

Post Emergence: Quizalofop-ethyl @ 0.050 g a.i. per hectare, Imazathayper @ 0.050 g a.i. per hectare in 500-600 Litre water.

Plant Protection: White gurb: Seed should be treated with Fipronil 5 SC @6 ml per kg of seed kernel and Clothianidin 50 WDG @1 g a.i. per kg of seed before sowing. Imidacloprid 17.8 SL @300 ml per hectare at 22 DAS. Biological Control by *Beauveria bassiana* @ 0.5 g/m^2 mixed with water in furrows at 15 days after sowing (DAS). Stem rot, collar rot, dry root rot, late leaf spot and rust: Seed treatment with Tebuconazole 2DS @1.5 g/kg of seeds or with *Trichoderma sp.* @10 g/kg of seed followed by furrow/soil application of *Trichoderma viride* @ 4 kg enriched in 250 kg FYM/ha. Thrips: Spray Malathion 5% powder @ 1 kg per hectare or dissolve 800 ml of Malathion 50 EC or 750 ml of Methyl Demeton 25 EC in water and spray. Bud necrosis: Treat the land with Carbofuran 3G @15 to 20 kg per hectare before sowing and spray Monocrotophos @1 ml per litre of water after 21 DAS. Termite: Apply Chloropyrifos @ 4 litres per hectare along with irrigation water.

Soybean

Time of Sowing: Soybean sowing should be sown by 15th June where irrigation facility is available. If irrigation facility is not available, sowing should be done with onset of monsoon.

Improved Varieties: Improved varieties are- NRC 138, RVSM 2011-35, JS 20-116, JS 20-98, JS 20-94, JS 335, NRC 127, JS 93-05, Pratap Soya 1, Pratap Soya 2 (RKS 18), Pratap Raj 24 (RKS 24), JS 97-52, JS 95-60, Pratap Soya 45 (RKS 45), JS 20-34, JS 20-29 and RKS 113

Seed Rate: 80-100 kg/ha.

Spacing: Row-to-Row spacing 30-45 cm and plant to plant 10 cm.

Seed Treatment: Treat the seeds with Carbendezim or Thiram @ 2g/kg of seed 24hrs before sowing or with talc formulation of *Trichoderma viride* @ 4 g/kg seed (or) *Pseudomonas fluorescens* @ 10 g/kg seed.

Fertilizer Application: Apply 20 kg N, 40 kg P_2O_5 phosphorus and 40 kg K_2O per ha before sowing. If the seeds not inoculated with *rhizobium* culture than use 40 kg nitrogen per ha. To get higher yield of soybean foliar spray of water-soluble N:P: K (19:19:19 or 17: 44: 00) @ 0.5% (5 g per litre of water) at 45 and 60 days after sowing is recommended. Soil incorporation of 30 kg sulphur/ha through gypsum before sowing and 1.0 kg boron per ha (borax@ 5 kg/ha) in boron deficient soil should also be done.

Water Management: Flowering and pod formation stage in soybean are the most crtical for water stress, 1-2 irrigations should be applied as per the need.

Weed Management: Pre emergence application of Pendimethalin 30 EC at 1.0 kg a.i. per ha (commercial dose 3.3 liter per ha) and one hand weeding at 30-35 days after sowing. Post emergence application of Sodium Acifluorfen 16.5 % + Clodinafop Propargyl 8 % EC (ready mix) at 1000 ml per ha at 20-25 DAS effectively control the narrow as well as broad leaf weeds.

Plant Protection: Stem Fly: to manage apply Quinolphos 25 EC @ 1.5 litre per ha or Thiamethoxam 12.6% + Lamdacyhalothrin 9.5% ZC@ 125 ml per ha. Gridle Beetle: can be manged by application of Dimethoate 30 EC @ 1.0 litre per ha or Thiacloprid 21.7 SC @ 750 ml per ha. Defoliators (Green semilooper, Tobacco caterpillar & gram pod borer): can be manged by application of Spinetoram 12 SC @ 450 ml or Quinolphos 25 EC @ 1.5 litre or Emamactin benzoate 5 SG @ 180 gm or Indoxacarb 15.8 EC @ 300 ml per ha. Seedling Rot: The disease results in poor seedling emergence because of seed rotting. The seed treatment with Thiram at 3.0 g/kg of seeds is beneficial. Pod Blight: The pods of affected plant turns yellowish green and later on dry up. The grain becomes shrivelled and mould. Use of resistant varieties, sowing of crop in rotation and spray of 0.5 per cent Zineb can control the disease.

Yellow Mosaic Transmitted by white fly (*Bemisia tabaci*). The disease is dangerous and widely spreads. Spray Metasystox 0.2 per cent at 10-15 days interval controls the vector effectively.

Sesame (Til)

Time of Sowing: Sowing with onset of monsoon and to be completed before mid-July. Crop is highly sensitive to water logging conditions; therefore, proper drainage facilities are must for higher productivity.

Seed Treatment: For management of seed borne diseases treat seed with Thiram 2 g/kg + Carbendazim 1 g/kg or *Trichoderma viride* 5 g/kg seed. For bacterial blight management soak the seed for 30 minutes in 2 gm solution of *Streptomycin* in 10 litre of water prior to seeding. By treating seed with *Azotobacter and PSB* fertilizer 25% nitrogen and phosphorus can be saved.

Improved Varieties: RT- 392, RT- 372, RT-346, RT-46, RT-125, RT-127, RT-103, RT-35, TC-25 (spreading type), Pratap (C-50), etc.

Seed Rate: For branching types, the seed rate is 2-2.5 kg per ha with plant geometry of 30-35 cm x 15cm. For non-branching types of varieties (Pratap) the seed rate 4-5 kg per ha with plant geometry of 30 cm x10-15 cm.

Nutrient Management: Farmyard manure or compost is applied @ 20-25 tons per ha 15-20 days before sowing. In sufficient rainfall areas, 25 kg phosphorus and 20 kg nitrogen should be given in furrows at the time of sowing 4-5 cm below the seed. After 4 to 5 weeks, the remaining nitrogen sprinkled during light rain. In areas with less rainfall, reduce the amount of fertilizer and use phosphorus based on soil test. In zinc deficient fields, spray 0.5 percent zinc sulphate plus 0.25% lime solution at 50 days after sowing. Use of gypsum 150 kg/ha can increase the yield as well as oil content in sesame.

Water Management: Sesame is very susceptible to drought at various physiological growth stages. The crop requires about 50 cm of water during the entire growth period. Usually, no need to irrigation is required if rains are well distributed. However, in case of long dry intermittent spells, adequate moisture in soil should be maintained with light irrigations.

Weed Management: First weeding at 20-25 DAS & Second weeding at 30-45 DAS. Fluchloralin (Basalin) 1 kg a.i. /ha in 800-1000 liters water as pre-planting effectively manage weeds.

Plant Protection: *Phyllody:* two time spraying of Dimethoate 25 EC @ 750 ml or Quinalphos 25 EC @ 1 litre per ha, first at 25-30 DAS or second at 40-45 DAS. Alternatively spray 5 % neem leaf solution twice @ 21 & 35 DAS. Leaf & pod borer: spray quinalphos 25 EC @ 1-1.5 litre per ha in 500-700 liters of water and repeat at an interval of 15 days as per requirement. Hawk moth and Gall fly: Apply Quinalphos (1.5%) powder @ 25 kg per ha. Blight: spraying mancozeb @ 1.5 kg or captan @ 2 kg per ha at the interval of 15 days.

COMMERCIAL CROPS

Cotton

Sowing: The cotton performs well when sown between first week of May to third week of May. The best time of its sowing is before 15 May.

Seed Rate and Spacing: *Desi (arboreum):* 12-15 kg/ha; (120 x 60 cm), *American (Narma):* 8.75-10 kg/ha; (90 x 45 cm), *Hybrid Bt cotton:* 2.4-3.0 kg/ha (75 x 30 cm). These spacings result a plant population of ~40,000-50,000 plants/ha. The seed should be sown at 2.5-3 cm depth and maintain 2-3 plants at point after thinning.

Seed treatment: Delinting: Dip seeds in concentrated sulfuric acid (1 L/10 kg seed) for 1-2 minutes until black. Rinse thoroughly and discard floating seeds. Dry in shade. (Use plastic containers only; wear gloves and dispose of acid safely.)

Pre-sowing Treatment: Soak dried seeds in water for 6-8 hours. Treat with fungicide (e.g., carbendazim 2 g/kg or *Trichoderma* 6-8 g/kg seed). Apply systemic insecticide (e.g., imidacloprid 70% WG at 5-7.5 g/kg seed) for early pest control.

Fertilizer Application: Incorporate 8-10 tonnes/ha well-decomposed FYM in soil thoroughly before sowing. Apply chemical fertilizers based on soil test recommendations. If no soil test is available, apply 90-100 kg nitrogen/ha for desi cotton and 100-150 kg nitrogen/ha for American cotton, divided into 2-3 split doses. Also apply 20-40 kg P_2O_5/ha at sowing. In case of Zinc deficiency, apply zinc sulfate at 25 kg/ha, or spray borax 0.1% during flowering if boron is deficient in soil.

Improved Varieties: *Desi (arboreum):* HD 123, RG 8, RG 542, CICR-1, CICR-3, KR 64. *Narma (American):* RS 875, RS 810, RS 2814, RS 2013, Bikaneri Narma. *Bt Hybrids:* RAJ H-HH-16, CSH 198, CSH 238. Buy certified seeds only and follow refuge planting for Bt cotton.

Water Management: Light irrigation within 3-4 days of sowing if no rainfall. First full irrigation can be given around 20-30 days after sowing. In water-scarce areas, use drip irrigation and mulching to retain moisture.

Plant Protection: To control leaf sucking pest & Leaf Curl Virus disease, seed should be treated with 4 g Thiamethoxam 70 WS/kg seed before sowing. Keep close monitoring on White fly host plants like vegetables, flower plants, weeds & unwanted plants and from time to time these affected host plants must be uprooted & burn. Some vegetables like Ladies Finger, Brinjal, Tomato & Chilly also act as host plants for white fly, accordingly, as per need these must be sprayed with Thiamethoxam 25 WG @ 0.5g/litre water. To control bacterial blight seed should be treated with soaking in 1 g *Streptomycin* or 10 g *Plantomycin*/10 litre water before sowing. Spray Thiamethoxam 25 WG @ 100g/ha and Profenophos 50 EC @1250 ml/ha for sucking pest. Proclaim (emamectin benzoate) 5 SG @250g/ha for pink, spotted and American bollworm

FRUIT CROPS

Pomegranate

Climate and Soil: Dry and semi-dry climate is very suitable for pomegranate production. Sandy loam soil with good drainage is the most suitable. Pomegranate plants have good capacity to tolerate salt and alkalinity.

Improved Varieties: 1. Bhagwa, 2. Sonar Lal, 3. Super Bhagwa

Planting Material: Tissue culture saplings are the best to guarantee disease-free planting material and for planting in new areas where there are no pomegranate orchards.

Establishment of Orchard: The digging of pits should be completed in May. Square and rectangular method is the easiest and convenient for planting orchards. The size of pit should be 60 x 60 x 60 cm at 4 meters rows apart. The plant to plant spacing should be 3 metres.

Planting Time: July-August is the suitable time for planting saplings. The saplings should be planted in the evening. The soil should be pressed well around the sapling after planting. The plant should be irrigated immediately after the plantation.

Post Planting Care: The pomegranate plants should be taken care for the first two years. Pruning is very important in pomegranate. Pomegranate can be pruned in two ways- 1. single stem method 2. multi stem method. The flowering and fruiting improves with pruning.

Time of Flowering and Fruiting: Pomegranate flowers three times in a year, which is known as Bahar. Commercially, only one Bahar should be taken in the whole year.

Bahar Control: Late Mrig Bahar is the best cropping in water shortage dry areas. Under late Mrig Bahar, irrigation is stopped in April-May. In the month of June, manure and fertilizers are given by digging the basins followed by light irrigation. After three days, give one heavy irrigation followed by 2-3 light irrigations till the rain comes. Thus the plant will start growing from July, flowers in July-August and fruits are harvested in January-February.

Irrigation Management: Drip irrigation method is very beneficial in pomegranate, irrigate for 1.5 to 2.0 hours at an interval of 2-3 days with drip irrigation. During fruit development, sufficient moisture should be maintained continuously in the soil and environment.

Weed Management: 2 to 3 times hoeing in a year in the ring of the plant keep the crop weed free.

Pruning in Pomegranate: Pruning in pomegranate is done twice a year. Immediately after pruning, a solution of copper oxychloride 2 grams per liter of water should be sprayed. Diseased and damaged branches should be removed from time to time.

Flower and Fruit Fall: For management, maintain proper moisture in the soil continuously. At an interval of 15 days, spray two micronutrient mixtures (zinc sulphate @ 0-6%, manganese sulphate @ 0-6%, boric acid @ 0-6% @ 2 grams per litre of water. Spray Planofix @ 4 grams per 15 litres of water.

Manure and Fertilizer: For good yield, give appropriate manure and fertilizer according to the age of the plant. Manure and fertilizer should be mixed in the soil by putting it at a depth of 15 to 20 cm in a perimeter of one to one and a half meter around the plants.

Disease and Insect Management:

Leaf Spot: spray copper oxychloride 50% WP @ 2.5 grams or thiophanate methyl 70% WP @ 1 g/L of water in the initial stage of the disease. In case of severe infestation, spray hexaconazole 5 EC @ 1 ml or difenoconazole 25 EC. @ 0.5 ml per litre of water and spray at an interval of 30-40 days.

Bacterial Leaf Blight: Fallen leaves and branches should be collected and destroyed. Apply streptomycin sulphate 90%, tetracycline hydrochloride 10% @ 0.5g, copper oxychloride @ 2.5 g per litre of water and spray.

Wilt: uproot the affected plants from the orchard and burn them. Make a solution of propiconazole 25EC @20ml in 10 litre of water and pour it in the roots of each plant. Repeat its use 3-5 times at an interval of 20 days.

Pomegranate Butterfly: Apply spinosad 45 SP @ 0.5 gram or indoxacarb 14.5 SP @ 1 ml or cypermethrin 24% EC @1 ml per litre of water, prepare the solution and spray first at the time of flowering and second spray after 15 days. During fruit development in rainy season, prepare a solution of Profenophos 40% EC @ 02 ml per litre of water and spray it twice at an interval of 15-2 days.

Thrips, Mealybug, White Fly and Aphid: In case of initial infestation, spray Dimethoate 30 EC @ 2 ml per litre of water. In case of severe infestation, prepare a solution of Fipronil 80% WP @ 02 ml or Thymethoxam 25 WG @ 0.25 gram or Imidacloprid 17.8 SL @ 0.35 ml per litre of water and spray.

Mites: Spray Dicofol @ 2.5 ml per 1 litre of water in the initial stage. In case of severe infestation, spray Fenzaquin 10 EC @ 2 ml or Abamectin 1.9 EC @ 0.5 per litre of water.

Nematode Management: African marigold should be planted around the plants or inter rows. Mix *Paecilomyces lilacinus* @ 25 gram, *Trichoderma viridi* @ 25 gram in 05 kg of cow dung manure and spray water, keep it for 15 days and put it in the roots of each plant. Apply neem cake @2 kg per basin after 10 days in roots of each plant. After 10 days, prepare a solution of Fluopyram 34.48% SC @ 2 ml or Flunesulfon 2% (Nimitz) 30-40 g in 10 liters of water and pour it in the roots of each plant. Irrigate regularly to prevent the pomegranate fruits from cracking. Add the amount of calcium with gypsum/2.5 kg after spraying Etherel and 2.0 kg at the fruit bearing stage to the roots of each plant. Prepare a solution of Boron @2.5 ml per liter of water and spray it first at the time of formation of Guti and then spray it second after one month. Spray 10g of Gibberellic Acid by dissolving it in 200 liters of water. Repeat this spraying again after 15 days.

Plucking of Fruits and Yield: Fruits should be plucked from the plant only when they are fully ripe. Fruits become ready for harvesting in about 4-5 months after flowering. Plants start bearing fruits 2-3 years after planting. But commercial production should be taken only after 4-5 years of planting. In the initial stage, only 20 to 25 fruit are obtained from pomegranate trees, but 70-100 fruits (20-25 kg) can be obtained from a well-cared fully grown plant.

Guava

In Rajasthan, guava is grown in the districts of Sawai Madhopur, Udaipur, Ajmer, Chittorgarh, Kota, Bundi, Jaipur, Jhalawar, etc.

Improved Varieties: Allahabadi Safeda, Lucknow 49 (Sardar), Lalit, Shweta, Arka Mridula, Arka Amulya, Hisar Safeda, Hisar Surkha, Punjab Pink

Planting: July to September is the ideal time for seedling transplantation. During summer days, fields must be levelled and kept weed free. Pits of 1m x 1m x 1m size are dug at a distance of 6 x 6 meters or 5 x 5 meters are dug during May-June. After keeping the pits open for 15 days, fill with a mixture of 20-30 kg of well-decomposed farmyard manure, 50 to 100 grams of Quinalphos, 50 g of Chloropyriphos, mixed into the topsoil removed from the pit. Plants should be planted at the time of evening.

Manure and Fertilizers management: Apply manure and fertilizers per plant. For young plants aged 1 to 3 years, relatively low amounts of nutrients are required, with

10-20 kg of farmyard manure (FYM), 0.05-1.5 kg of urea, 0.15-1.5 kg of super phosphate, and 0.20-0.40 kg of muriate of potash per plant. As the plant matures, nutrient demands increase. Plants aged 4 to 6 years should receive 25-40 kg FYM, 0.30-0.60 kg urea, 0.50-2.0 kg super phosphate, and 0.40-0.80 kg muriate of potash. For plants 7 to 10 years old, the recommendation is 40-50 kg FYM, 0.75-1.0 kg urea, 2.0 kg super phosphate, and 0.80-1.20 kg muriate of potash. Fully mature plants over 10 years old require the highest nutrient input with 50 kg FYM, 1.0 kg urea, 2.5 kg super phosphate, and 1.20 kg muriate of potash per plant. This gradual increase supports the growing nutrient demands as plants age and enter higher stages of fruit production. Manure and fertilizers applied in a trench around the plant at 1-meter radius and 25 cm depth on all four sides. For winter season crop, complete dose of farmyard manure, super phosphate, muriate of potash, and half dose of urea should be applied in June, and the remaining urea should be applied in September.

Irrigation: Generally, guava is a rainfed crop, but where irrigation facilities are available, irrigation should be provided to improve yield and quality. After transplanting, continue irrigation regularly to reduce plant mortality. Irrigation is essential for initial 2-3 years, irrigate at every 7-10 days interval during summer and 15-20 days interval during winters. For winter crop, start irrigation from June month repeat as per requirement during rainy season.

Intercultural Operations: After planting, keep removing the weeds by hoeing until the crop becomes strong. For the first three years except the cucurbitaceous vegetables, all types of crops like leguminous crops, leafy vegetables, brinjal, chili, tomato, cabbage, etc. can be taken.

Training and Pruning: Mainly, there should not be any branch up to 90 cm from the ground, after this allow 3-4 branches to grow in four directions. When the plant is about 1.25 meters tall, the main branch should be cut to promote branching. Once new branches reach 50 cm, prune to maintain height and repeat this after 2 or 3 years. Remove suckers and water shoots regularly.

Crop Management / Bahar Treatment: In guava three flowering and fruiting seasons occur annually, First Rainy (Mrig bahar), second Autumn (Ambe bahar) and third Winter (Hast bahar). Although the rainy season crop produces higher yields, the fruit quality is inferior, therefore, only one winter crop per year should be taken. For this make a solution of 100-150 grams of urea in one liter of water and spray it twice at an interval of 8-10 days at the time of fruit appearance in the month of April-May so that flowers and fruits fall.

Mulching: In dry areas, moisture can be conserved by covering the soil surface around the plants with plastic mulch or hay straw. This reduces water requirement by 25-30 percent and helps in preventing weed growth.

Anti-Bird Net: Guava fruits are badly damaged by birds, if not protected, the entire crop can be destroyed, hence, advised to cover the entire field with anti-bird net.

Plant Protection: Fruit fly: Prepare the temptation by mixing 10 ml malathion 50 EC in one liter of water solution with 100-gram sugar. 50 to 100 ml of this temptation put in an earthen cup and hang on the trees. Spraying of Malathian 50 EC 1 ml or Diamethoate 30 E.C. 1.5 ml per liter of water, at 10-15 days' interval. Mealy bug: Spray

of Chloropyriphos 20 EC (1 ml/L) help to manage it, destroy alternate host plants growing nearby. Shoot Borer: Prune and burn affected branches. Spray branches and trunks with a solution of Chloropyriphos of 2 ml/ L of water. Clean the cavities with a pesticide-coated stick or cotton, then seal with mud and cow dung paste. Root knot nematode: To manage practice soil solarization, use healthy planting material, apply organic manures, inter crop marigold plants, use resistant varieties and apply 5-10 kg neem cake per plant to suppress nematodes. Wilt Disease: control is difficult but drenching the soil around the root zone with 20-30 liters water per plant of carbendazim 50 wp 2 gram/L fungicide solution can help. Mix 1 kg of *Trichoderma viride* per 10 q of compost or farmyard manure and apply around the root zone, after keeping it 15-20 days under shade. Use 1-2 kg *Trichoderma* mixed compost per plant. *Anthracnose:* To manage this remove and destroy the infected twigs and plant parts. Spray Mancozeb 2 gm per liter of water every 10-15 days until fruiting begins. Fruit Rot: Spray Mancozeb or Zineb 2 gm per liter of water every 15 days at least twice. For already infected plants, spray preventively before rainfall.

Harvesting and Yield: For local markets, harvest when fruits are fully ripe. For long-distance market fruit should be harvested when mature but still firm, when fruits change from green to reddish in 24 hours or more, harvest them promptly. A single plant can produce around 40-50 kg of fruits, and mature trees (8-10 years) can yield up to 100 kg per tree. Good practice of grading and sorting, packing, transport and marketing helps to fetch better prices.

VEGETABLE CROPS

Brinjal

Improved Varieties: Pusa Purple Long, Punjab Sadabahar, ARU-2, H-4, H-7, PB-91-2, K-202-9, DBR-8, AB-1, Hybrid varieties- Arka Navneet, Pusa Hybrid-6, Pusa Hybrid-2

Nursery: 400-500 grams of seeds are required for one hectare. For one hectare of seedlings, 15-20 beds of 1 meter width and 3 meters length and 10-15 cm hight are required. Seeds should be treated with thiram or captan 2 g/kg. In the nursery, seeds should be sown in rows at an interval of 5 cm.

Field Preparation: The field should be ploughed 3-4 times deep. First ploughing should be done by mixing 120-150 quintals of decomposed cow dung manure/hectare in the soil. During the last ploughing, 40 kg nitrogen, 80 kg phosphorus and 60 kg potash/hectare should be mixed in the soil.

Sowing Time: Nursery Preparation: June-July; Transplanting in the main field: July-August

Planting: Saplings should be transplanted in the evening when they are 10-15 cm and 30-40 days old. Distance between rows should be 60-70 cm and distance between plants should be 60 cm.

Manure and Fertilizer: 20 kg/hectare nitrogen should be sprayed when flowers appear.

Irrigation: Irrigation should be done every 4-5 days or as per requirement in rainy season.

Plant Protection: Green aphid, thrips, white fly, and net winged bug-Imidacloprid 0.5 ml or Dimethoate 30 EC or Methyl Demeton 25 EC 1 ml/litre should be sprayed. Hada *(Apilechna)* beetle- Dimethoate 30 EC or Methyl Demeton 26 EC 1 ml/litre should be sprayed. Fruit and stem borer- At the time of fruit formation, Paracefate 75 SP 0.5 gram/ Dimethoate 30 EC or Methyl Demeton 26 EC 1 ml/litre should be sprayed. Root knot nematode- Carbosulphan, Neem, Karanja and Mahua cake should be used while preparing nursery. Small leaf- Dimethoate 30 EC. Spraying of 1 ml/litre should be done. Blight- Spraying of Mancozeb or Zineb 2 gm/litre should be done. Wet rot- Seed treatment should be done at the rate of 3 gm/kg seed with Captan or Thiram and soil treatment should be done at the rate of 4-5 gm/square meter with Captan or Thiram.

Harvesting and Yield: Harvesting should be done when the crop is ready to be sent to the market. Yield of about 200-250 quintals/ hectare can be obtained.

Okra

Improved Varieties: Pusa Savani, Pusa Makhmali, Parbhani Kranti, Arka Abhay, Arka Anamika and Punjab Padmini.

Field Preparation: 3-4 deep ploughings should be done before sowing.

Manure and Fertilizer: 120-150 quintals of manure/hectare should be applied at the time of first sowing. 30 kg nitrogen, 30 kg phosphorus and 30 kg potash/hectare should be applied at the time of last ploughing. 30 kg nitrogen/hectare should be applied 30 days after sowing.

Seed and Sowing: 20 kg seed/hectare is required for sowing in summer and 12 kg seed/hectare is required for sowing in rainy season. Before sowing, seeds should be treated with Carbendazim or Thiram 3 g/kg. During sowing in summer, distance between rows should be 45 cm and distance between plants should be 30 cm and during sowing in rainy season, distance between rows should be 45-60 cm and distance between plants should be 30-45 cm.

Irrigation: During summer, irrigation should be done at an interval of 5-6 days and during rains, irrigation should be done as per requirement.

Plant Protection: Green aphids, thrips, whitefly and thrips: spray Imidacloprid 0.5 ml or Dimethoate 30 EC or Methyl Demeton 25 EC 1 ml/litre. Fruit borer- Cypermethrin 25 EC half ml/litre should be sprayed. For root knot nematode- Spray Carbosulphan 2 ml/litre before sowing. Powdery mildew-Karathion LC or sulphur powder or Calexin 1 ml/litre should be sprayed. Root rot-Seeds should be treated with Bavistin 2 g or Topsin M 2 g/kg seed. Yellow vein mosaic-Imidacloprid 0.5 ml/litre should be sprayed.

Harvesting and Yield: Harvesting should be done when the crop is ready to be sent to the market. A yield of about 50-100 quintals/hectare can be obtained.

Onion

Climate and Soil: Moderate temperature and sufficient light are appropriate for onion cultivation. Fertile loamy soil with good drainage is considered suitable.

Improved Varieties: N-53, Agri Found Dark Red, Balwant-780

Nursery: For Kharif, sowing can be done from the last week of May to mid-June for growing seedlings from seeds. 15 kg of seeds are required for one hectare. For seedlings of one hectare, beds of 1 meter wide and 3 meters long and 10-15 cm high are required. Seed treatment should be done with thiram or captan 2 g/kg. Seeds should be sown in nursery in rows at an interval of 5-7 cm.

Planting: Plants can be planted in the field after 7-8 weeks. For Kharif, seedlings can be planted from the last week of July to August. Distance between rows should be 15 cm and the distance between plants should be 10 cm.

Field Preparation: 3-4 deep ploughings should be done before sowing.

Manure and Fertilizer: At the time of first ploughing, 400-500 quintals of manure/hectare should be mixed in the soil. At the time of final ploughing, 100 kg nitrogen, 50 kg phosphorus and 100 kg potash/hectare should be mixed.

Irrigation: In summer, irrigation should be done at an interval of 4-5 days or as per requirement.

Weed Management: For weed management, spray Oxylorfen 23.5 EC 800 ml/hectare before planting.

Plant Protection: Green aphids, thrips, white fly and thrips- spray Imidacloprid 0.5 ml or Dimethoate 30 EC or Methyl Demeton 25 EC 1 ml/litre. Pink root rot- The tubers should be treated in a solution of Bavistin 1 gm/liter for 30 minutes. Digging: Digging can be done after 90-110 days when sowing is done from tubers. Digging can be done after 140-150 days when sowing is done from seeds. Drying: Dry the dugout nodes along with the leaves in the shade for a week. After a week, cut the leaves two to two and a half cm above the node and dry for a week.

Yield and Storage: A yield of 200-300 quintals/hectare can be obtained from onions. Onions should be stored in well ventilated rooms.

VEGETABLE CROPS IN PROTECTED CULTIVATION (POLYHOUSE)

Capsicum

Improved Varieties: Red capsicum: Bomby, Nun 3019, Natasha, Torkal, Mahabharat, Tanvi Plus, Bachata; Yellow capsicum: Swarna, Fiesta, Nun 3020, Auroville, US 26, Persilia; Green Capsicum: Indira, Bharat, California Wonder, Greengold

Temperature and Humidity: The optimum temperature for seed germination is 24-25°C, and 20-25°C soil temperature is suitable for germination. For fruit setting, day temperature should be maintained at 20-22°C and night temperature is 18°C. The relative humidity should be maintained at 75-80%.

Nursery Preparation: 3000 capsicum plants are required for 1000 m^2. Seedlings can be grown in raised beds or pro-trays. The pro-tray should be washed with clean water and dried in the sun for 2 hours. Thereafter, a mixture of vermiculite, perlite and coco peat should be filled in the ratio of 1:1:2 (by volume). Sufficient water should be added to this mixture that it can be tied by taking it in hand. One seed should be sown in each chamber followed by application of water by sprinkler. The pro-tray should be covered with thermocol or polythene. The cover is removed after 2-3 days according to the

weather. Thereafter, solution of NPK (19:19:19) @ 1 kg NPK/100 liters of water should be prepared and watered daily. The plants become ready for transfer after 30-35 days. Care should be taken not to put the pro-tray on ground. Otherwise the roots of the plant go inside the soil. The roots may break while pulling out the plant from the pro-tray. Better, the pro-tray is kept on a stand of wood or iron.

Bed Preparation for Transplanting: One meter wide and 30 cm high beds are made. The length of the beds depends on the size of the polyhouse. A 60 cm wide path is kept between two beds. The beds should be sterilized two days before planting. Potassium permanganate crystals @ 8-10 grams are put in petri dish and the bed is covered with polythene. Thereafter, 5-7 ml of formalin is put in each petri dish. This release gas immediately, which destroys the harmful microorganisms present in the soil. This gas is harmful for health, so immediately after putting formalin, the entire unit should be closed for at least 24 hours. The polythene is removed next day, beds are dug and the saplings are planted at recommended spacing laying a drip line. The distance between plants should be 45 cm. It is good to start drip irrigation 2 hours before planting. Transplanting should preferably be done in the afternoon to minimize the chances of mortality of plants.

Nutrient Management: Next day of the transplanting, 1% solution of NPK 19:19:19 (@1 kg NPK/100 liters of water) should be sprayed. Subsequently, a mixture of NPK and micronutrients should be given to the plants through drip or by drenching once in a week. Generally, 250 kg nitrogen, 125 kg phosphorus and 125 kg potash is required per hectare for capsicum. Application of 5-7 kg water soluble fertilizer mixture per 1000 m^2 area every week, leads to better plant growth and yield. In the initial four-five weeks, 2-3 kg of NPK 19:19:19 is applied and thereafter, the dose of fertilizer mixture is gradually increased. During fruit formation, a mixture of micronutrients like Agromin or Biovita etc. should be applied @ 1 kg for 1000 m^2.

Training and Pruning: The training and pruning of plants is started at 40-50 days. The excess branches of plants should be removed and only 2-3 branches per plant should be kept. The plants should be trained by twine or plastic ropes. While pruning, the adjacent branches and weak branches are removed and shoots coming below the main branches should be removed from time to time. Training of the branches of the plants is necessary once a week, the new growth is wrapped with twine and kept high. If training is not done on time, the branches break, and the quality of the produce gets affected.

Yield: The capsicum in polyhouse lasts for 8-9 months. Fruits become ready to be harvested after 3-4 months of planting. Up to 6-7 kg of yield is obtained from one plant.

General Care and Precautions: The pH of the fertilizer solution should be 6-7 and EC should be less than 0.01. The drip line should be inspected at an interval of 15-20 days. In case of drip jam, the drip should be run with 2-3 percent solution of phosphoric acid. The crust formed around the plants should be removed with a hoe after 15-20 days of transplantation, to improve the air circulation and plant growth. The balance between the vegetative growth and fruiting of the plant to be maintained. If there are more than 6-7 fruits on each branch, then the weak and small

fruits should be removed. Capsicum is a very sensitive to root rot, LCV and anthracnose, etc. They should be properly inspected and treated from time to time. Due to continuous cropping in poly house, the deficiency of micro nutrients develops in the soil, especially of calcium. This causes black brown spots on the fruits which start rotting resembling with a fungal disease. In such a situation, gypsum should be applied @ 10-15 kg per 1000 m^2 area. In case of coloured capsicum, only fully developed and matured fruits should be harvested with the help of a knife or secateurs. Sometimes, price of coloured capsicum in the market rules below than that of green capsicum. In such a case the colored capsicum fruits should be plucked at the initial stage. The branches of capsicum plants are generally weak. They break due to the weight of the fruits. They should be tied with the help of a string from time to time. The shoots coming out of the stem of the plants should be removed from time to time. The old leaves should also be removed.

Tomato

Varieties: Badshah, Dev, Abhinav, Himshikhar, Subhrano, Naveen, DT-1, DT-7, ARTH-4, Nun-7711 and 646. Cherry tomato varieties: BR-124 and HA-818

Planting Time and Spacing: Tomato can be planted in greenhouse from July to September. The crop lasts up to April to June or July next year. The period of growing depends on the size and type of greenhouse and the climate. The row to row spacing is kept at 60-70 cm and plant to plant at 50-60 cm.

Pruning and Training: In polyhouse, usually 2 to 3 main branches of the plants are allowed to grow and the rest are removed continuously. This process should be repeated at every 10-15 days. Tomato plants are trained upwards supported by plastic ropes which are tied to main iron wire at a height of 9 to 10 feet.

Irrigation and Fertilizer: Regular irrigation is recommended along with fertigation with fertilizer solution which is a mixture of nitrogen, phosphorus and potash in the ratio of 5:3:6. From transplantation to flowering, 2000 to 2500 litre of water is given/1000 m^2 of area. Along with this, nitrogen is given @ 1 g/liter, phosphorus @ 0.5 g/liter and potash @1 g/liter of water. From flowering to fruit setting, 3000 to 4000 litre water is applied per 1000 m^2 area along with N, P, and K @ 2 g,1 g and 2 g/liter of water through drip system. The fertigation should be done at 3-4 days interval in summer and 6-8 days interval in winter.

Plant protection: The affected plants by viral disease TMV should be uprooted and destroyed immediately.

Harvesting of fruits: Harvesting should be done with scissors or sharp knives so that tomato plants and other fruits are not damaged. Fruits are harvested only when they are fully ripe (red in colour). They should be graded according to colour, size and weight for getting better price.

Storage: If the fruits have to be sold after a day or two, they should be kept at a temperature of 8-10^0 C in summer. In winter, they can also be kept at normal room temperature.

Yield: Generally, 200 to 220 t of tomato yield is obtained per hectare from a good greenhouse. About 100 to 120 t of yield can be obtained from cherry tomatoes.

Cucumber

Varieties: Satisfy, Kian, Infinity, Hilton, Malistar, Dynamic, Kafka etc.

Temperature and Humidity: Optimum temperature for germination is 20° Celsius and 22 to 30 °C is suitable for the growth and development of plants. Relative humidity is 70-80% should be maintained.

Nursery Raising: Generally, direct sowing of cucumber is done but in order to increase crop density in polyhouse, seedlings are prepared in pro-tray. To prepare the nursery, first the pro-tray is sterilized and a mixture of coco peat, vermiculite and perlite in the ratio of 2:1:1 is filled in the pro-tray. One seed is sown in each cell. Later, water is given daily with the help of a sprinkler. Cucumber seedlings are ready in 12-15 days depending on the weather. When the plant has two leaves in addition to the cotyledons, then the plant is considered ready for transfer.

Seed Bed Preparation and Transplanting: Before the nursery is ready, beds should be made in the polyhouse. The height of the beds should be kept 30 cm, one meter wide and length according to the size of the polyhouse. A 60 cm path should be kept between two beds.

Training and Grafting of Plants: After 15 days of transplanting, a thread-like structure emerges from the plant. The plants should be provided support at this stage. The plant should be supported upwards with the help of a twine. As the plants grow fast, they should be trained twice a week. The shoots emerging from the main stem should be removed from time to time.

Plucking and Yield: The first plucking is done 30-35 days after planting. Subsequent plucking can be done continuously for the next 60 days. About 20-25 fruits grow per plant weighing about 4 kg. Thus, about 100 quintals cucumber is produced per 1000 m^2.

Plant Protection: White fly, aphid and jassid: Spray of Imidacloprid 17.8% SL. Leaf miner: Spraying of 1 ml of propanophos can be done. Leaf and fruit borer pests: Spraying of 25 ml of thiodicarb should be done. Spider: Spraying of 1 ml of abumectin can be done. Nematodes: The beds should be sterilized and then planting should be done. While making the beds, neem or Karanja cake should be added in the beds. Along with this, a trench of 1.5-2 feet should be made around the polyhouse. It can also be controlled with carbofuran. Powdery mildew: It can be controlled by spraying 1 ml of hydrophilic sulfur or karathane. Leaf curl and leaf bunch disease: For its control, the sap sucking pests should be controlled before the disease appears. Mosaic: This disease is also spread by sucking insects; hence these insects should be controlled timely. Wilt disease: Drenching with 1% solution of Ridomil Gold should be done.

LIVESTOCK

Cattle and Buffalo

Proper shelter management during the month of May wherein high temperature and dusty winds blows. The animals should be protected from excessive temperature and heat stress. Prevent young calves from direct sunlight. Due to excess temperature, the animals may suffer from heat stroke, and dehydration and loss of appetite etc may

occur. The high environmental temperatures may cause fever, dehydration, decrease in body salts, loss of appetite and decrease in production. If the animals become ill, should be treated immediately by a veterinarian. In concentrate mixture the portion of barley and bran can be increased in this month. Grazing of animal in pasture during noon should be avoided. Animals should be grazed in pastures during the early hours of the morning and or in the evening. Provide enough green fodder to animals or provide nutritious feed containing vitamins, essential minerals, and salts. Give Vitamin A injections to animals that do not have access to green fodder. Animals should be fed in the morning, evening, and night-time because in the afternoon the animals remain under stress due to high temperature. Animals should be fed appropriate amount of salt in feed to avoid the loss of essential minerals, at least 50 g of mineral mixture and 30 g of salt should be provided daily in feed of cattle and buffalo. Give fresh and wholesome water to the cattle and buffalo. If possible, give shower in the morning and evening particularly to buffaloes. Vaccinate the cattle and buffalo against Haemorrhagic Septicaemia and Black Quarter in this month. Deworming of animals should be carried out, if not done previously. Protect animals from external parasite like ticks and mites.

Sheep and Goat

During the summer months, sheep and goats should be taken to grazing in the morning and evening and give rest to the animals in the shady place in the afternoon. Sufficient drinking water should also be available for sheep and goats. Keep drinking water utensils clean and give animals water at least four times a day. Animals should be fed appropriate amount of salt in feed to avoid the loss of essential minerals due to excessive temperature. Deworming of sheep and goats should be carried out. Vaccinate the adult sheep and goats against enterotoxaemia. Avoid extra feeding of goats and sheep to prevent enterotoxaemia. If sheep and goats have not yet been vaccinated against enterotoxaemia, it must be administered in the month of June. To protect animals from dehydration, give them proper salt and mineral mixture with feed and water. Sheep should be sheared during this month and 21 days after the sheep have been sheared, their bodies should be drenched with disinfectants to protect them against ectoparasite.

Poultry

Poultry are very sensitive to heat, so protect the birds from overcrowding and direct environmental heat and take measures to protect the chickens from hot winds. To protect chickens from heat, gunny bags/sacks should be planted around the farm, and these gunny bags /sacks should be wetted by spraying water through sprinklers in the morning, evening and as required. Proper drinking water should be available to chicks. To reduce the heat stress in poultry, supplement the vitamin C in diet. Maintain the proper ventilation in poultry house. Keep the curtain open in the night. Deworming of chicks should be carried out with piprazine mixed in drinking water.

CEREAL CROPS

Rice

Cultivation of Rice Variety Sikkim Dhan 1

Farmers can select the medium duration varieties like Sikkim Dhan 1, CAU-R1, Abhishek, Attey etc. Farmers are suggested to start main field preparation for paddy transplantation through repairing old bunds by maintaining 20-30 cm height in low land situation. Well decomposed FYM should be applied 2-3 days before sowing @10 q/1000 m^2. or vermicompost @ 3-6 t/ha either alone or in combination 15 days before transplanting. Sow the seeds @35-40 kg/ha for transplanting, 60-100 kg/ha for direct seeding, 5 kg/ha for SRI method. Seed should be treated with Azospirrilum @ 20 g/kg seed. Farmers of mid and high altitude are suggested to complete the transplanting by month end of May and in low altitude it should be completed by last week of June. An area of 1000 m^2 nursery area is sufficient for planting in one hectare of land. Uprooting of 25-30 days old rice seedlings with 20 cm x 15 cm spacing and 2-3 seedlings/hill is considered best for timely transplanted crop. Neem based formulation (15ppm) @ 0.5% or 5 ml/l of water two to three times can be used for pest management.

Maize

Promising varities are Pahenlo makkai (local variety) and CP-333 (hybrid variety). Seeds should be inoculated with Azospirillum, Azotobacter etc., and phosphorus solubilizing bacteria (PSB) @ 20 g/kg seed before sowing. A seed rate of 15-20 kg/ha is optimum for maize. Sowing should be done in furrows at a depth of 2-3 cm and

spacing of 50 cm between rows and 30 cm between plants. Mixed compost @ 2.5 t/ha + neem cake @ 0.5 t/ha +vermicompost @ 2.5 t/ha or FYM 2.5 t/ha should be applied. Manual weeding or use of biomass can be done for control of weeds. One Earthing up should be followed after plant attains knee height stage. Next earthing up should be done after 40-45 days of sowing. For management of cut worm, mixture of cow urine + water + neem oil (2 litre + 8 litre + 50 ml) @ 100 ml/plant should be applied. For management of FAW, spray spinosad @ 0.3 ml/litre and Neem oil 4ml/L of water at 2 weeks interval and apply mud slurry in the whorl of affected maize plants soon after observation of FAW incidence in the field.

Cultivation of Maize variety CP-333

Finger Millet

For organic condition of Sikkim: VL mandua 352, VL Mandua 379, VL Mandua 347 are suitable. Field preparation should be started at second fortnight of May. Field should be ploughed to prepared smooth seedbed. Provide inward slope with shallow drain to take out excess rain water. Well decomposed FYM @ 10t/ha mixed with 50g of Trichoderma harzanium and 200g of Bacillus cereus should be incorporated at the time of field preparation. 21-25 days old seedlings should be transplanted with spacing of 30*10 cm with two seedlings/hill. Foliar spray of neem-based formulation @ 0.5% or 5 ml/lit of water at weekly interval is recommended.

Spice Crops

Cherry Pepper

The seed of cherry pepper is to be sown in the month of February so as to make the seedlings ready for transplanting in the month of April to May. The seeds should be sown 3-5 cm apart for producing healthy seedlings. Generally, 45-50 days old seedling is ready for transplanting in the main field in raised beds, maintaining an optimum spacing of 35 cm x 40 cm. The beds need to be covered by organic mulch like dried leaves, straw or black poly mulch whichever is available. Nutrients should be properly managed through organic sources with the use of different nutrient rich manures, FYM @ 20 t/ha, neem cake @ 2 t/ha, vermicompost @ 2.5t/ha, and drenching of root area with 20% cow urine at 25 days interval till the harvesting stage.

Light hoeing is required to remove weeds and loosen the top soil for better aeration and root growth. The buds from the first and second nodes should be pinched off to promote vegetative growth, more fruit set and yield. Treatment of soil with Trichoderma harzianum culture @ 10g/m^2 one week before sowing manages soil borne diseases. As damping off and wilt is the most common disease, it can be managed by dipping the roots of seedlings in Trichoderma viride and Pseudomonas fluorescens culture @ 10g/l for about 15 minutes. After the fruit set, placing of 8-12 pheromone traps is necessary to manage fruit fly problem. Regular collection and destruction of dropped fruits also controls fruit fly population.

Ginger/ Turmeric

Local cultivar Bhaise, Gorbuthane, Sano Aduwa. The best time to sow ginger is in the month of April to May when there is sufficient moisture in the soil. A healthy rhizome free from diseases of about 30-45 g size is to be made and sown in furrows in a raised bed. Spacing of 30cm x 25cm is considered ideal for ginger sowing. The rhizomes should be placed at a depth of 4-5 cm in furrows and covered with soil. Nutrients should be properly managed through organic sources with the use of different nutrient rich manures, FYM @ 20 t/ha, Neem Cake @ 2 t/ha, Vermicompost @ 2.5t/ha. Weeding needs to be carried out twice or thrice for checking the weed growth. Mulching with locally available mulch materials like dried leaves and straw may be used for covering the beds. Rhizome rot/ Soft rot is the major disease and can be controlled by spraying with 1% Bordeaux mixture. Drenching of affected and surrounding beds with 0.3% Copper Oxychloride is recommended. Shoot borer can be managed by spraying Neem oil @ 3ml/l or Beauveria bassiana@ 5ml/l or spinosad @ 0.2 ml/l.

VEGETABLES CROP

In high altitude, for raising nursery it is advised to use polythene covers/shade above the nursery to protect seedling from untimely extreme weather condition. Provide support of bamboo structure for climbing upward the plants like bottle gourd, bitter gourd, cucumber and bean. Apply bio mulch @ 5 t/ha to cover the ridges and furrows of the field. Start spraying copper oxychloride @ 0.25 % at weekly interval to control fungal and bacterial diseases. Apply plastic mulch/agro jute textiles as mulching for soil & water conservation and weed control. Regular monitoring for increase in pest and disease of large cardamom should be done. Shade management should be done with the proper lopping of trees. Farmers are advised to spray neem-based formulation (1500 ppm) @ 3-5 ml/litre of water or Bacillus thuringinsis @ 2g/l or Metarhiziumanisopliae @ 5ml/l and Copper oxychloride @ 0.25% to avoid any of pest and diseases.

LIVESTOCK

For poultry, variety like broilers & Vanaraja is recommended. Due to prevailing weather conditions of high humidity and frequent rainfall it is utmost necessary to change the litter materials of poultry shed frequently to prevent Coccidiosis infection. Feed materials of poultry should be stored properly to avoid possible mould growth (Aflatoxins) due to prevailing hot and humid weather condition.

Use of Clean & fresh litter in poultry rearing

Deworming in Pig

In case of Goats, ensure deworming of goats (Albendazole @ 7.5 mg/kg body weight) especially young kids before the start of rainy season. In case of pregnant does, pregnancy safe anthelmintic (Fenbendazole @5mg/kg body weight) should be administered 15 days prior to expected date of kidding.

Pig breed like HDK-75 is recommended for Sikkim. Pig farmers are advised for regular supplementation of mineral mixture @50-60 gm/day for pregnant sow and calcium to the lactating sow @ 60-80 ml/day.

Dairy cattle farmers are advised to feed edible tree fodders as well as chopped paddy straw regularly to sustain the production. Also suggested for regular supplementation of mineral mixture @50-60 g/day for adult cows and calcium to the lactating and pregnant cows @60-80 ml/day is very much essential for milking cows for getting optimum production and productivity.

Restrict the movement of visitors into the farms and follow strict bio-security measures. Use of good disinfectant in foot bath. Vaccinate against Ranikhet, IBD, Fowl pox, Marek disease in poultry birds. In pigs vaccinate against Swine fever. Vaccination for FMD, BQ and HS for bovines is recommended.

Tamil Nadu & Puducherry

GENERAL ADVISORY

Zinc Solubilizing Bacterial Biofertilizer: Carrier or liquid bioformulation that improves Zn availability and increases yield by 17-20%. Soil Respiration Indicator (SRI) Gel Probe: Visual colorimetric tool for rapid microbial activity testing in soil (results in 6-8 hours). Vetiver Grass for Tannery-Polluted Soils: Used with organic composts to reduce chromium (21.5%) and enhance carbon (25%) with by-product value. Sesuvium portulacastrum: Salt-tolerant species for reclaiming saline soils and improving physical and chemical soil properties. TNAU Panchagavya: 3% foliar spray of organic growth promoter containing nutrients and hormones; boosts yield by 25-30%, improves quality, and acts as pest repellent.

For Horticultural Crops:

Fruit Fly Management: IIHR's Arka Dorsolure-F and kairomone traps targeting *Bactrocera dorsalis* (gravid females).

Seed Treatment: Use TNAU seed coating formulation, dry, and sow accordingly.

Drought Mitigation: Apply Nano Revive @ 10 ml/L at drought onset.

CEREAL CROPS

Paddy

Foliar application of Rice Reap (5 kg/ha) at booting and 10 days later, and Rice Bloom (5 kg/ha) at heading and grain filling stages with wetting agent for increasing spikelet fertility, grain filling and yield up to 15%. *Zinc Solubilizing Bacteria* (2 L/ha) + Zinc Sulphate (25 kg/ha) + RDF; *Bacillus altitudinis* FD48 improves drought resilience. Water management: Alternate Wetting and Drying from 21 DAS to 10 days before harvest + 125% RDF. Stubble management: Incorporate with TNAU Biomineralizer (2 kg/t) + urea. Disease control: Azoxystrobin + Propiconazole @ 500 ml/ha at tillering and booting stages. FD48 applications: Seed treatment (125 ml/ha) and foliar spray (500 ml/ha at 30 & 50 DAS) enhance yield under stress.

Stage-Specific Inoculants: Biofertilizer pack with *Azospirillum, Azotobacter, Phosphobacteria, Potash bacteria, Pseudomonas,* and PPFM for different crop stages; enhances yield by 10-15% and reduces chemical fertilizer use by 25%. Zinc Solubilizing *Bacterial Biofertilizer:* Carrier-based or liquid form; enhances Zn nutrition and yields by 17-20%, adding 250-400 kg/ha. TNAU Micronutrient Mixtures: Enriched FYM-based micronutrient mixtures for wetland and rainfed rice; alleviates deficiencies, improves quality, and enhances yield by 11-20%. Nanosci Lure for YSB: Nano-pheromone lure for eco-friendly pest monitoring and mass trapping of yellow stem borer. Stage-Specific Inoculants: Biofertilizer pack tailored to growth stages; increases yield (10-15%) and reduces chemical fertilizers by 25%. *Bacillus altitudinis* FD 48: Dual-use bioagent (seed+foliar) enhancing root traits and yields under both irrigated and stress conditions. TNAU Biomineralizer for Stubble: Microbial product (2 kg/tonne) for in-situ rice straw decomposition to reduce burning and enrich soil.

Maize

Nutrient & Soil Management: Neem cake @ 250 kg/ha; Zn citrate (0.5%) + Fe citrate (1%) foliar sprays at 30, 40, and 50 DAS in deficient soils. FAW Management (Technology Capsule): Seed treatment: Thiamethoxam 30 FS @ 10 ml/kg; maintain spacing (60 × 25 cm) + rogue rows every 10 rows. Border cropping: Cowpea, gingelly; Intercrop with blackgram; install pheromone traps (50/ha) and solar traps (1/ha). Insecticides by stage: Early whorl (15-20 DAS): Emamectin benzoate 5 SG, Chlorantraniliprole 18.5 SC, Flubendiamide 480 SC, or Azadirachtin. Late whorl (35-40 DAS): Metarhizium anisopliae, Emamectin benzoate, Novaluron, or Spinetoram. Tasseling/cob formation (60-65 DAS): Use any insecticide not used earlier. Biologicals: Release Telenomus remus @ 1.25 lakh/ha.

COMMERCIAL CROPS

Cotton

High Density Planting: Closer spacing (90 × 15 cm) for 29,629 plants/acre using suitable varieties like Suraksha, CO-17, and VPT-2.

Fertilizer: Apply 100:50:50 kg NPK/ha; weed control using Pendimethalin 38.7% CS @700 ml/acre within 24-48 hours of sowing.

Growth Management: Spray NAA @40 ppm or Cotton Plus @2.5 kg/acre; apply Mepiquat Chloride (0.015%) at square/flowering stage; use sodium chlorate (0.9%) or Drop Ultra as defoliant at 60% boll burst.

Intercropping: Paired row planting (45/90 × 30 cm) of Bt Cotton with two rows of cluster bean; application of Mepiquat Chloride and Sodium Chlorate enhances suitability of CO 17 for mechanical harvesting.

Coconut

Pest Traps: Install yellow sticky traps (20/ha or 8/ac), trunk banding, and spray jet water on fronds. *Biocontrol:* Release *Apertochrysa astur* (1000/ha), *Encarsia spp.* (250/ha or 100/ac). *IDM Package:* FYM (50 kg) + neem cake (5 kg) + fertilizers; $CuSO_4$ (200 g) + $MgSO_4$ (1 kg) alternately; bio-agents (*Trichoderma, Bacillus, Phosphobacteria, Azospirillum, VAM*); TNAU Coconut Tonic (40 ml twice/year);

COCOCON drench @ 2 L/tree every 2 months; crown spray of hexaconazole if needed. *TNAU Coconut Tonic:* Nutrient-rich tonic applied via root feeding (200ml/tree every 6 months); increases photosynthetic efficiency, nut yield, and palm vigour. *IIHR Arka Decomposer:* Microbial mix that rapidly composts coconut residues, enhancing organic carbon and soil health. Copra Guard: Polymeric nano-formulation (10 ml/litre) replacing sulphur fumigation to control fungal growth on copra.

FRUIT CROPS

Banana

Insect Management: Apply emamectin benzoate 5 SG @ 0.4 g/L at 5th, 6th & 7th months via pseudo stem injector. Seedling Bio-hardening: Bacillus velezensis + Brachybacterium paraconglomeratum (1% consortia) twice fortnightly; soil drenching @ 0.5 L/plant at 2, 4, 6 & 8 months.

Papaya

Vector & Disease Management: 3-row maize border; insect-proof nursery; neem oil spray (3%); humic acid drenching @ 2 ml/L every 2 months; foliar spray of $ZnSO_4$ (5 g), boron (1 g), and urea (10 g)/L at 4^{th} and 7^{th} month. Jeevamruth: Drenching (200 L + oilcake extracts) @ 1 L/plant on 3^{rd}, 5^{th} & 8^{th} months; Flonicamid 50 WG @ 75 g a.i./ha on need. Hi-Tech Farming Practices: Raised bed planting with drip+fertigation and foliar micronutrients (Zn, B) improving yield and fruit quality by 25-30%.

VEGETABLE CROPS

Chilli

Seed treatment: Bacillus subtilis @ 10g/kg; use three-row maize barrier; install yellow sticky traps @ 12/ha. Nutrition: Apply and spray a micronutrient mix (Fe, Zn, Cu, Mn, B). Virus & pest management: Rogue infected plants till 45 DAT; apply Imidacloprid 17.8% SL @ 3ml/10L and Pyriproxyfen 10% EC @ 1ml/L alternately. Fungal disease management: Spray Azoxystrobin 18.2% + Difenoconazole 11.4% SC @ 0.1% thrice at 15-day intervals. IPM module for chilli: Includes border cropping with cowpea/lab-lab/coriander, bird perches (20/ha), sticky traps (20/ha), pheromone traps (12/ha), need-based foliar sprays with Azadirachtin 1%, NSKE 5%, 3G extract 5%, five-leaf extract 10%, and *Bacillus subtilis* 0.5%-effective in reducing thrips population and increasing yield and B:C ratio.

Cassava

IPM module for mealybug: Application of Azadirachtin 0.15% (1.5 L/acre) on 60 DAP followed by release of *Anagyrus lopezi* and *Apertochrysa astur;* reduces mealybug population and increases tuber yield. TNAU Cassava Booster: A mixture involving cow dung slurry enriched with neem cake, bioagents, and nutrients; enhances starch content, reduces CMD, and increases yield by 20-25%.

Nutrients for Vegetables: Bio NPK Formulation: Multi-functional biofertilizer (NPK bacteria) improving nutrient uptake and reducing chemical fertilizer dependency. BIOGROW Liquid (Tomato): Microbial liquid with *Bacillus and Pseudomonas* boosting yied (25-30%), lycopene, -carotene, and plant health.

Micronutrient Spray (Tomato, Bhendi, Chilli): TNAU multi micronutrient @ 1% during vegetative and flowering stage. Bhendi: Spray WSF 19:19:19 @ 2% + liquid Multi MN @ 1% at 30 DAS, repeated 3 times every 10 days.

Finger Millet

Organic Package: FYM @ 3 t/ha, *Azophos* (2 kg/ha), *Trichoderma* (2.5 kg/ha), vermicompost (1.5 t/ha), Panchagavya (3%) at vegetative, flowering, and grain filling stages. Disease/pest control: NSKE 5% and *Bacillus subtilis* 0.5% as needed. Foliar spray: 1.5% foliar formulation at flower initiation. Horsegram: Foliar Spray: TNAU Horsegram Wonder @ 5 kg/ha during flowering with wetting agent.

PULSE CROPS

Greengram, Blackgram, Redgram

Foliar Spray: TNAU Liquid Pulse Wonder @ 5 kg/ha at peak flowering (Greengram/ Blackgram) and 15 days after (Redgram). Land preparation: Raised beds (90 cm) with 30 cm furrows. Seed Treatment: Imidacloprid (5 ml/kg) + Bacillus subtilis (10 g/kg) + Rhizobium & Phosphobacteria (30 g/kg). Agronomy: Spacing 30 × 15 cm; drip irrigation; fertigation 25:50:25:40 NPKS kg/ha. for weed control: Pendimethalin + Imazethapyr (PE) + Quizalofop-ethyl + Imazethapyr (EPoE). TNAU Vigour Plus: Nano-formulated seed coating (20-25 ml/kg) that boosts germination, seedling vigor, and early establishment. Bio-Pulse: Microbial seed bio-priming formulation that enhances yield under pathogenic stress, effective in chickpea, pea and lentil.

Blackgram

Nodule-Associated Plant Probiotics for Blackgram: Blend of beneficial microbes improving nodulation, drought tolerance, and yield (14% over standard). Newer fungicides for foliar disease management: Foliar spray of tebuconazole + trifloxystrobin (1g/L) or tebuconazole 25 EC (1ml/L), at symptom appearance and 15 days later; effective against *powdery mildew* and *Cercospora leaf spot.*

Greengram

Newer fungicides for foliar disease management: Foliar spray of tebuconazole + trifloxystrobin (1g/l) or tebuconazole 25 EC (1ml/l), at symptom appearance and 15 days later; effective against powdery mildew and Cercospora leaf spot. TNAU Vigour Plus (Seed Booster): Pre-sowing seed coating with biopolymer matrix containing IAA and GA^3; enhances seed germination and seedling vigour (also helpful in multiple crops like Pulses, Groundnut, Cotton, Paddy, Millets, Vegetables).

OILSEED CROPS

Groundnut

TNAU Groundnut Rich: A foliar nutrition solution. Applied twice @ 5.0 kg/ha at 35 DAS (50% flowering) and 45 DAS (pod development). Requires 500 litres of water per spray. Enhances pod development and improves yield. Nut Boost: A seed inoculation formulation containing a consortium of phosphate, potash, and zinc solubilizing PGPRs. Applied as a seed treatment. Improves pod yield by 16.5% to 18.1% compared to untreated seeds.

SPICE CROPS

Turmeric

Soil application: TNAU micronutrient mixture @ 15 kg/ha as EFYM-50% basal + 50% top dressing at 90 DAP.

LIVESTOCK

Dairy

TANUVAS PAM 21: Anionic salt (Salt I & II) @ 20 g + 10 g/day from 16 days pre- to 5 days post-calving to prevent milk fever. TANUVAS GRAND: 10 ml/day in gruel to boost digestion and prevent acidosis. TANUVAS Mastiguard: Teat dip to prevent mastitis. Wormivet: Herbal dewormer @ 15 g twice/day for 2 days. 10 Cent Fodder Model: Co(BN5), COFS 31, Valimasal, tree fodder system yielding 10.5 t/year.

Poultry

Probeads-EC: Patented enteric-coated probiotic supplement.

Fisheries

Water Quality and Predator Control: Use nylon netting at the water inlet to prevent predatory fish entry and ensure monthly water quality monitoring for all inland fish culture systems.

Feeding and Stocking Practices: Maintain proper feeding schedules-e.g., feed Murrel with floating pellets at 5% of body weight-and select quality seeds and advanced fingerlings for better growth and survival.

Pond Management and Disease Prevention: Apply manures as recommended, exchange 30% of water regularly to reduce disease incidence, and fence ponds with shade nets to prevent fish escape.

Ornamental Fish Culture Care: Rear ornamental fish in cement tanks for better pigmentation; use aquatic plants like Hydrilla and Ceratophyllum in breeder tanks for fry protection.

Shrimp Culture Biosecurity: Perform real-time PCR for disease screening before stocking, use proper aeration (1 HP/250 kg biomass), and maintain Vibrio levels with probiotics.

Value Addition and Post-Harvest Practices: Promote hygienic dry fish, masala dry fish, and pickles from low-value fishes using solar dryers and preservatives to enhance income and shelf life (up to 2 years for pickles; 6-12 months for dry fish).

Inland Fish Culture (Carp farming, Murrel, GIFTilapia culture and Ornamental fish culture): Water intake from natural source should be kept with nylon net in the inlet pipe to prevent the entry of predatory fishes. Proper manuring should be maintained. Quality seed should be selected for fast growth. To maintain proper feeding management (i.e., feeding). Sampling should be done once in three months. Water quality parameters should be analysed at least monthly once.

Murrel Culture: Stocking of advanced fingerlings to increase the survival rate. Feeding of floating pellet feeds at the rate of 5% of body weight. Fencing of farm ponds using

green shade nets to prevent the escape of fishes. Exchange of water (about 30%) to reduce the occurrence of disease.

Ornamental Fish Culture: Rearing of ornamental fishes in cement tanks will maintain its desired pigmentation. Young ones should be separated from the parents immediately. Provision of aquatic plants like Hydrilla & Ceratophyllum is necessary for breeder tanks for hiding of young ones.

Shrimp Culture: Real-time PCR diagnosis is compulsory to check the pH before releasing into the pond. Water quality analysis should be done once in 15 days. Proper aeration should be maintained (every 250 kg of biomass; 1 HP aerator). Adoption of nursery rearing (technology) will reduce operational cost of the farmers. Water and soil should be properly monitored. Maintain the Vibrio count by using probiotics.

Hygienic Dry Fish Production: Dry fishes can be prepared from low value marine fishes such as Anchovies (Nethili) and Ribbon fishes (Valaimeen) and Leiognathids and freshwater fishes such as Tilapia and Carps using solar dryer by addition of fish : salt ratio of 1:8 or without salt with final moisture content of 10-15%; shelf life will be 6-9 months.

Hygienic Masala Dry Fish Production: Hygienic Masala Dry Fishes can be prepared from low value marine fishes such as Anchovies (Nethili) and Ribbon fishes (Valaimeen) and Leiognathids and freshwater fishes such as Tilapia and Carps using solar dryer by addition of fish : salt ratio of 1:8 and masalas (Turmeric and Chilli powder) with final moisture content of 10-15%; shelf life will be 9-12 months.

Pickle Production Technology: Pickles can be prepared from low value and less bone fish species such as Indian Mackerel, Tuna, Ora Fishes, Prawn/Shrimp, Tilapia by addition of masalas with added preservatives such as vinegar & sodium benzoate (permitted @ 0.005%). It should be packed in Glass bottles or HDPE pouches. Shelf life will be 1.5 to 2 yrs.

Value Added Fishery Product Technology: Ready to eat Value added Fishery Products such as fish 65, Bajii, Fish Cutlet, Fish samosa, and Fish cake can be prepared from low value & less bone species such as Indian Mackerel, Tuna, Threadfin Bream, Prawn/Shrimp and Tilapia by addition of masalas. The shelf life will be 3-5 days at 4°C.

Farmers are advised to follow the sowing rule to take-up sowing of rainfed crops like Cotton, Soybean, Maize, Jowar, Redgram, Greengram etc., only after receipt of cumulative rainfall of 50-60 mm in light soils and 60-75 mm in heavy soils or the soil should be wet up to top 15-20 cm depth after enter of South-West monsoon rains into the state.

CEREAL CROPS

Paddy

Under assured irrigation farmers are advised to raise rice nurseries of long duration (140-145 days) varieties from May 20th to June 20th. Under assured irrigation farmers are advised to raise rice nurseries of medium duration (130-135 days) or short duration (120-125 days) varieties from June 20th onwards. Month of June is not optimum for raising paddy nurseries using Telangana Sona (RNR15048) variety. Take the Greengram as catch crop to preceding rice in areas where the release of water into the canals and tanks is delayed. Green manuring with Sesbania/ Crotalaria / Pillipesara / grain legumes, residues of blackgram / greengram and in situ incorporation before flowering. Varieties: cultivation of long duration (BPT-5204, WGL-44, RNR 11718 etc.), medium duration (WGL-14, JGL-11470, JGL-384, RNR-28361, JGL-33124 etc), short duration (RNR-15048, KNM-1638, KPS-6251, WGL-362, KNM-118, JGL-24423, RNR-29325, JGL-28639 etc.) varieties.

Direct seeding of rice with Seed-cum ferti drill wherever suitable. In Telangana state, dry converted wet and wet direct seeded rice are popular, and the sowing can be started from June ending. Treat seeds with carbendazim @ 3 g/ kg (dry seed treatment) or 1 g/L (wet seed treatment). Farmers are advised to apply the Carbofuran 3CG granules @ 800 g per acre of nursery one week before pulling of the nursery. Root dipping: prepare the slurry with 5 packets (1000 g/ha) of Azospirillum and 5 packets (1000 g/ha) of phosphobacteria or 10 packets of (2000 g/ha) of Azophos, inoculant in 40 lit. of water and dip. the root portion of the seedlings for 15-

30 minutes in bacterial suspension and transplant. Make 20 cm alleyways at every 2 meters to facilitate free aeration, ease of farm operations and better pest and disease management. Broadcast butachlor @ 1-1.5 l or pretilachlor @ 500-600 ml or 4 kg granules of bensulfuron methyl (0.6%) + pretilachlor (6.0%) with 20 kg sand per acre. Practice alternate wetting and drying in well irrigated areas to save water, better aeration and minimize incidence of BPH besides getting carbon credits with less emission of greenhouse gases. Recommended dose of fertilizers: 40-48 Kg Nitrogen, 20 Kg Phosphorus 16 Kg Potash per acre during Vanakalam. Spray 0.2% $ZnSO_4$ 2 to 3 times at 5 days interval to manage Zn deficiency, particularly in alkaline soils.

Maize

Deep summer plough to destroy pests and conserve moisture. Optimum sowing window is from June 15th to July 15th with medium and long duration. varieties (90-100 days and 100-120 days) without any yield reduction. Sow medium duration varieties/hybrids DHM-206, DHM-182, DHM-117, Bisco-855, Bio-9637, Bisco-740, Kaveri Ekka-2288, Kaveri -2020, Kaveri-3696 and short duration hybrids DHM-115, Pioneer-3342, KH-5991, DKC-7074 during 15th June to 15th July. Sowing can be extended up to July end if monsoon is delayed. Sow on receipt of at-least 50-60 mm rainfall for better germination and complete sowing in a week for reducing the incidence of FAW. Spray NSKE 5% or neem oil 1500 ppm @5ml/l after sowing and at weekly intervals. Dibble seeds with tractor drawn cultivator or seed cum ferti drill on ridges and beds. Intercrop red gram varieties PRG-176, WRG-97 in 2:1 ratio in light soils and in 4:1 ratio in heavy soils to reduce incidence of FAW. Follow IPM for FAW management: summer ploughing, growing single cross hybrids, clean cultivation, intercropping with pulses, balanced fertilization, release of egg parasitoids (Trichogramma sp) and spraying Chlorantraniliprole @ 0.4 ml or spinetoram @ 0.5 ml or Emamectin benzoate @ 0.4 g per litre in plant whorls. As post emergence, spraying of Tembotrione @ 115 ml + Atrazine 400 g or Toperamezone @ 40 ml + Atrazine 400 g or mesotrione + atrazine @1400 ml/acre in 200 litre of water will effectively control weeds. After 30-35 days, crop may be inter-cultivated followed by earthing up is needed for better nutrient uptake and to avoid lodging.

COMMERCIAL CROPS

Cotton

Sow the crop early by June 1st/2nd week after receipt of sufficient good rains at least (60mm). Don't sow cotton crop after July 20th as yields will be reduced drastically under rainfed conditions. Sowing of Cotton on ridge and furrow in medium soil and broad Bed furrow in black soil under rainfed conditions facilitates the crop to moisture conservation and excess water drain out. In a village or area all the cotton cultivating farmers should take up the sowings on community basis and complete within a period of 7 - 10 days. Depending on soil type and rainfal pattern cotton should be sown at a spacing of 120 x 60 cm/ 120 x 45 cm/ 90 x 60 cm/ 90 x 45 cm / 90 x 30 cm. Deep summer plough to destroy the eggs of insect pests and to remove weed stock. Intercrop with greengram/ blackgram/ soybean/ cluster bean in 1:2 or 1:3 ratio, and red gram 4:1 / 6:1 / 8:1 ratio which also helps to manage sucking pests.

Grow 2-3 rows of maize or sorghum as border crop as barrier to prevent pests. Treat the seed with imidacloprid 70 WS@ 5 g per kg or thiamethoxam 70% WS @ 4 g per kg followed by Trichoderma viridi or Pseudomonas fluorescens @ 10 g per kg.

Pre-emergence herbicides like pendimethalin (Stamp extra) @ 700 ml/acre should be applied within 24 -48 hours after sowing with the help of hand sprayer for better control of weeds in cotton. Application of post emergence herbicides like quizalofop ethyl @ 400 ml + pyrithiobac sodium @ 250 ml in 200 L of water at 30 DAS in cotton to control grasses and broad-leaved weeds. Inspect the crop at squaring and flowering stage for presence of PBW larvae within flowers. Installation of Pheromone traps @ 8/acre and monitoring ETL at this stage is 10 % damaged flowers. Spray $MgSO_4$ @ 10 g/l twice at 45 and 75 DAS; Boron @ 1.5 g/l twice at 60 and 90 DAS; 0.5% $FeSO_4$ with citric acid twice at weekly intervals and $ZnSO_4$ @ 2 g/l twice at 4-5 days interval at 45 DAS to manage micronutrient deficiencies. During excess rainfall, drain excess water and apply 25 kg urea and 20 kg potash per acre. Spray Planofix (NAA 10 PPM) @ 1 ml per 4.5 liters of water twice at 10-15 days interval to manage flower dropping. Spray 1% KNO3 or 19:19:19, 20:20:20, 21:21:21. Follow rotation of insecticide sprays against insect pests for high efficiency. Stem application of fipronil 1: 4 at 30 DAS and Flonicamid / Imidacloprid with water (1:20) at 45, 60 DAS to be done which protects the crop from early season sucking pests like jassids and aphids.

PULSE CROPS

Pigeon pea

Sow high-yielding wilt-resistant varieties (155-165 days) like WRGE-93, WRGE-97, WRGE-121, and medium-duration varieties like WRG-255 and TDRG-4, TDRG-59 & TDRG-272 can be recommended. Sowing should be initiated only after receipt of 60 mm rainfall. The optimum sowing time should be 15th June to 15th July at a spacing of 150-180 x 20 cm in black soils and 90-120 x 20 cm in red soils. Seed rate should be 2.5 to 3.0 kg per acre only (plant-to-plant spacing should be mandatory). Treat seeds with thiram or captan @ 3g/kg followed by rhizobium culture @200-400 g/ 3 kgs of seed. The raised bed method or ridge and furrow method should be followed to protect the crop from Phytophthora blight disease, which occurs due to excess and stagnation of rainwater. Intercropping in Red gram + Cotton (1:4/ 1:6), Soybean (1:4/ 1:6), Green gram/ Black gram (1:7) should be followed. Treat the Red gram seed with Trichoderma viride @ 10 g/ kg seed to protect the crop from soil-borne diseases.

Spray pendimethalin @ 1 - 1.5 L in 200 liters of water within 24 - 48 hours after sowing will effectively control the weeds in Red gram Post-emergence application of quizalofop ethyl @ 400 ml/ acre to control grasses and imazethapyr 10 % @ 300 ml/ acre to control grasses and broad-leaved weeds. Both herbicides in the tank mix are also recommended in case both weeds are observed. If there is submergence due to excess rain, drain excess water at the earliest and spray 1% KNO_3 or 19:19:19, 20:20:20 or 21:21:21. Application of Multi K or 13-0-25 @ 10g/l at the time of flowering should be done. Practice nipping at 45 and 60 DAS, wherein terminal branches are removed to facilitate lateral branches, thus improving yields. To control pod fly spraying of Thiomethaxam 25 wg @ 0.2ml/l, Flubendamide 0.2ml/L with Jaggery 5g/L to be sprayed at the time of early pod formation stage.

Greengram and Blackgram

Sowing time is generally from June 15th fortnight- July 15th during Kharif, Sept 15th to 30th October during Rabi, January last week to March 15th during Summer. Greengram varieties MGG-295, MGG-385, MGG-351, TM-96-2, WGG-37 and WGG-42, Virat, IPM-2-14, Sikha. Blackgram YMV-resistant varieties MBG-1070, PU-31, GBG-1 and TBG-104 are the preferred varieties. Treat seeds with imidacloprid @ 5g or thiamethoxam @ 5g/kg. Intercropping can be done with cotton (2:1 or 1:1 ratio) or redgram (6:1)/(8:1). Greengram can be taken as a preceding crop to Rice and Chilli as green manure for incorporation in the soil.

OILSEED CROPS

Groundnut

Seed rate recommended is 237 kg/ha and practice seed treatment with imidacloprid 600 FS @ 2 ml/kg followed by tebuconazole 2 DS @ 1g or Trichoderma viride @ 10g/kg to control early and late leaf spot diseases, sucking pests, collar rot, PSND in the early stages. Application of Gypsum @ 500 kg/ha at pegging stage near podding zone for pod development. Weed management with Diclosulam 84% WDG @31 gm/ha as pre-emergence herbicide followed by post-emergence application of Imazethapyr @ 750 ml/ha at 20 to 25 days after sowing.

Soybean

Sow varieties ASB-22, JS-335, AISb-1, JS-93-05 during 15th June 1st week of July using seed drill/ gorru/ desi plough/ by tractor drawn seed cum fertilizer drill / broad bed furrow planter. Sowing of Soybean by Broad bed Furrow (BBF) planter or Raised bed method facilitates the crop to withstand heavy rains and moisture stress conditions and to obtain higher yields. Treat the seeds with carbendazim @ 1g or thiram or captan @ 3 g/kg followed by 1.5 ml of imidacloprid (48 %) and Rhizobium culture @ 200 g/10 kg seed. Apply 50 kg DAP + 26 kg MOP at the time of sowing and top dressing of urea @ 25 -30 kg/acre at 30 DAS. Pre-emergence herbicides like pendimethalin 30 % @ 1 - 1.5 L/ acre should be applied within 24-48 hours after sowing with the help of hand sprayer for better control of weeds. Post emergence application of quizalofop ethyl @ 400 ml/ acre for control of grasses and imazethapyr + imazomax 40 g /acre or imazethapyr 10 % @ 250 ml/acre to control the grasses and broad-leaved weeds. To control stem fly and stem gridler as a prophylactic application of carbofuran 3G granules @ 8 kg/acre is recommended at 10 DAS. To control of pod blight spraying of tebuconazole + sulphur @ 2.5 g/L is recommended. Dry the seed and maintain the below 12 % moisture during seed storage to avoid incidence of pest and disease.

Castor

Sow high yielding castor hybrids viz., ICH-5, ICH-66, PCH-111, DCH-519 & ICH-6, PCS-262 from 15th June to 15th July in rainy season under rainfed conditions. Intercrop with redgram in 1:1 or greengram in 1:3 ratio, open furrows between rows to conserve moisture in light soils.

LIVESTOCK

Animal Husbandry & Fisheries

Agriculture and allied sectors play a vital role in the lives and livelihoods of the majority of Telangana's population. The state is rich in livestock resources and

livestock production, according to national Livestock census 2019, the total livestock population in the state is 3.26 crore. The livestock sector is a major driver of primary sector growth. The sectors contribution to Telangana's Gross State Value Added (GSVA) at current prices increased from Rs. 96, 908 crores in 2023-24 to Rs. 1,02, 835 in 2024-25. Across India, inland fisheries where farmers build ponds on their landholdings to breed fish, is emerging as an important source of additional income to the farmers (Socio Economic Outlook, 2025). Scarcity of feeds and fodder resources is a big problem limiting animal production. Among all, flood and drought are the major devastating natural calamity leading to a massive loss of vegetation.

General Guidelines for Livestock Management: To protect animals from the weather fluctuations keep them in well-ventilated shelters and under the shade of trees. Restrict the movement of visitors to the livestock farms and practice biosecurity measures in case of disease out breaks. Keep sufficient feed, fodder and medicine in hand. Vaccinate animals against Foot and Mouth Disease and Hemorrhagic septicemia (Cows and buffaloes), PPR (goats). Except pregnant animals, deworm all animals for external and internal parasites. Keep clean drinking water available at all times. Monitor water intake by animals to protect from heat stress. Supplement herbal immune boosting products in ration to boost immunity. Observe and detect oestrus and inseminate on time. Splash/bath buffaloes especially pregnant animals to prevent adverse effect of summer on oestrus and conception and prevent early embryonic mortality/ abortion due to heat waves.

Offer ample milk or electrolyte water to new born calves to prevent dehydration, heat stroke and death of neonatal stocks. Maintain clean, well-ventilated shelters with proper drainage to prevent diseases during floods. Ensure adequate space: Overcrowding causes stress and disease outbreaks. Local authorities may be informed about the outbreak of the diseases. All animals should be untied/evacuated immediately in case of floods to avoid mortality. All dead animals should be disposed of hygienically and should not be thrown in nearby drainages, water bodies etc. Burial Pit should be of 8 X 9 feet. Sprinkling of disinfectants like bleaching powder, quick lime etc. in the affected areas helps in reducing the spread of diseases. Remove all the flammable items from the area in and around the animal shed. Always maintain a sufficient stock of feed, fodder, water and medicines and store them in a safe place. Proper Care should be taken after reallocation of animals after natural disasters. During Drought bajra fodder varieties and in water logging areas Para grass may be cultivated. Clean, safe, hygienic water should be provided to the animals. Restrict the transportation of animals to consumer's doorstep for milking.

Dairy

Disinfect sheds regularly with Phenol 1-2% solution and Washing Soda (4% solution). Deworm all adult stock with broad spectrum antihelmintic, Albendazole (Dose: 10 mg/ kg body weight) during last week of May. Vaccinate animals with Haemorrhagic septicaemia (HS) and black quarter in June @ 5ml per animal subcutaneously. Segregate animals in milk production, dry, pregnant, non- pregnant and heifers. Allow animals to graze early in morning or later in evening. Follow body weight-based feeding regimen. Provide 1 kg concentrate for every 2.5 kg milk for

cows and for every 2 kg milk for buffaloes. Feed colostrum to new born calf within twelve hours calving @ 1/10th of body weight. Provide tender leafy fodder to the calves for early development of rumen. Feed calf starter from 3rd day onwards to 2-3 weeks before weaning. For calves up to 3-6 months of age, mineralised salt blocks may be hanged in the sheds to prevent mineral deficiency.

Deworm on 14th, 35th and 56th day followed by monthly up to six months and half yearly thereafter. Supplement with Area specific mineral mixture developed by PVNRTGVU @ 50-100g/day/animal and salt licks to prevent deficiencies. Avoid feeding spoiled or mouldy feed. Supplementation of Sodium Bi-carbonate (Baking soda) @ 30-50 g/day/animal for better milk fat yield and to avoid SARA. Azolla supplementation may be taken-up @1-2 Kg/dairy cattle per day. Do not allow animals for grazing at a time between 9am to 5pm (particularly period during heat weave period. During feed scarcity period feeding strategies such as densified Complete feed block@ 6-8 Kg/ day of these pellets sustain body maintenance and 3-4 kg of milk/day, Urea molasses mineral blocks, Liquid urea molasses feeding, feeding of urea treated straws, use of dry and fallen tree leaves like subabul, Mahua, banyanan, neem, mango (@ 50 kg of tree leaves 5 kg of GNC, 25kg of babubl pods, 15 kg of molasses, 1kg of urea and 2 kg of mineral mixture) conventional and unconventional feeds can be offered to balance the feeding with locally available resources. The dry fodder like paddy straw and sorghum stover may be enriched with urea or molasses and salt to enhance the digestibility in large ruminants. Hydroponics fodder may be utilized wherever available. Isolate the sick animals and quarantine the newly purchased animals.

Small Ruminants (Sheep and Goat)

Animals should be kept under the shade of trees during the hot periods of the day. The size of the flock shall be reduced by culling Unproductive and un healthy animals should be sold. Sick animals should be sold as sick animal in the flock is a dead animal. Rotational deworming at quarterly interval. In pre-monsoon period, deworm the whole flock with broad spectrum anti-helminthic Albendazole @ 10mg/ kg body weight. Before the onset of monsoon, based on worm load by dung examination, deworming to be done with appropriate deworming medicine. Vaccinate with ET @ 2ml subcutaneously during May to June months in sheep. Blue tongue vaccination @ 1 ml intramuscularly should be done between July and August. FMD vaccine during the month of July/ August in sheep and goats. Smoke with neem leaves in the night time to control mosquito borne diseases. Always Keep the sheds clean and dry. Hang mineralized salt lick @1 block for 5 number of animals. Provide ad libidum water. Azolla supplementation may be taken-up @ 250-500 g/sheep/goat per day. Dipping with acaricides should be carried out to get rid of ectoparasites (ticks/fleas) in small ruminants. Fodder tree seedlings should be cultivated by using the rainfall and green fodder leaves may be fed to the animals. 250-300 gms of concentrate feed should be given to the pregnant ewes to avoid stillbirth or weak kids which is common in June, July months due to scarcity of pasture in grazing.

Poultry

Protect birds from excess summer heat. Vaccinate for Fowl Pox @ 0.5 ml intramuscularly and Ranikhet disease @ 0.5 ml subcutaneously. Add anti-stress

liquids & probiotics in drinking water during summer. Utilize broken rice or bajra (up to 30-40%), cotton seed meal (10-12%) and rapeseed meal (5 -8%) in poultry when there is shortage of maize during natural calamities. Keeping in view of disease outbreak follow biosecurity measures and mass vaccinate backyard poultry birds against Newcastle and viral diseases to prevent outbreak during stress periods. For hatching purpose of fertile eggs keep it in fridge at temperature of 4°C. To improve the growth rate 1 per cent protein level (soybean meal) may be added in the feed. Suitable coccidiostat should be added in the feed continuously by consulting the local veterinarian to prevent coccidiosis. 3-5 g of oyster shell/limestone/grit per day/bird shall be given to laying hens to avoid leathery eggs.

Value Addition: Convert milk into ghee, paneer, curd, khoa for better returns. Explore meat processing and packaging for hygienic sale. Utilize manure for biogas and compost.

Fisheries

Failed Monsoon: Use bore well or alternative water sources to maintain minimum pond water levels. Reduce stocking density to lower water demand. Adopt partial harvest strategies to minimize losses. Use water-saving practices like reduced water exchange. Avoid new stocking if water availability is uncertain.

Flood: Strengthen pond bunds and spillways to prevent overflow and escape of fish. Install protective netting around pond perimeters. Avoid feeding during peak flood to prevent water quality issues. Harvest fish early if flood risk is imminent. Apply disinfectants like Benzalkonium Chloride 80% (BKC) @ 2.5 L/ha and Rock Salt @ 75-125 kg/ha/5ft depth/ha after floodwater recedes to control disease outbreaks.

Drought: Reduce biomass load in ponds by early or partial harvesting. Avoid use of organic manure if water level is too low to prevent oxygen depletion. Apply aeration measures (e.g., paddle wheel aerators) to maintain DO levels. Maintain good water quality by regular monitoring and minimum exchange.

Delayed Monsoon: Postpone seed stocking until adequate water level is available. Increase application of manures/fertilizers once rains begin to promote plankton growth. Avoid breeding activities during uncertainty to protect brood stock. Maintain brood stock in protected tanks.

Advanced Monsoon: Prepare ponds early for stocking, complete liming 200 kg/ha and fertilization in advance. Ensure brood stock is not disturbed during monsoon (15th June to 31st August). Avoid overfeeding as heavy rains can cause feed waste and water quality degradation. Watch for sudden temperature or pH fluctuations due to early rains.

High Temperature: Maintain higher water levels (5-6 feet) to buffer temperature fluctuations. Avoid feeding during peak heat hours, feed early morning and late evening. Use shade nets or plant trees around ponds to reduce direct sunlight. Monitor dissolved oxygen (DO) and apply aeration during hot afternoons.

Low Temperature: Reduce feeding rate and switch to highly digestible feed. Avoid handling fish during early mornings and nights. Provide windbreaks and increase pond depth to retain heat. Avoid use of antibiotics and strong chemicals during cold periods unless essential.

CEREAL CROPS

Paddy

Farmers should begin nursery preparation by late May using recommended varieties like CR Dhan 310, CR Dhan 311, Gomati, or Swarna Masuri (135-150 day duration). Treat seeds 24 hours before sowing with Carbendazim/Captan (2g/kg) or Trichoderma viride (5 g/kg) to prevent soil-borne diseases. Transplant seedlings based on variety duration: 20-25 days for short/medium (?120 days), 25-30 days for medium-long (120-130 days), and 30-40 days for long-duration (130-160 days) varieties. To enhance soil fertility, incorporate green manure crops (dhaincha, cowpea, moong) or Gliricidia leaves during field preparation, along with Azotobacter application (12kg/ha soil or 1.5L/ha seed treatment). For weed control, use post-emergence herbicide Metsulfuron Methyl + Chlorimuron Ethyl (50gm/ha). Farmers currently harvesting boro rice should watch for gundhi bugs (control with Ethofenprox 10EC/Imidacloprid sprays) and blast disease (apply Hexaconazole at flowering), harvesting when 85% grains turn straw-colored.

Maize

Farmers are advised to cultivate high yielding varieties include RCM 1-1, RCM 1-2, RCM 1-3, Vijay Composite, DA 61-A, HQPM-1, and HQPM-2. Perform three deep ploughings to ensure proper soil aeration and seedbed preparation. Apply atrazine herbicide 2-3 days after sowing to effectively manage weeds for up to 30 days. Proper earthing up is essential to prevent lodging due to high winds or cyclonic conditions, ensuring stable maize growth. Ensure a well-maintained drainage system during the kharif season to avoid waterlogging, as excessive moisture can negatively impact maize yield. To control maize stem borer, apply Dimethoate 30 EC (660 ml/ha) or Carbaryl 50 WP (1.0 kg/ha) for effective management. For Fall Armyworm (FAW) control in kharif maize, use Emamectin Benzoate 5% SG (600-700 g/ha) as a systemic insecticide to protect the crop.

VEGETABLE CROPS

Okra

Farmers are advises to cultivate varieties such as Baazigar-0865 (Sakata), Simba-0895 (Sakata), NS 7774 (Namdhari Seeds), Lavanya (Advanta), Arka Nikita, Arka Abhay for better yield. Sow seeds during May-June with a seed rate of 8-10 kg/ha for open-pollinated varieties and 2.5 kg/ha for hybrid varieties. Soak seeds overnight for better germination and maintain spacing at 75x30 cm. Apply 25 t/ha of FYM and N:P:K @ 100:60:50 kg/ha as the recommended manure and fertilizer dose. For pest control use yellow sticky traps (10-20/acre) to minimize whitefly population.

Cucurbits

For effective management of cucurbits, start by treating seeds before sowing and shade drying them. Use healthy, certified seeds from registered sources to avoid seed-borne diseases, and follow the soil health card recommendations for appropriate fertilizer application. Prepare the nursery on raised beds with a polythene cover to protect seedlings from rain and hail damage. To control melon fly, collect and bury infested fruits in deep pits, install 25 pheromone traps per hectare in May, and apply a mixture of 30 ml Malathion and 150 L Gur in 15 liters of water at 15-day intervals. For downy mildew management, alternate sprays of Cymoxanil 8% + Mancozeb 64% (2 L/liter) and Thiaphanate Methyl 70% WP are recommended. Additionally, use 25 fruit fly traps per hectare for fruit fly control and apply Bavistin (1 g) + Mancozeb (2 g) per liter of water for fungal diseases, while Imidacloprid at 0.5 ml per liter will help control sucking pests.

Tomato

Raise the nursery for hybrids like Arka Abhed, Arka Samrat, and Arka Rakshak in the months of May-June. Prepare the nursery bed by the first week of May, mixing well-rotted farmyard manure (FYM) or compost into the soil. Drench the bed with a 0.1% solution of Captan or Fytolan to control damping-off disease, then cover with a polythene sheet or gunny bag for 2 days. Sow seeds thinly in U-shaped furrows with a spacing of 2.5 cm and a depth of 1-2 cm. Cover with a thin layer of sand mixed with sieved, well-dried FYM. Protect the seedlings from soil-borne insects by thoroughly mixing Malathion 5% dust into the soil before sowing. Planting pits 15 days before transplanting, applying FYM and liming to raise soil pH. Treat the pits with insecticide, and transplant seedlings at a spacing of 75x30 cm when they are 21-30 days old, usually in the second or third week of June. Apply half of the nitrogen (N) and full doses of FYM, P_2O_5, and K_2O as basal fertilizer at transplanting, with the remaining half of N top-dressed in one or two splits. Irrigate with 4 cm of water every 18-20 days by surface flooding. Pre-emergence application of Metolachlor @ 1 kg a.i/ha, followed by Grubber application at 40 days after planting (DAP), is recommended. For late blight, apply a 0.25% solution of Mancozeb 75 WP (2g/L). Control bacterial wilt by drenching the soil with 200 ppm Streptomycin, and fungal wilt can be managed by drenching the soil with Captan 50 WP (0.3%).

SPICE CROPS

Ginger &Turmeric

Farmers are suggested for planting ginger (Varadha, Nadia) and turmeric (Megha Turmeric 1 or Lakadong) rhizomes in the first week of May for optimal growth. Before planting, dip the rhizomes in Trichoderma Viride (4g/L of water for 5 minutes) or Trichoderma Harzianum (10ml/L) to prevent soil-borne diseases. Additionally, spraying Neem oil (10000ppm @ 2ml/L) or Trichoderma solutions can help prevent soft rot. Apply farmyard manure (FYM) at 25t/ha, and fertilizers with a ratio of N:P:K 75:50:50 kg/ha for better growth and yield. Plant rhizomes in ridges and furrows with a spacing of 40x20 cm. Ensure proper weeding and earthing up. Intercrop with crops like soybean, French bean, finger millet, or maize to improve farm income. Mulch the beds with dry paddy straw or green leaves to conserve soil moisture, control weeds, and prevent soil erosion.

LIVESTOCK

Regularly de-worm livestock as per their body weight and condition, especially during the hot and humid kharif season when worm infestations are more prevalent. Keep the livestock shed clean by using potassium permanganate for regular disinfection, and apply phenol compounds outside the shed to reduce the multiplication of disease-carrying vectors like mosquitoes and flies. Begin planting perennial fodder varieties like Nappier, Congo Signal, and Moringa. Additionally, prepare for the lean season by drying maize stalks for hay or making silage. Vaccinate cattle against FMD, HS, and BQ, goats over three months old against PPR, and pigs against Swine Fever. Apply external ectoparasiticides to prevent ticks, mites, and fleas. Keep the poultry shed dry, apply lime regularly to reduce the incidence of coccidiosis, and ensure proper ventilation to prevent disease outbreaks. Restrict poultry from exposure during rainy or stormy weather to protect from seasonal fever and other environmental stress factors. Use herbal or chemical fly repellents on a daily basis to manage external parasites and prevent fly infestations in the poultry farm.

FISHERIES

It is recommended to focus on carp breeding, hatchery management, and carp fry and fingerling production from April to July, as this is the peak time for these activities. For optimal carp fingerling production, dewater seasonal ponds to remove unwanted fish. Plough the pond bottom, expose it to sunlight for one week, and apply lime at a rate of 400 kg per ha to prepare the pond. After a week, apply cow dung at 10,000 kg per ha. Two weeks later, remove aquatic insects by using soap and kerosene emulsion. The exact doses should be confirmed by consulting a fisheries expert. Once the pond is prepared and insect removal is complete, stock healthy 4-day-old carp spawn at a density of 30 lakh/ha. This should be done 1-2 days after insect removal. Ensure regular feeding of carp fry with a mixture of finely powdered MOC and RB powder in a 1:1 ratio to promote healthy growth. It is advisable to excavate or renovate water harvesting ponds to conserve rainwater and runoff, maximizing water storage during the monsoon season. Maintain pond embankment stability by ensuring side slopes of 2:1 (Horizontal: Vertical) for sandy soil, 1.5:1 for loamy soil, and 1:1 for clayey soil. Additionally, create an empty berm of a width equal to the depth of the pond to prevent siltation during the rainy season. To maintain water quality, check the pH level of the pond after heavy rainfall. If the pH falls below 6.5, apply lime at 50 kg/ha to improve the water's alkalinity.

CEREAL CROPS

Direct Seeded Rice

DSR is suitable for sandy loam to heavy clay soils, but should be avoided on light-textured soils like loamy sands and sands. Choose a well-levelled field (which is best achieved using laser-assisted land levelling) with good drainage and reliable irrigation, as DSR needs precise water control during early growth stages. Select high-yielding, early to medium duration varieties that are resistant to lodging and local pests/diseases. Good choices include MTU-7029, Pusa Sugandha 4, Pusa Rice Hybrid 10, NDR- 9930111, Sambha Sub-1 and NDR-9436. DSR can be sown in dry soil followed by light irrigation for germination, or in moist soil after pre-sowing irrigation or rain. Planking after sowing in moist soil conserves moisture and improves establishment. While both methods suit conventional tillage, moist soil sowing is preferred for ZT-DSR due to softer soil.

Plan to sow seeds between mid-May and mid-June, before the monsoon sets in, to take advantage of early rains and reduce weed problems. Sowing with primed seeds in moist soil promotes rapid crop establishment. To prime, soak seeds in water for 10-12 hours in a gunny bag, then air-dry for 1-2 hours to ensure smooth flow through the seed drill. For pre-germination (moist soil sowing), incubate the soaked seeds for an additional 8-12 hours. Seeds should be sown soon after priming or incubation. Avoid sowing pre-germinated seeds in dry soil, as this can reduce emergence.

Treat seeds with fungicides (e.g., Carbendazim 2g/kg seed) to prevent seed-borne diseases. Use a seed rate of 20-30 kg per hectare, depending on the sowing method (drum seeder or broadcasting) and type of grain (fine or course grain) at a depth of 2-3 cm in rows spaced 20-25 cm apart to ensure uniform germination and allow easy weed control later.

Apply fertilizers based on soil test results. If a test is not available, use a general dose of 80-120:60:60 kg/ha of N:P:K along with 25 kg/ha of zinc sulphate (33%). Apply all

fertilizers except urea at the time of sowing, placing compound fertilizers like DAP or NPK as basal. Apply the remaining nitrogen as urea in 3-4 equal splits, starting 2-3 weeks after sowing and finishing at panicle initiation. Ensure nitrogen is applied just before irrigation.

Immediately after sowing, apply a pre-emergence herbicide such as Pendimethalin (1.0 kg a.i./ ha) within 1-2 days to control early germinating weeds. Monitor weed growth, and if needed, spray a post-emergence herbicide like Bispyribac-sodium (25 g a.i./ha) around 20-25 days after sowing, depending on weed type and density.

Keep the field moist, especially during critical stages like germination, tillering, flowering, and grain filling. Avoid standing water in early growth stages, but ensure timely irrigation. Adopt alternate wetting and drying method to save water. Allow the soil to dry for 2-3 days before irrigating again.

Regularly inspect crops for pest attack, especially stem borer, leaf folder, and brown plant hopper. Use insecticides like Chlorantraniliprole, Flubendiamide, or Imidacloprid as per recommendations when needed. For diseases such as rice blast, sheath blight, and bacterial leaf blight, grow resistant varieties, improve drainage, and spray appropriate fungicides (e.g., Tricyclazole, Propiconazole) in early stages if symptoms appear.

Harvest when about 80-85% of the grains on each panicle turn golden yellow. Ensure the grain moisture content is around 20% at the time of harvest to avoid damage during threshing. Dry the harvested paddy to 13-14% moisture to prevent fungal growth in storage.

Puddled transplanted rice

Select suitable rice varieties: Early maturing (110-115 days): Malviya Dhan 2, Pusa 2-21, Pusa 33, Pusa 834, Govind, Saket 4, Narendra 97. Mid-late maturing (120-125 days): NDR 2065, VL Dhan 61, Pusa 169, Pusa 205, Pusa 44, Sarju 52, Pand Dhan 10, Pant Dhan 12. Long duration (more than 130 days): Malviya 36, Narendra 359. Use certified, disease-free seed; seed rate: 30-40 kg/ha; seed treatment with Carbendazim or Trichoderma @ 2 g/kg seed to prevent fungal diseases; for insect protection, treat seed with Imidacloprid @ 5 ml/kg seed.

Nursery area: about 800-1000 m^2 per hectare of main field, nursery sowing time: mid-May to mid-June. Apply FYM or compost to nursery @ 5-10 t/ha and apply 1 kg urea, 2.5 kg SSP and 0.5 kg MOP as basal for 100 m^2 nursery. Maintain proper moisture; avoid water stagnation in early stages; use light irrigation and drain excess water during heavy rainfall in nursery.

Transplant 20-25 day-old seedlings during mid-June to early July, preferably in the morning or evening hours, avoiding continuous rain, using 2-3 seedlings per hill with a spacing of 20×15 cm for HYVs and 20×20 cm for hybrids. Maintain 2-3 cm standing water for the first 3-5 days after transplanting, followed by 2-5 cm during tillering and 5 cm during panicle initiation and flowering. Apply the recommended dose of fertilizers, and in case of zinc deficiency, spray 0.5% zinc sulphate mixed with 2.5% urea solution at 15-day intervals, repeating 2-3 times as needed.

Perform weeding manually or mechanically at 20 and 40-45 days after transplanting; for chemical weed control, apply Bispyribac-sodium @ 25 g a.i./ ha at 15-20 days after transplanting. Monitor for pests such as stem borer, leaf folder, gall midge, and grain bugs; apply Cartap hydrochloride 4 G @ 10 kg/ha for stem borer, spray Chlorantraniliprole @ 150 ml/ha for leaf folder and for grain-sucking bugs, apply Acephate 75 SP @ 1 g/liter. Monitor for diseases such as blast, sheath blight, brown spot and false smut, and manage them with appropriate fungicides- spray Tricyclazole @ 0.6 g/liter for blast, Mancozeb @ 2.5 g/liter for brown spot, and Tilt (Propiconazole) @ 1 ml/liter for false smut.

Avoid nitrogen topdressing at flowering/grain-filling stage to reduce disease risk. Harvest when 80-85% grains are golden yellow and hard. Stop irrigation 10-12 days before harvest. Delay in harvesting increases shattering and lodging risk. Thresh soon after harvest and dry grains to 13-14% moisture

Basmati Rice

Paddy blast disease

Cultivation practices for Basmati scented rice differ slightly from general rice, primarily in aspects like nitrogen application, lodging and specific pest/disease management. Basmati, particularly tall and semi-tall varieties, require less nitrogen and prone to lodging. For pest and disease management, basmati rice requires specific strategies for diseases like neck blast and sheath blight. Variety of scented basmati rice: Azad Basmati, Pusa Basmati 1, Pusa Basmati 6, Pusa Basmati 4, Pusa Sugandh-2, Pusa Sugandh-3, Pusa Sugandh-4, Pusa Sugandh-5, Ballabh Basmati 22, Malviya Sugandh 105, Malviya Sugandh 4, Malviya Basmati 1, Pusa Basmati 1509, PRH 10.

Optimum sowing time for DSR is the first fortnight of June. For nursery sowing and transplanting: Pusa Sugandh-4, Pusa Sugandh-5, Ballabh Basmati 22, Malviya Sugandh 105, Malviya Sugandh 4, Malviya Basmati 10, Pusa Basmati 1509: Nursery sowing in 1st fortnight of June; transplanting in 1st fortnight of July. CSR 30 (for pH >8.5 soils), Basmati 370, Basmati 386: Nursery sowing in 2nd fortnight of June; transplanting in 2nd fortnight of July.

Treat seeds with Trichoderma harzianum @ 15 g/kg seed before sowing to prevent foot rot. Dip seedling roots for 6 hours in T. harzianum solution (15 g/litre) before transplanting. Transplant 25-30 day-old seedlings (5-6 leaf stage), using 2-3 seedlings per hill at 20×15 cm spacing (33 hills/m^2); reduce to 15×15 cm (44 hills/m^2) for late planting to avoid yield loss. Prefer green manuring with 45-55 days-old dhaincha/sunnhemp or incorporation of summer moong straw. Skip urea application if green manure is used.

Apply fertilizers based on soil test and crop rotation. Avoid phosphorus if already applied in the preceding crop. For Pusa Sugandh-4, Sugandh-5, Ballabh Basmati 22, and Malviya varieties, apply 90 kg urea/ha in two equal splits at 3^{rd} and 6^{th} weeks

after transplanting. For Pusa Basmati 1509, apply 135 kg urea/ha in three splits at 3rd, 6th, and 9th weeks after sowing (DSR) or in two equal splits after transplanting. Apply urea when fields are non-flooded; irrigate on the third day after application.

Maize

Select suitable hybrids and composites like Shaktiman-1, K-41, Azad Uttam, Sharad Mani, Azad Kamal, Chandra Mani, Azad Shankar Makka-1 and Azad Shankar Makka-2 or other recommended varieties based on agro-climatic zones. Use certified, disease-free seeds treated with Carbendazim or Captan @ 2 g/kg for fungal protection and Imidacloprid @ 5 ml/kg for insect protection at a seed rate of 20-25 kg/ha.

Adjust sowing time to ensure proper crop establishment before the regular onset of monsoon. Time of sowing from mid-June to early July with spacing of 60 cm×20 cm (approximately 83,000 plants/ha). A population of 60-75 thousand plants per hectare at harvest is required for obtaining the optimum yield.

In irrigated area, it is most desirable to complete the sowings 10-15 days before the onset of the rain. For rain-fed areas, which entirely lack irrigation facilities, it will be desirable to sow the crop as soon as adequate amount of soil moisture has been built up to ensure germination and establishment of proper plant stand. Ensure proper field drainage to prevent water stagnation, especially during germination.

Apply FYM or compost @ 8-10 t/ha during land preparation; also apply 120-135 kg nitrogen, 60 kg phosphorus (P_2O_5) and 40 kg potash (K_2O) per hectare, with full phosphorus, potash, and one-third nitrogen as basal at sowing, followed by top-dressing of one-third nitrogen at knee-high stage and the remaining at tasseling, along with 25 kg/ha zinc sulphate if deficiency is suspected.

Perform inter-culture and weeding at 20 and 40 days after sowing to maintain a clean field, and apply pre-emergence herbicide Atrazine @ 1.0-1.5 kg/ha within 2 days of sowing to control broadleaf and grassy weeds effectively.

Monitor for insect-pest (stem borer, shoot fly, fall armyworm, and aphids) and diseases, and follow recommended practices as per need. Maintain soil moisture during critical stages-tasseling, silking, and grain filling; avoid water stress and drain excess water during heavy rainfall.

Harvest when husk turns brown and grains become hard and glossy, dry cobs properly before shelling; reduce grain moisture to 13-14% for safe storage.

Bajra

Grow improved long-duration hybrids such as ICMB-155, WCC-75, Narendra-3, Raj 171, Pusa 322, Pusa 23, 86M45 and ICMH-451 based on the length of the growing period and purpose. Sowing should be done from mid-July to mid-August. Sow seeds 4 cm deep using the behind-the-plough method, maintaining a row spacing of 50 cm. Use 4 kg/ha seed rate for all recommended varieties/

Pearlmillet variety 86M45 (Mathura)

hybrids. If seeds are not treated, treat 1 kg of seed with 2.5 grams of thiram before sowing to prevent seed-borne diseases. Seeds can be extracted by dipping in a 20% salt solution.

For effective weed management, first weeding 15 days after germination, and the second weeding at 35-40 days. Apply fertilizers based on soil test results. In the absence of soil test data, apply 80-100 kg nitrogen, 40 kg phosphorus (P_2O_5), and 40 kg potassium (K_2O) per hectare for hybrids. For local varieties, apply 40-45 kg nitrogen and 40 kg potassium per hectare. Apply the entire dose of phosphorus and potassium, along with half the nitrogen, as basal dose at sowing. Apply the remaining half of nitrogen as topdressing at 25-30 days after sowing.

PULSE CROPS

Arhar (Pigeon Pea)

Well-drained, fertile loam soils are best suited for Arhar cultivation. Waterlogging in the field harms the crop and reduces productivity. Grow improved long-duration varieties such as Bahar, Amar, Narendra-1, Azad, Pusa-9, PDA-11, MA-6, MAL-13, IPA 203 and Narendra Arhar-2, and short-duration varieties like Paras, UPAS-120, Pusa-992, and Type-21 based on the growing period and intended use. Late-maturing varieties (approx. 270 days) should be sown in July, while early-maturing varieties should be sown in irrigated areas by mid-June to allow harvest by the end of November and timely sowing of wheat in early December.

Sowing should be done behind the plough. Maintain a spacing of 50 cm between rows and 20 cm between plants. Use 20 kg seed per hectare for all varieties. Perform thinning 20-25 days after sowing to ensure proper plant spacing and remove excess seedlings. Higher yields are often obtained with ridge sowing.

Treat 1 kg of seed with either a mixture of 2 g Thiram and 1 g Carbendazim, or 4 g Trichoderma + 1 g Carbendazim or Carboxin before sowing. Additionally, inoculate seeds with Rhizobium culture specific to pigeon pea by mixing one packet (sufficient for 10 kg of seed) evenly by hand. Sow treated seed immediately and avoid exposure to strong sunlight to protect the culture. Use culture especially in fields where pigeon pea is being cultivated after a long interval.

Fertilizer application should be based on soil test results. In the absence of test data, apply 25-30 kg nitrogen (N), 40-50 kg phosphorus (P_2O_5), and 30 kg potassium (K_2O)

Pigeonpea (Narendra Arhar 2) at Ayodhya

Pigeonpea (IPA 203) at Firozabad

per hectare as a basal dose at sowing. Use single super phosphate as the phosphorus source to also supply 12% sulphur. All fertilizers should be applied by drilling them 5 cm deep and 5 cm away from the seed in the furrows. Apply 20 kg sulphur per hectare (equivalent to 154 kg gypsum or phospho-gypsum) and 3 kg zinc per hectare (equivalent to 15 kg zinc sulphate heptahydrate or 9 kg zinc sulphate monohydrate) as a basal dose. In case of zinc deficiency in standing crops, spray a solution of 5 kg zinc sulphate and 2.5 kg lime dissolved in 800-1000 litres of water per hectare. For iron deficiency in light-textured soils, foliar application of 0.5% ferrous sulphate ($FeSO_4$) is recommended at 60, 90, and 120 days after sowing.

The first 60 days are critical for Arhar; two mechanical weedings should be done- first at 20-25 days and second at 45-50 days after sowing, before flowering. For effective weed control, apply Pendimethalin @ 0.75-1.0 kg a.i./ha as a pre-emergence spray in 400-600 litres of water to prevent weed seedling emergence for up to 50 days. In fields with persistent weed problems, use Fluchloralin 50% EC @ 1.0 kg a.i./ ha incorporated into the soil before sowing, or Alachlor 50% EC @ 2.0-2.5 kg a.i./ha in 400-500 litres of water as a pre-emergence spray.

Green gram and Black gram

Green Gram (Moong) Varieties: Narendra Mung-1, Narendra Mung-2, T-44, K-851, Sweta, Swati, IPM 02-03, IPM 02-14, IPM 409-4, Virat, SML 668, SML 832, and HUM 16. Black Gram (Urd) Varieties: Vallabh Urd-1, Narendra Urd-1, Narendra Urd-2, T-27, T-77, T-65, T-9, Shekhar-1, Shekhar-2, Shekhar-3, Azad Urd-1, Azad Urd-2, Azad Urd-3, KU-99-21, Pant Urd-19, and Pant Urd-3.

Mung bean and urd bean should be sown with the onset of monsoon, typically from June to July, as both early and late sowings can negatively affect crop performance. Early sowing may lead to maturity during the rainy period, causing losses, while late sowing results in poor crop growth and higher disease incidence. During the rainy season, both crops are often broadcast using a seed rate of 15 kg/ha, but line sowing is recommended as it provides better canopy management and facilitates intercultural operations.

Maintain row spacing of 30-45 cm depending on the sowing time and variety, with 15 kg/ha seed rate being optimal for effective plant stand and spacing. Before sowing, treat seeds with Agrosan GN or Thiram @ 2.5 g/kg of seed to prevent seed-borne diseases. Inoculate seeds with appropriate Rhizobium culture, especially if urd bean is being

Greengram (Virat) at Etawah

Blackgram (Shekhar 2) at Kaushambhi

cultivated in the field for the first time or after a long gap, to enhance nitrogen fixation. For weed control, one or two hand weedings should be done up to 40 days of sowing depending upon the weed intensity. Weeds can be controlled by the use of Pendimethalin 0.75-1.00 kg a.i./ ha in 400-600 L of water as pre-emergence application.

OILSEED CROPS

Groundnut

Cultivate improved groundnut varieties such as Chitra, Kaushal, Prakash, Ambar, TG-37A, Utkarsh, and Divya, based on the length of the growing season and end-use requirements. Groundnut matures in about 120-130 days and should ideally be sown in the first fortnight of July to ensure harvest by the end of October.

Maintain row spacing of 45-50 cm and plant-to-plant spacing of 15-20 cm. Use 70-75 kg seed kernels/ha for timely sowing, and 90-95 kg/ha for late sowing conditions. Treat seeds before sowing with Thiram @ 2 g and Carbendazim @ 1 g per kg of seed, or Trichoderma @ 4 g + Carboxin @ 1 g per kg. Inoculate seeds with groundnut-specific Rhizobium culture 5-6 hours before sowing. Dissolve 50 g jaggery in 0.5 liters of water, mix with 250 g Rhizobium culture, and coat over 10 kg of seed. Dry treated seeds in the shade for 2-3 hours and sowing of seeds should be done in early morning or evening times to protect Rhizobium from heat-induced mortality.

Apply fertilizers based on soil testing; in the absence of test results, apply 20 kg nitrogen, 30 kg phosphorus, 45 kg potash, 250 kg gypsum, and 4 kg borax per hectare. Perform two hoeing-cum-weedings, the first at three weeks after sowing and the

Groundnut (TG 37A) at Mainpuri

Sesame (GJT 5) at Amethi

second three weeks later, as this helps minimize early weed competition, promotes better aeration, and supports healthy crop growth. For additional control, especially under high weed pressure, apply pre-emergence herbicide imazethapyr @ 100 g/ha in 500-600 liters of water within 3 days of sowing.

Soybean

Cultivate improved soybean varieties such as PK-472, JS-715, PS-564, PK-262, JS-2, JS-935, JS-7244, JS 20-29, Pusa-20, Pusa-16, and PK-416 based on growing season and production goals. The crop matures in about 120-125 days; sow between mid-June and the first fortnight of July. Maintain a row spacing of 45 cm and plant-to-plant spacing of 3-5 cm; sow seeds 3-4 cm deep. Use 70-75 kg seed/ha under normal conditions and 75-80 kg/ha under late sowing. Ensure a minimum germination of 75-80%.

Sesamum

Grow improved varieties such as Type-4, Type-12, Type-13, Type-78, Shekhar, Pragati, Tarun, GJT 5 and RT-351 depending on crop duration and use. The crop matures in 90-95 days; sow in the last week of June to the second fortnight of July. Maintain a row spacing of 30-45 cm; use 3-4 kg seed/ha. Due to small seed size, mix seeds with sand, ash, or dry light soil for uniform sowing. Treat seed with Thiram @ 2 g and Carbendazim @ 1 g/kg to control seed-borne diseases. Apply fertilizers based on soil test; in the absence of test data, apply 30 kg nitrogen, 20 kg phosphorus, and 20 kg sulphur per hectare. In rocky soils, add 20 kg potash per hectare. Apply half of the nitrogen and full doses of phosphorus, sulphur, and potash as basal at sowing; apply the remaining nitrogen during weeding. Spray 2% urea solution during flowering and pod formation to enhance yield.

Conduct first weeding at 15-20 days and second at 30-35 days after sowing. During weeding, thin the plants to maintain a spacing of 10-12 cm. For chemical weed control, apply Alachlor 50 EC @ 1.25 liters per hectare as pre-emergence. Provide irrigation at the pod development stage if moisture stress occurs when 50-60% of pods have formed.

COMMERCIAL CROPS

Sugarcane

Select suitable varieties based on region and maturity group: Early maturing (CoS 08272, CoS 13231, CoS 17231, CoS 13235, UP 05125, CoSe 98231, Cose 03234, Co 0118, Co 98014, CoLK 94184, CoLK 14201), mid-late maturing (Cos 08279, CoS12232, CoS 09232, CoS 14233, CoS 15233, CoS 16233, CoSe 08452, CoSe 13452, CoPant 84212, CoPant 97222) and waterlogging conditions (CoS 10239, CoS 08276, UP 9530, CoSe 96436, CoLK 94184).

Use healthy, 3-budded setts from 8-10 months old crop for seed cane and treat setts with Carbendazim (0.1%) before planting. Adopt proper spacing 75 cm to 90 cm between rows. For spring planting, ideal time is February to mid-March; late planting can be done up to May with assured irrigation. The recommended fertilizer dose for sugarcane is 180-200 kg N, 80 kg P_2O_5, and 60 kg K_2O per hectare. Apply one-third of nitrogen and the full dose of phosphorus and potassium as basal at planting. The remaining two-thirds nitrogen should be applied in two equal splits, first at 45 days after planting and second before the monsoon. Adjust doses based on soil test results for precise nutrient management. According to soil type and rainfall, 4-5 irrigations in the eastern region, 6-7 in the central region, and 7-8 irrigations in the western region of the state and two supplemental irrigations after rainy season.

Weeds can sometimes reduce sugarcane yield by up to 30%, with a more pronounced effect observed in ratoon crops. Perform intercultural operations (hoeings) at 30, 60, and 90 days after planting. For chemical weed control, apply Atrazine @ 2 kg/ha or metribuzine @ 1 kg a.i/ ha immediately after planting, followed by 2,4-D sodium salt @ 2 kg/ha at 60 days after planting.

Carry out earthing-up at 60-90 days to support plants and reduce lodging. Monitor and manage pests- Early shoot borer (dead heart; control with Carbofuran 3G @ 33

kg/ha or Chlorantraniliprole granules), top shoot borer (appears in later stages; remove infested shoots), termites (apply Chlorpyrifos 20 EC @ 2.5 l/ ha in irrigation water), use light traps and natural predators (Trichogramma) for IPM. Watch for diseases- red rot (rogue and destroy affected clumps, use resistant varieties), smut (remove smutted whips, use sett treatment with fungicide). For ratoon management, cut cane at ground level, irrigate immediately, remove dead clumps and do gap filling, apply 25% higher fertilizer N and irrigate regularly.

VEGETABLE CROPS

Treat seeds with 2 g of Thiram per kg to prevent seed-borne diseases and damping-off in the nursery. Sowing of bhendi during June-July, and tomato and brinjal in June. Use 18-20 kg/ha seed for bhendi with a spacing of 45x20 cm. For tomato and brinjal nurseries, use 500 g and 650 g seed per hectare, respectively. After transplanting, maintain spacing of 50x50 cm for tomato and 60x60 cm for brinjal.

Apply fertilizers based on soil test; basal application should be done at the time of sowing. For effective weed management, perform hoeing at 30, 60, and 90 days after sowing. To manage sucking pests in summer vegetables like gourd, bitter gourd, and cucumber, spray Imidacloprid 70% WG @ 1.05 g in 15 liters of water. For whitefly control in brinjal and tomato, use Thiamethoxam 25% WG @ 6 g in 15 liters of water. In okra, spray Thiamethoxam 25% WG @ 3 g per 15 liters of water for jassid and whitefly control. For shoot and fruit borers, spray Carbaryl 50 WP @ 2.5 g/l or Quinalphos @ 2.0 ml/l, or Monocrotophos @ 1.6 ml/l as required. To control jassids, aphids, and whiteflies, use Dimethoate @ 2.0 ml/l or Triazophos @ 1.5 ml/Lof water.

In crops like muskmelon and watermelon, mulching with mustard stover helps in conserving soil moisture. Ridge and furrow sowing in cucurbits improves fruit quality, reduces irrigation needs by 35-40 %, and ensures better returns. Onion bulbs, after harvesting, should be dried in the shade for 3 days. The stalk should be trimmed 1.5-2 cm above the bulb to enhance storage life. For kharif season, use the Agri Found Dark Red variety, which is ready for marketing as green onions by November-December.

In bottle gourd, select germplasm with prominent bottlenecks and pale green fruits, yielding 25-30 t/ha.

FRUIT CROPS

Plant banana in July. If fertilizers haven't been applied in April, use 140 kg Urea, 80 kg DAP, and 80 kg MOP per acre. To address stem burst issues, apply 25 g magnesium sulphate per plant, remove unwanted suckers, and irrigate regularly. For pest control in litchi orchards, spray Thiacloprid @ 0.75 ml or Novalurone @ 1.5 ml per liter of water. To prevent fruit bursting, spray Borax @ 4 g per liter of water. Spray Naphthalene Acetic Acid (NAA) @ 20 ppm at 15-day intervals during April-May to reduce fruit drop, especially when agricultural operations are disturbed.

In mango orchards, intercrop with turmeric to supplement income. Prune dead, criss-cross branches to allow sunlight penetration and reduce canopy density. For uniform flowering and fruiting, spray 1% Urea and 0.5% Zinc Sulphate during October-November. Apply 100 g of NPK per one-year-old tree (217 g Urea, 625 g SSP, 167 g MOP), increasing

by 100 g each year up to 10 years. For trees older than 10 years, apply 2.17 kg Urea, 6.25 kg SSP, and 1.67 kg MOP per tree. During harvesting, mangoes should be picked with the pedicel intact to avoid bruising and fruit drop. Avoid shaking the branches to reduce losses. Use proper post-harvest handling to maintain fruit quality and market value.

LIVESTOCK

During extreme summer, animals should be protected from heat stress by ensuring wallowing arrangements on farms, especially in rural or small-scale operations. Large commercial dairy farms may use cooling devices like fans, wet curtains, air coolers, or air conditioners. Ensure availability of clean, cool, potable water at all times, and install shaded water troughs in convenient locations in sufficient numbers.

Feed a concentrate mixture with more than 18% digestible protein and 70% energy content, along with palatable, digestible, and laxative green fodder. Increase the proportion of green fodder in the diet and chop long fodders before feeding to enhance intake. Soaking concentrates in equal amounts of water for 20-30 minutes improves nutrient utilization. Supplementation of sodium, potassium, minerals, and vitamins is essential during heat stress, as it helps maintain health and improves milk yield.

During the monsoon season, maintain clean, leak-proof animal sheds to prevent dampness and disease. Rainy-season grasses should be partially sun-dried before feeding to reduce water content and improve digestibility. De-worm livestock at the beginning of the season and repeat as necessary since worm burden increases in moist conditions. Regular spraying of animals for ectoparasite control and cutting of bushes near sheds is recommended. Disinfect sheds frequently and ensure dry, safe feed storage. In goat husbandry, avoid feeding potentially toxic plants like rhododendrons, and seek immediate veterinary help if ingested. Goats are highly susceptible to internal and external parasites and must be dewormed every 2 to 3 months. Young kids should receive deworming medicine at 7-8 weeks of age. CDT vaccination should also be administered at 7-8 weeks, with a booster after 4 weeks and then annually, to protect against clostridium and tetanus.

In poultry farming, efforts should be made to integrate poultry produce like eggs and meat with essential commodity supply chains, especially in targeted regions. Public awareness campaigns are needed to dispel myths about poultry product safety and educate consumers about nutritional benefits and production standards. Eggs should be properly cleaned, graded, packed, and labeled with details like date of production, expiry, weight, and nutritional content to boost consumer confidence. Improved transportation practices for live birds, such as using ventilated and temperature-controlled containers, are recommended. Processed chicken meat consumption should be promoted by encouraging hygienic processing, attractive and informative packaging, reliable cold chains, and building trusted brand identities.

Public health campaigns involving healthcare professionals, fitness influencers, and social workers can further enhance consumer trust and poultry product consumption. Before brooding, prepare poultry sheds by spraying insecticide

immediately after removing old birds. Remove all portable equipment and leftover feed. Eliminate rodents, wild birds, and thoroughly clean all organic material like manure, litter, feathers, cobwebs, and dust using hard brushes. Remove weeds and trash from the vicinity, and use flame guns to sanitize wire mesh, crevices, and equipment. Mass vaccination of backyard poultry against diseases such as Newcastle is essential during stress periods like extreme summer.

FISHERIES

During summer, rising water temperatures reduce the dissolved oxygen content in fish ponds, which can stress fish and affect productivity. To manage this, catfish farming is a better option in this season due to its higher tolerance to low oxygen conditions. If irrigation facilities are available, circulate fresh water in the pond regularly to boost oxygen levels. Additionally, manually circulating water by running a boat in the pond can also help aerate the water and maintain a healthy environment for fish. During the monsoon season, water levels in ponds naturally rise, which can lead to overflow and erosion if not managed properly. Deepening the pond before the monsoon increases its water-holding capacity and helps avoid flooding. Strengthen and repair pond dykes in advance to prevent erosion caused by heavy rainfall, and ensure proper slope for effective drainage and control of excess water.

Desilting of ponds is crucial before the onset of the rainy season. Organic matter tends to accumulate at the pond bottom, which, when mixed with excess rainwater, can deteriorate water quality by affecting the growth of beneficial algae and zooplankton. Regular removal of silt helps maintain a favorable aquatic environment. Rainwater can also reduce dissolved oxygen, causing fish to come to the surface. In such cases, immediately add fresh water or use aeration devices to restore oxygen levels. Continuous monitoring of water parameters, especially pH, is essential during the monsoon, as rain tends to make surface water more acidic. Adequate drainage systems and inflow of fresh water help maintain optimal water quality. To prevent overflow, inlet and outlet structures should be in place and well-maintained. These outlets help manage water levels during heavy rainfall and allow complete drainage when required. A collecting area within the pond is useful for gathering excess water and preventing fish loss during floods.

CEREAL CROPS

Rice

Important rice varieties for Tarai, Bhabhar & Plain areas are Pant Dhan 10,12, 18,19, 22, 24, 26 & 28, Narendra 359, PR 113 & 114 in bold rice, scented rice-Pant Sugandha Dhan-15,17, 25 & 27, Pusa Sugandha-4 and 5, basmati rice-Pant Basmati 1 and 2, Pusa Basmati 1121, Pusa Basmati 1509, Pusa Basmati 1692, Pusa Basmati 1718, Pusa Basmati 1728, Pusa Basmati 1847, Pusa Basmati 1885, Pusa Basmati 1886 and traditional basmati rice are Type 3, Basmati-370 and Taraori recommended for cultivation. Time of nursery sowing is 2nd fortnight of May to 1st week of June and transplanting time is June end to 1st week of July. Rice varieties for irrigated valleys & lower hill (<900 msl)- Govind, Pant Dhan 6, 10, 11& 12, VL Dhan 65, 81, 85 & Vivek Dhan 82, for mid hills (900-1500msl)- Pant Dhan 6,10 & 12, VL Dhan 61, 65,85, Vivek Dhan 62 & 82. Nursery sowing time is May 2nd fortnight to June 1st week in valley & lower hill and May 1st fortnight for mid hills, transplanting time is June last week for valley and lower hill and 2nd fortnight of June for mid hills. Varieties of Jethi rice (rainfed, direct seeds) are Vivek Dhan 154 & VL Dhan 221 for sowing during 4th week May - 1st week of June, Chetaki rice (rainfed) varieties are VL Dhan 207, 208 & 209 are suitable for sowing in mid-March to 1st fortnight of April. Seed rate in transplanting rice are 40 kg (bold grains) and 25-30 kg/ha for fine grains is sufficient. Raising the healthy nursery in basmati rice 1.0kg of seed should be sown in 25 m^2 area. Planting geometry should be maintained as 20*10-20cm in transplanting to obtaining higher productivity. To reduce/avoid the crop weed competition, transplant at least two healthy seedlings per hill early in the season to optimize plant population.

Fertilizer Application: The transplanted rice crop in Tarai, Bhabhar & Plain area should be fertilized with NPK @ 150:60:40 Kg/ha, hybrid rice 150:60:60, scented and basmati rice 100:60:40, old basmati rice 60:30:20 with 50 % N and entire dose of

HYV of Rice Pant Dhan-28

Basmati rice cultivation in Valley of Dehardun

P & K at the time of transplanting as basal and remaining N top dressing in two equal splits at 3rd and 6th weeks after transplanting. In hilly area dwarf rice should be fertilized with 100-120:60:40 and desi rice 60:30:30 kg/ha of NPK. In case of zinc deficiency symptoms in previous crop, apply zinc sulphate (21%) 25 kg/ha at puddling.

Weed Management: Pendimethalin 1.0 kg /ha at 0-3 DAS fb metsulfuron methyl 4.0 g/ha at 25-30 DAS and one hand weeding (40-45 DAS) is recommended for DSR. Post emergence application of bispyribac sodium 10 SC 25g/ha or penoxulam 24 SC 22.5g/ha or ready mixture of penoxulam 1.02 %+ cyhalofop-butyl 5.1% (120- 135 g/ha) or cyhalofop-butyl 10%EC 80 g/ha used for effective control of weeds in direct seeded rice. In transplanting rice, maintaining at least 3-4 cm standing water in main field during early stages is recommended to check weed emergence. Application of butachlor 1.5 kg/ha, or pretilachlor 1.0 kg/ha as pre-emergence (0-3 DAP) and if required 2,4-D 500 g/ha or metsulfuron methyl 10% + chlorimuron ethyl 10% WP 20g/ha as post-emergence to control sedges and broad leaf weeds or one manual weeding is effective for weed control in transplanted rice.

Organic Pest Management: Application of Trichoderma enriched FYM compost @100kg/ha (Trichoderma 2kg+100kg FYM composting) at field preparation. Seed treatment with Pseudomonas fluorescens1.5% LF @ 4.5 ml/kg seed for leaf and neck blast management. Seedling treatment with Pseudomonas fluorescens1.5%LF @10 ml/liter of water dip seedlings for 30 minutes for management of BLB. Two spray of Pseudomonas fluorescens 1.5%LF @ 6 L/ha, 1st at vegetative growth and 2nd at 25% flowering initiation can be done for blast control. Spray of Azadirachtin 0.03% EC 5.0L dissolved in 1000 liter of water/ha for leaf roller, stem borer and brown plant hopper .Application of Bacillus thuringiensis var rustaki 2.5% @1.5 kg in 500-750 liter of water for stem borer and leaf folder management in rice.

Chemical Pest management: Spray of fipronil 5% SC @1000-1500ml/ha in 500 liter water for management of stem borer, BPH, green leaf hopper, rice gall midge and white backed plant hopper. Spray of thiamethoame 25% WG @100 g/ha in 500-750 liter water for stem borer, gall midge, leaf folder, white backed plant hopper, brown plant hopper, green leaf hopper and thrips control. Spray of imidacloprid 6% + lambda-cyhalothrin 64% SL @ 300 ml/ha in 500 liter of water for stem borer, hispa,

plant hopper and gandhi bug management. Spray of hexaconazole 5%EC 1000ml or azoxystrobin 18.2%+ difenconazole 11.4% SC 500ml or mancozeb 75WP 1.5-2.0 kg or isoprothiolane 40% EC 750ml/ha for of blast and sheath blight disease management in rice.

Maize

Recommended sankul varieties for Tarai, Bhabhar & Plain area are Pant Sankul Makka-3, Sweta, Bajora Makka-1 & Vivek Sankul-11. Hybrids maize are H M 4, 10, 11, 13, HQPM 1, 4, 5, Pant Sankar Makka-1, 4, 5, 6, Sartaj, P-3522 and Vivek Makka-51. Best sowing time is mid-June in Uttarakhand plains. Popcorn varieties: Pant Popcorn-1 and VL Amber Popcorn, fodder maize variety is African Tall. Sowing time is mid-June to mid-July. Sankul varieties suitable for hills: Vivek Sankul Makka-11, 37, 31, 35 and Pant Sankul Makka-4, hybrids maize are Vivek Sanker-9, 39, 45, 53, 55, 57 and DMH-109. Time of sowing in lower hill (1st week June to mid-June), mid hill (May end to mid-June) and higher hill during April end to mid-May is suggested. Optimum seed rate of 18-20 Kg for sankul, 20-22 Kg for hybrids, 12-14 Kg for popcorn, 40-45 for baby corn and 8 kg/ha for sweet corn is recommended. Spacing for maize may be maintained at 60*20-25 cm in line sowing at a depth of 5 cm. Inter-cropping of cowpea/soybean/ginger in maize would be effective to achieve the higher productivity, profitability and also control the soil erosion in hills.

Fertilizer Application: The maize crop in Tarai, Bhabhar & Plain area should be fertilized with NPK @ 120:60:40 kg/ha. Full P and K, ¼ N apply at sowing and rest of N applied in 3 equal splits at 3-4 leaf stage, knee stage and flowering time. In case of zinc deficiency symptoms in previous crop, apply zinc sulphate (21%) 25 kg/ha as basal application.

Weed Management: For proper weed control minimum two hand weeding at 20-25 and 40-45 days after sowing is recommended. Application of atrazine 2.5 kg/ha as pre-emergence for broad leaf weeds fb tembotrione 42% SC 120 g/ha post-emergence at 3-4 leaf stage (15-20 DAS) for grassy and broad leaf weeds or alachlor 2.0 kg/ ha as pre-emergence for both grassy and BLW is recommended. To control the sedges, application of halosulfuron methyl 70WG 67.5g a.i./ha as post-emergence at 3-4 leaf stage (15-20 DAS) is recommended. For control of broad leaf weeds in maize crop application of 2, 4 -D dimethyl amine salt 58% SL 0.5 kg/ha or 2, 4-D ethyl ester 38% EC 0.9 kg/ha as post-emergence at 15-20 DAS.

Plant Protection: Banded Leaf and Sheath Blight disease in maize can be effectively managed through an integrated approach. Soil application of Trichoderma (Pant Bioagent-1) at the rate of 1 kg multiplied in 100 kg of vermicompost (VC) or farmyard manure (FYM), applied 10-15 days prior to sowing, has shown good results. Additionally, seed treatment with Trichoderma (Pant Bioagent-1) at 20 g

FAW infestation in Maize

per kg of seed as a slurry before sowing further enhances protection. For managing the disease at later stages, foliar spray of Azoxystrobin 18.2% + Difenaconazole 11.4% SC at 500 ml per hectare is recommended, with the first spray at disease appearance, followed by a second spray after a 10-day interval. Similarly, Fall Army Worm can be controlled through regular monitoring of fields to collect and destroy egg masses, which are covered with hairs and are easily visible on leaves. For crops up to 20 days old, spraying with Chlorantraniliprole 18.5 SC at 0.4 ml per litre of water, Spinetoram 11.7 SC at 0.5 ml per litre, or Emamectin benzoate 5 SG at 0.4 g per litre using 300 litres of water per hectare is recommended. For older crops, the water volume should be increased to 200 litres per acre with a corresponding adjustment in insecticide dosage. To ensure effective control, the spray nozzle should be directed towards the whorl of the plant.

Millets

Millets are drought-tolerant and climate-resilient crops that can be grown in a variety of soil types, including those with low fertility. PRJ-1 is a variety of Barnyard millet, specifically adopted for hill agro-ecosystem. Ideal conditions for millet cultivation include well-drained, moderately fertile soils, but they can also thrive in sandy, loamy, and clay soils. Finger millet verities- Pant Mandua-3, VLM-146, 315, 348, 352, 376, 379, 380, PRM-1 and 2.

Deep ploughing is recommended once in the summer, followed by 2-3 harrows. Seed treatment/ biofortification with Azospirillum brasilense (N fixing bacterium) and Aspergillus awamori (P Solubilizing fungus) @ 25 g/kg seed is beneficial. In case seeds are to be treated with seed dressing chemicals, treat the seeds first with seed dressing chemicals (carbendazim 2.0 g +Trichoderma 10g/kg seed) and then with bio-fertilizers at the time of sowing.

The optimal time for sowing is typically the 3rd week of June to the 1st week of July, with the onset of the monsoon. A seed rate of 10 kg/ha is found to be optimum for drill sowing and 5 kg/ha for raising seedling for transplanting. Spacing maintains as 45 cm row to row and 12-15 cm plant to plant within the row. Manures are applied 5-10 t/ha FYM about a month before sowing.

Millets respond well to fertilizer application. The general recommendation for finger millet is 60 kg N, 30 kg P_2O_5 and 30 kg K_2O per ha under irrigated and 40 kg N, 20 kg P_2O_5 and 20 kg K_2O per ha under rainfed conditions. Use jeevamrit and ghanjeevamrit to enhance the fertility of the soil. For light soils under low rainfall areas, NPK @ 30:30:20 ha can be applied at the time of sowing, with an additional 30 kg N as top dressing at 30-35 DAS. A dose of 40:40:40 kg/ha NPK can be applied in medium-deep soils and moderate to high rainfall areas. Use dashparni extrtact, neemastra, brahmastra, agniastra for IPM in millet crops. It is essential to control weeds in

Finger Millet cultivation in Uttarakhand

the initial stage of crop growth and development. The inter-cultivation and manual weeding should be done at 25 DAS. In line sown crop 2-3 times inter-cultivation and one time hand weeding is suggested whereas, in broadcast seeded crop two hand weeding will effective to minimize the weeds. In assured rainfall and irrigated areas, pre-emergence spray with pendimethalin @ 1.0 kg a.i./ha. (rainfed areas), Oxyflurofen @ 0.1 L a.i./ha (irrigated areas) can be done. For post-emergence spray 2,4-D Na salt @ 0.75 kg a.i./ha around 20-25 days after sowing is recommended. Yellow sticky trap (10-12/ha) is advised to control the aphids control. Stem borer is destructive for millets; it can be control with spray of neem oil 5 ml/litre of water or spray fipronil 2ml/litre of water after pest emergence.

COMMERCIAL CROPS

Sugarcane

Sugarcane under Trench planting method

Normally, two groups in sugarcane varieties i.e. early and mid-late/late maturity are observed. Farmers prefer the varieties of high tonnage while, sugar mills prefer the higher sucrose content. Nowadays early maturing, high sucrose and higher tonnage varieties are available and are in higher demand by the farmers and sugar mill owners. These varieties are performing well in the country and accounts for higher sugar production. Early maturity varieties: Co Pant 12221, Co Pant-3220, Co 15023, Co 118, Co 98014, CoS 13235, CoS 17231, CoLK 9709, CoLK 11203, CoLK 14201, CoLK 15201, CoS 88230,CoS 8436 and CoS 3251. Mid-late maturity varieties: Co Pant-12226, Co Pant-13224, Co Pant-97222, Co Pant-5224, Co 5011, CoS 13035, CoLK 14204, CoS 14233, 16233 and CoPb 14185.

Field Preparation: As sugarcane crop stands in field for >1year, it is necessary to give deep ploughing by tracto drawn mould-board plough. The proper time for ploughing is immediately after the preceding crop is harvested or just after a good shower of rain received. The harrowing is done 3-4 times to break clods and to make the land smooth and even to facilitate uniform irrigation, 4-6 ploughings to produce good tilth is recommended and each ploughing should be followed by planking. Spring cane is planted in the month of February-March. March is the best time for cane planting in Uttarakhand, some area also lying under late planting which can be possible after harvesting of wheat (April-May) require special management practices.

Sugarcane planting can be done in flat bed method; shallow furrows (8-10 cm deep) are opened tractor operated furrow opener at a distance of 75-90 cm. Three budded settsare planted taking care that on 3-budded sett falls in each running 30 cm length of furrow. After planting, the furrows are covered with 5-7 cm soil and the field is leveled by heavy planking. After germination 3-4 inter-cultures are recommended at a proper interval to control the weeds and facilitate the tillering.

In heavy or fertile soil farmers can adopt trench planting methods to get the higher cane productivity and profitability per unit area, in trench planting method, single or double row trench opened through tractor mounted trench opener at 120-150 cm apart, two budded setts to be planted in trench with basal application of NPK+FYM+Insecticide mixture in running trench only, then covered the 4 cm soil above the cane setts. If required, summer planting should be done only by half ridge irrigation method of planting for better germination.

Fertilizer Application: Well decomposed FYM @ 20-25 t/ha with NPK 150:60:50 kg/ha recommended for sugarcane plant crop whereas, ratoon crop fertilized with 25% more N than the plant cane. Full P and K applied at as basal. A dose of 150 kg N/ha, one third given as basal, remaining two third top dressing in equal two splits at 45 and 60 days after plating (end June) gives better cane yield in late planted conditions. Ratoon cane fertilized with N as one-third at 1st week of ratoon initiation with first hoeing, one-third at 6th and rest one-third at 8th weed after rationing. Phosphorus and potassium (on soil-test basis) should be drilled along the cane rows at the time of first inter-culture at 1st week of rationing. Iron deficiency symptoms first appear in young leaves as yellow stripes between the green veins. Later, the veins also turn yellow. In severe cases, leaves become white and the plants remain stunted. Spray the crop 2-3times with 1% solution of ferrous sulphate (1kg ferrous sulphate in 100 litres of water) at weekly intervals soon after the symptoms appear.

Weed Management in Sugarcane Plant crop: To manage the weeds in sugarcane, metribuzin 1.0 kg a.i./ha or ametryn @ 2.0 kg a.i./ha as pre-emergence is as effective as earlier recommended pre-emergence herbicide atrazine@ 2.0 kg ai/ha. Either of these herbicides should be coupled with application of 2,4-D @ 1.0 kg a.i./ha at 60 days after planting (DAP) and one hoeing at 90 DAP to sustain cane yield equivalent to three manual hoeings at 30, 60 & 90 DAP.

Weed Management in Ratoon Crop: Two hoeings at 15 and 45 days after ratooning should be adopt for effective control of weeds in sugarcane ratoon. However, under limitations of manpower-availability, cost etc., pre emergence application of either of atrazine @ 2.0 kg a.i./ha or metribuzin @ 1.0 kg a.i./ha (800- 1000 L water/ha) fb either of 2,4-D Na salt @ 1.0 kg/ ha a.i. (in 600-800 litres water/ha) or hoeing at 45 days after ratooning can be successfully practiced. Further, trash mulching in alternate rows and hoeing in un-mulched furrow at 1st and 6th weeks after ratoon initiation is also a good option.

Management of binding weeds: In sugarcane, application of atrazine @ 2 kg ai/ha or metribuzine @ 1.25 kg ai./ha as pre-emergence followed by DICAMBA @ 350 g ai/ha at 75 DAP is effective for controlling binding weeds in sugarcane.

Tying and Wrapping: These operations are most essential in sugarcane cultivation just to provide mechanical support to the grown-up plants to prevent lodging. The leaves are removed from the plants and wrapped together by taking all canes in one bundle. Tying should be done in the month of August when cane reaches about 2 m height. Green leaves should not be tied up together while tying up the crop.

Plant Protection: To control the termite, early shoot borer &root borer application of chlorpyriphos 20 EC @ 5.0 litres/ ha in 1600-1800 litres water (3 ml/l) on cane

setts in furrows at planting for checking the infestation of shoot borer. Collection and destruction of infested shoots at periodic intervals from March to May on campaign basis is also recommended. Whitefly cane be managed effectively by removal of lower leaves followed by foliar application of Imidacloprid 0.005% + 2% urea is recommended. Urea solution should be prepared first and then Imidacloprid is to be added to avoid coagulation of the mixture. Spraying of 0.2% carbendazim or 0.2% Blitox-50 or 0.2% copper oxychloride are the most effective fungicides for pokkah boeng disease management. Propineb @ 0.25% and mancozeb @ 0.20% are found to be effective against sugarcane rust and it should be sprayed on the foliage just after the appearance of rust pustules, thrice at 15 days interval.

PULSE CROPS

Pulses cultivation in Uttarakhand

Urdbean varieties are Pant Urd 19, 31, 35, 40, Pant Urd 10, Pant Urd 7, Pant Urd 8 & Pant Urd 9 for Tarai, Babhar and lower hills and sowing time is 3rd week of July to 1st week of August in plain areas and 2nd fortnight of June in valleys. Mungbean varieties for Tarai, Babhar and hills are Pant Mung 2, 5, 8 & 9 Pusa Vishal and Virat sowing time is last week of July - 2nd week of August in plain areas and 2nd fortnight of June in valleys. Pigeopea varieties for hill and plains area are Pant Arhar-3 & 291, Pant Arhar-6, VL Arhar 1 and UPAS-120, time of sowing in hills mid-April to mid-May and in plains till mid-June. Horsegram varieties are VLG-15 and 19 for hilly area, sowing time 1st fortnight June. The seed rate for urd and mung 12-15kg/ha is sufficient; line sowing maintains the 30-45 cm R to R space at 3-4 cm depth. Arhar crop prefer to sow in lines using seed rate of 15-20 kg/ha, spacing of 60-75*20 cm row to row and plant to plants obtaining desired plant population. Prior to sowing seed treatment with carbendazim 2.0 g/kg of seed, then seed bio fortification with Rhizobium and PSB and Trichoderma culture should be done.

Fertilizer Application: Kharif pulses should be fertilized with NPK @ 20:40:30 kg/ha as basal. It is better to supply the P with sulphur (SSP) containing fertilizer. Foliar spray of 2% urea in pulses at flowering stage will be beneficial.

Weed Management: For proper weed control, 2 hand weeding at 15 and 30 days after sowing is recommended. For effective weed control in pulses viz., urd, mung, cowpea and pigeonpea pre-emergence application of pendimethalin 30%EC 1.0 kg/ha at 0-3DAS or pendimethalin 30%+ imezathapyr 2% 750+50 g/ha at 3-4 leaf stage is recommended. Application of imazethapyr 35%+imazamox 35% or quizalofop 5% EC 37.5-50 g/ha or propaquizafop 10% EC 75g/ha as POE at 3-4 leaf stage is recommended in such crops.

Plant Protection: Application of flubendiamide 20% WG @ 300 g per ha in 500 L water to control the Spodoptera litura and Maruca spp. Application of chlorantraniliprole 18.5% SC @ 100 ml/ha in 500 L water for pod borer control. Appliocation of indoxacarb

14.5 SC % @ 300 ml/ha or emamectin benzoate 5% SG @ 11 a.i. g/ha or Spinosad 45 SC @ 56-73 a.i g/ha is effective against pod borer, blister beetle and leaf webber complex. Use dashparni extrtact, neemastra, brahmastra, agniastra for insect pest management in pulses crop. Spray neem oil 5 ml per litre of water and fipronil 2ml per litre of water for *Helicoverpa armigera* control in pulses.

FRUIT CROPS

Mango

Nutrient Application: Apply 100g each of NPK per one-year-old plant (217g Urea + 625g SSP + 167g MOP). Increase 100g each of NPK every year up to 10 years. For 10 years and above old plantation apply 2.17 kg Urea + 6.25 kg SSP + 1.67 kg MOP / tree.

Pruning: Practice pruning to remove the criss-cross dead & dried branches so that the Centre of the tree is opened with a less dense canopy and inner branches are exposed to sunlight. Spraying1% Urea & 0.5% Zinc sulphate during months of October& November for uniform flowering and fruiting every year.

Plant Protection: For the control of fruit drop in mango spray Planofix @ 20 ml per 100 liters of water at pea stage of fruits. Keep the sufficient moisture in the orchard basin. For the control of Powdery mildew and Die-back diseases, spray of Karathen 48% EC @ 200ml/200lit. Spray Thiamethoxam 25% (Actora) @ 40g/200lit. of water for the control of mango hopper and mealy bug.

Harvesting: All the fruits harvested with pedicel avoiding injury to the fruits. Avoid shaking and injuries to branches and thus no loss by way of fruit drop from trees during harvesting.

Peach & Plum

To control Peach leaf curl, adopt integrated approach. Thin the fruits, ensure moisture availability, apply organic fertilizers with high N content to reduce stress of plant. A copper-based fungicide i.e. Copper oxychloride 50% WP @ 600 g per 200 liters of water should be sprayed. Time of spray is falling of leaves and bud swell stage. For the control of peach leaf curl aphis spray imidacloprid 17.8% SL@ 80ml/200 L. of water For the control of gummosis in stone fruits spray Streptocycline 20 g + Copper oxychloride 50% WP @ 600 g per 200 litres of water.

Litchi

Maintain sufficient and consistent moisture during May -June to prevent fruit cracking. Mulching with grass around tree basin is helpful for moisture conservation. Spraying of Neem oil@ 400ml/200 L.of water before flowering to avoid egg laying for the management of Litchi fruit borer. Second spray of Novaluron 10 EC 300 ml/ 200 litre of water after fruit attains the clove size (at 10-12 days after fruit set) and third spray of Emamectin benzoate 5% SG @ 80g/ 200 L of water during aril (pulp) development stage which comes 25-30 days after fruit set.

Guava

Spray Zinc sulphate 2 Kg + Lime 1 Kg in 200 liters of water to control die back of branches due to deficiency of zinc in the orchard. Copper based fungicide i.e. Copper

oxychloride 50% WP @ 600 g per 200 litres of water can be applied during rainy season to prevent Anthracnose. Set up Fruit fly trap (Methyl eugenol trap) in the orchard @ 25/ha for the control of fruit fly. Quinalphos 25% EC (Ekalux® @ 2 ml/L + neem oil (Eco-neem Plus @ 3ml/L.) will help in controlling fruit flies under their high population situation in mango

Citrus

For the control of Gummosis, Canker and Die back problem in the orchard, spray Copper oxychloride 50 % WP @ 600 g/ 200 litres of water during June-July. Spray Zinc sulphate 1 Kg + Lime 500 g in 200 litres of water to control zinc deficiency during last week of April and mid of September.

VEGETABLE CROPS

Tomato

Varieties Pusa Ruby, Pant T-3 and Hybrid varieties Indam 1313, Himsohna, Kranti, Shivay, Abhilash, Himshikhar etc., are suitable for cultivation. Earthing up and staking in summer tomato may be completed by end of April by adding split N dose. Remaining Nitrogen can be applied at one-month interval thereafter. For Kharif tomato, nursery raising of varieties like Indam 1313, Himsona, Himshikhar etc., may be started in the month of February and transplanting should be completed by mid-April. For the management of Early blight, Buck eye-rot and Fruit rot diseases apply Copper oxychloride @ 3g/L, Rhidomil MZ @ 2.5 g/L and Mancozeb 45 @ 2.5 g or Kavach @ 2g/L respectively as and when symptoms appear. Some other effective fungicides are Azo-oxy-strobin 23%@0.5 -1.0 ml per litre and Tabuconozol 38%@ 1ml per liter. For the management of fruit borer, apply Profenofos @ 1ml/L or Chlorpyriphos @ 2ml or Cypermethrin 10EC @ 1ml per litre of water. In areas where blossom end rot is problem apply Calcium chloride @ 5g/L of water as foliar application

Capsicum

Transplanting of capsicum using California wonder, Hungtinton, Bharat and other suitable hybrids may be completed by end of April using NPK @ 100:75:55 before sowing with Nitrogen in 3 splits (30, 60 90 DAT). For the management of Powdery mildew and Fruit rot diseases use Hexaconazole or Contaf @ 0.5 ml/L and Mancozeb 45 or Rhidomil MZ @ 2.5 g/L as and when symptoms appear in the standing crop. For the management of fruit borer apply Lambda cyhalothrin @ 0.8 ml/L or Acephate @ 1 g/L or Flubendiamide @ 0.2 g/L; and Imidacloprid @ 0.5 ml for sucking pests.

Cucurbits

Transplanting of cucurbit seedlings must be completed by April end using FYM and Fertilizers (NPK @ 100:50:60 before sowing with Nitrogen in 3 split doses at 30, 45, 70DAT. For fruit fly management, install Fruit Fly traps @ 25 traps per ha in May and use Malathion 30 ml + Gur 150 g per 15 L water at 15 days interval. Use Bavistin 1g + Mancozeb 45 2g per litre of water for management of fungal diseases and Imidacloprid @ 0.5 ml per litre for the management of sucking pests.

COLE CROPS

Transplanting of cole crops in high areas can be started in the month of June using NPK @ 125:75:70 at the time of sowing with Nitrogen in 3 splits (30, 60 90DAT). Borax can be added for the management of browning in cauliflower. For the management of cutworms apply Cypermethrin 10EC @ 1ml/L of water

Brinjal

Transplanting of brinjal may be completed by April end. Apply Cypermethrin @ 1ml/L at flowering for management of brinjal Fruit & Shoot borer. For the management of Phomopsis blight apply COC @ 3g/L or Ridomil MZ @ 2.5 g/L

French bean

Sowing of French bean using high yielding varieties (Bush type: Palam Mridula, Falguni, Anupama, Ragini, Arka Komal, Solan Naina, Contender, Bahaar Pole type: Luxmi, SVM-1, Moraleda, Padmini) could be completed by end of April or first week of May. Apply NPK @ 25:65:65 at the time of sowing following seed inoculation with Bavistin and Rhizobium culture. For weed management use pre-emergence herbicide Pendimethalin @ 1.5 kg/ ha. Management of Anthracnose and angular leaf spot diseases can be achieved by applying Bavistin @ 1g/L as and when symptoms appear in end May

Chilli

To avoid damping off disease seed treatment with Carbendazim, Mancozeb can be done. To control viral diseases the infected plants should be uprooted and burnt or buried to avoid further infection. Suitable insecticidal sprays reduce the incidence of viral diseases, since majority of viral diseases are transmitted by insect vectors. Drenching with 1% Bordeaux mixture or blue copper or Fytolan 0.25% may give protection against Fusarium wilt. White fly which is the vector of viral diseases can be controlled by spraying Dimethoate 30% EC @660 ml/ha. Thrips may attack chilli and to control thrips spray Profenophos 20ml or neem seed oil 50 ml in 10 litre water. In case of severe attack, spray Spinosad 3ml/10 litre of water.

Okra

Pusa Bhindi-5, Pusa Sawani, Pusa Makhmali can be sown during February-March for lower hills/ plains and April to Mid-May in mid hills as summer crop and July for rainy season crop. Management practices should be followed to protect the vegetable crops from hot air. Irrigation management should be done early in the morning, at evening or during night time in vegetable crops as per availability and requirement of crop. For management of fruit borer in okra take a spray of Cypermethrin 10 % EC @ 15 ml or Quinalphos 25 % EC @ 20 ml per 10 liter of water. Harvesting of mature vegetables should be done early in the morning.

Ginger

For management of Rhizome rot seed can be treated with PBAT-3 like Carbendazim, Mancozeb, Copper oxychloride. Spraying of Axostrobin and tebuconazole @ 1.5-2 g/L of water can be done. Varieties like Himgiri, Rio De Janeiro can be sown during June month.

Potato

Recommended Varieties of potato for hills are Kufri Himalini and Kufri Jyoti with seed rate of 1.5 to 2.5 t/ha. Recommended crop geometry for potato cultivation is 50 cm X 20 cm. During last ploughing around 10-15 tonne of FYM plus basal dose of 90 Kg Urea, 300 Kg SSP and 65 kg MOP is recommended to be applied followed by top dressing of Urea at the rate of 70 kg/ha and 50 kg/ha 30 and 50 DAS in potato cultivation. Earth up around the base of plants to encourage better tuber formation, particularly when plants attain 15-20 dm height. Hand weeding, followed by earthing up and mulching with local material like Baanj leaves should be performed for effective weed management. In plains of Uttarakhand, where chemicals are used, Pre-emergence application of Metribuzin 70% WP at the rate of 250-300 g/acre or post emergence application of Propaquizafop 10% EC at the rate of 2 ml/L water or 400 ml/acre are found some excellent choices to control weed flush.

Plant Protection Practices: Larvae of Potato tuber moth, cause damage in the form of mines in the leaves and/or weakening of the stem, which can break. To control/ manage this pest, avoid planting potato tubers in shallow soil. Plant the tubers at a depth of 10 to 15 cm. for biological control, install pheromone traps 20/ha and spray NSKE 5% or Quinalphos 20 EC 2 ml/L (ETL 5% leaf damage) to control foliar damage. Potato Cut worm, is one of the most damaging pests in rainfed areas of Uttarakhand. To manage this pest, set up a light trap to attract adult moths during summer. Install a sprinkler irrigation system to potato farm and irrigate the field during the day to expose the larvae to bird predation. As chemical control, a day after planting, drench the collar region of the plants with chlorpyrifos 50% + cypermethrin 5% at the rate of 1ml/L of water. To manage White Grub, go for summer ploughing to expose pupae and adults, install light traps and should be active between 7 PM. to 9 PM Major diseases of potato in Uttarakhand are Late blight and Early blight. To manage these two diseases, remove any ground creepers that are a source of infection. Spray Mancozeb 2 g/L water or Chlorothalonil 2.5 g/L water at 45, 60, and 75 days after planting is recommended for late blight and Difenoconazole 25% EC or Hexaconazole 5% EC at the rate of 2ml per litre of water for early blight.

BEEKEEPING PRACTICES DURING RAINY SEASON

Wax moth infestation in Bee Hives

Colonies should not be inspected on cold, windy, and cloudy days, and during heavy rain, hives should be protected with roofing sheets. Always use protective dress and veils while inspecting colonies, handle them gently without jerks, and isolate diseased colonies from healthy ones. Ensure the provision of fresh water nearby in shallow vessels, and provide 50% sugar syrup during dearth periods when nectar and honey stores are inadequate. Avoid feeding colonies with honey or syrup mixed with honey. When pollen stores are low, provide pollen substitutes made of fat-free soybean flour (3 part), brewer's yeast (1 part), skimmed milk powder (1 part), sugar (22 parts), and

honey (50 part) formed into patties. Old and dark combs should be discarded, and the inside of the hive should not be painted. Open the hive only when necessary and remove highly infested combs, which should be destroyed by burning. To sterilize combs and equipment, dip them in soap solution containing 7% formalin for 24 hours, wash with water, dry, and reuse. Diseases such as European Foulbrood (EFB), caused by Melissococcus pluton, can be identified when larvae turn yellow, then coffee brown, dying in uncapped cells as larvae, not pupae. EFB can be treated with oxytetracycline (Terramycin), but not during nectar flow, and robbing of infected hives should be prevented.

Wax moths like the Greater Wax Moth (Galleria mellonella) and Lesser Wax Moth (Achroia grisella) tunnel through combs, leaving webs and feces, primarily attacking weak colonies. Infested combs should be removed, and regular inspection will help maintain strong colonies that naturally suppress wax moths. As wax moths dislike light, exposing equipment to light or freezing empty frames will deter them. Ants can be controlled by placing hives on stands with legs in earthen cups filled with water. The ectoparasitic mite Varroa jacobsoni is highly destructive and requires strict colony hygiene, regular examination, and the use of Formic Acid to manage infestations.

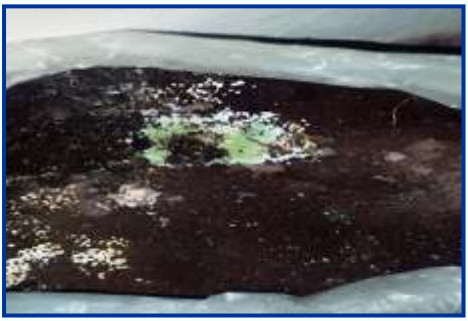
Care during Migration: During migration, successful beekeeping demands timely and well-managed movement of colonies, particularly from areas lacking flora to those with abundant floral resources. Before migration, survey the target area to ensure flora availability and extract honey from the colonies. Close the entrance gates of colonies in the evening after all worker bees are inside, and pack the colonies internally and externally to prevent jerking. When loading onto vehicles, ensure the entrance faces the front side of the vehicle. Migration should start late in the evening, ensuring colonies reach the destination within 10-12 hours and entrance gates are opened upon arrival in the morning. For long-distance moves, colonies should be halted at appropriate locations during the day, the entrance gates opened, and the process repeated. Avoid jerking during transport to prevent colony stress and losses.

Bee Forage Plants: At this time weeds, grasses, and many kharif crops like coriander, maize and oilseeds flower and bees start collecting pollen. Comparatively, nectar is not freely available. Plants which are good source of nectar are tamarind, neem, eucalyptus. Plants which are good source of pollen are sorghum, sweet potato, maize, millets like ragi, roses, castor, pomegranate. Plants which are good source of both pollen and nectar are banana, peach, citrus, guava, apple, Sunflower, berries, safflower, pear and plum.

MUSHROOM PRODUCTION PRACTICES DURING RAINY SEASON

During the rainy season in Uttarakhand, mushroom production requires careful management to ensure healthy growth and prevent contamination in mushroom units. Mushrooms thrive in a humid environment (80-90%), but excessive humidity during the rainy season can become a challenge; hence, proper ventilation is crucial to prevent moisture buildup. Maintaining a consistent temperature within the recommended range for the specific mushroom species, typically between 15-30°C, is essential, while the mushroom house should be well-insulated to avoid temperature fluctuations that may hinder growth or cause diseases. Dehumidifiers

Yellow sticky trap for Sciarid and Phorid flies control



Green mould in button Mushroom

can be used to control humidity but should not dry the substrate excessively. Ventilation fans must be installed to ensure adequate air circulation, prevent CO_2 buildup, and remove stale air. Additionally, during the rainy season, pests such as insects and rodents become more prevalent; therefore, preventive measures including regular cleaning, placing rat-baiting traps, and ensuring sanitation are necessary, along with routine monitoring for any signs of diseases or pest infestation.

Preventive Measures and Management: A major disease threat during this period is Green Mould, caused by Trichoderma species, which appears as greenish spots on the substrate and may also affect fruiting bodies, leading to reduced yields and economic losses. To manage this, mushroom houses, including spawning, spawn running, and cropping rooms, should be thoroughly cleaned and disinfected, using high-quality compost with the right structure, humidity, and carbon-nitrogen ratio. Infected areas should be isolated by covering them with wet paper towels sprinkled with salt, and spraying with Bavistin solution has been found effective in controlling green mould. Among common insect pests in mushroom units are Sciarid flies (fungus gnats) and Phorid flies, which damage mushrooms and spread diseases. Integrated Pest Management (IPM) strategies include maintaining strict cleanliness, sanitizing units with Formalin solution, ensuring proper composting and pasteurization, and optimizing environmental conditions to make them less hospitable for pests. Additionally, the use of yellow sticky traps effectively controls Sciarid and Phorid flies under mushroom production units.

LIVESTOCK

Livestock is an integral part of agriculture and in order to maximize the production and productivity the livestock should be kept under comfortable environment. As ruminants such as cows, buffaloes, goat, sheep produce methane gas it is pivotal that shed should be well ventilated, floor should be elevated and non-slippery to avoid injuries such as lameness and hip dislocation. During monsoon season, different disease such as Mastitis, foot rot, maggot wounds, pox disease are common and to avoid this regular disinfection of shed with 1% sodium hypochlorite, 2-5% sodium hydroxide, 2-3% cresols etc. are recommended, while potassium permanganate in 1:1000 to 1:10000 is applied in general wound as well as preventive measure of mastitis. Lime or potassium permanganate solution is kept at foot step of entrance in order to avoid any entrance of microorganism in animal shed. During summer to

avoid heatstroke, animal should be kept in shady areas and if possible, arrangement for fans and cooler should be made. Animal should be given fresh and clean water ad libitum especially during summer season. The feed given should be balanced consisting of appropriate quantity of green, dry fodder and concentrate along with mineral mixture, common salt. In higher altitude region, where the temperature is low throughout the year the animal whether cattle, goats, sheep, poultry should be given jaggery water in order to maintain optimum energy level. During summer and monsoon season the parasitic infestation rises especially in plain areas of the state. For control of ectoparasites various ecto-parasiticidal/acaricides are applied topically such as amitraz, cypermethrin, deltamethrin @ 2-3 ml/L of water and for control of endoparasites various anti-helminthic drugs such as Fenbendazole, Albendazole, oxyclozanide, levamisole etc. are used at appropriate dose and dosage. To combat any adverse condition such as outbreak of any disease the farmer should be in close contact with nearby Veterinary hospital, dispensary.

Cow and Buffalo

Prior to monsoon season cattle should be vaccinated against economically important diseases such as Foot and mouth disease, Hemorrhagic disease, brucellosis etc. Now a days vaccination is also done in cross breed cattle against theleriosis (haemoprotozoan diseases) in disease endemic areas. The feed should be nutritious consisting of green fodder such as sorghum, maize, napier etc. ($^2/_3$), dry fodder such as wheat/paddy straw ($^1/_3$) and adequate amount of concentrate (1 kg for maintenance and 1kg for 2.5-3 L of milk). Regular feeding of mineral mixture@ 50 mg/day/cattle and common salt @ 30 g/day/animal should be done for lactating/dry/pregnant/heifers. Deworming should be done at regular interval preferably in every 3 months particularly prior and end of monsoon season as prevalence of endoparasites particularly liver fluke are highest during this season. Topical application of acaricides is done to control ectoparasite such as ticks, lice, mites etc. However special precaution should be taken during application of acaricides as these are highly toxic and if ingested could be fatal. During lean period when there is scarcity of quality fodder feeding of hay, silage should be practiced. In consultation with veterinarian animal health camp and awareness programs should be organized at village level.

Sheep and Goats

Prior to monsoon season the sheep and goats should be vaccinated against PPR, Hemorrhagic septicemia, Foot and mouth disease and Enterotoxemia. Deworming of sheep and goat in every 2-3 months should be done with emphasizes on rotational grazing. Dipping of goats and sheep is done in medicated water to control ectoparasites however, certain precautionary measures should be taken before dipping the animal. Store the forage in dry and moist free condition to prevent any fungal growth which could be detrimental for the health of sheep and goats. For optimum production, productivity and growth mineral mixture should be fed on regular basis @ 15-20 g/day/animal along with common salt. Trimming of hoofs should be done in order to prevent lameness, foot rot and other such conditions. To enhance the conception rate and probability of twinning flushing ration i.e., over and

above the maintenance ration be given prior to breeding season. The floor of the shed should be raised and to prevent moisture straw, wood husk etc. should be used as bedding material and be replaced at regular interval.

Poultry

The shed of the poultry farm should be free from any leakages and the floor should be elevated. Feeding cost constitute 70% of total cost incurred in poultry farming so special focus should be given that feed is moisture-free with antifungal and anticoccidials are added to feeds as any contamination such as aflatoxins, aspergillosis, coccidiosis could lead to disease outbreak causing mortality and thus a great loss to farmers. Fumigation with potassium permanganate and formalin (1:2) is done prior to new lot in order to destroy any microbes present in farm. The water given should be fresh, clean and replaced at regular interval and supplemented with multivitamin, liver tonics, calcium supplement, probiotics in order to maintain growth of the poultry birds. Biosecurity measures include footbath at entrance, restricted entrance by visitors, use of foggers, fans during moisture/summer months. Vaccination of birds against important diseases such as IBD, Ranikhet, Pox disease.

Swine

The Swine shed should be durable and leak proof to withstand heavy rains and wind. To prevent water logging and fungal growth the shed should be proper drainage and ventilation. Regular deworming and supplementation of mineral mixture optimizes the growth and productivity of swine. Swine should be vaccinated against classical swine fever. Dipping should be avoided during monsoon. Good hygiene and sanitation are important to combat any disease outbreak.

FODDER AND FEEDING MANAGEMENT

Livestock feed is generally classified according to the amount of nutrient present. They are generally classified as roughage and concentrate. Roughages are bulky feed containing large amount of crude fiber (>18%) and low Total digestible nutrients (<60% TDN). While concentrate have less fiber (<18%) and high TDN (>60%). Some of the commonly cultivated fodder crops in Uttarakhand during kharif season are Maize, sorghum, pearl millet, cow pea, guar, hybrid napier, perennial forages, lucerne etc. During scarce period silage, hay feeding should be fed to animals. Feeding management is an important aspect, the feeding should be done 2-3 times a day however fresh clean water should be available 24 hrs. The fodder should be chopped as it avoids wastage and increases the palatability of the feed. The ratio of green fodder ($^2/_3$) and dry fodder ($^1/_3$) should be maintained. Feeding of concentrate is based on the stage of animal i.e., dry animal are given maintenance ration, dairy cattle are fed concentrate based on milk production, pre-starter, starter, finisher ration is given in poultry etc. Along with dry, green fodder, concentrate regular feeding of mineral mixture, common salt should be given. Animal should be given maximum time for rumination so that all the nutrient available in feed of animal are fully utilized. Azolla, an aquatic fern is also now a days as a source of green fodder @ 1.5-2 kg in cattle, swine @ 300-500 g in goats and 20-30 g is poultry.

Disease Surveillance during monsoon season: Livestock are prone to various viral, fungal, protozoan, bacterial infection. However, vaccines are available for prevention of some of the economically important diseases such as FMD, PPR, H.S. etc. So, vaccination of livestock should be done prior to monsoon season. If diagnosed with disease the animal should be isolated and prompt treatment should be done. Different ectoparasites act as vector for disease transmission such as Theleriosis, Babesiosis, Trypanosomiasis etc. thus ecto-parasiticidal drugs/acaricides should be applied at regular interval. In case of any disease outbreak, restricted movement of animal, culling of affected animal, proper disposal of carcass and disinfection of shed and surrounding area should be done to check further outbreak of disease. The farmer/owner should be in regular contact of veterinarian for any further assistance regarding any preventive and control measure.

Fish Farming

Provide 1-2 % feed for feeding according to fish weight. Use lime in plain areas @ 200 kg/ha/month while in hills @ 2 kg/100 m^2. Maintain minimum level of 1-1.5-meter level of water. Disinfect the net and other equipment before and after use, harvesting and marketing of old fish stock. Use prophylactic $KMnO_4$ (2-5 ppm) or salt (1-2%) baths biweekly. Fishes breed during monsoon season (June-July) therefore proper feeding should be done. Maintain records for water quality, feeding, and growth.

SPECIAL ADVISORIES FOR HIGH ALTITUDE AREAS (MUNSYARI, KEDARNATH ETC.)

In high altitude hilly areas, proper arrangement for heat source should be made by using dung plaster, use of lamps, heater etc. Animal should be given additional ration to maintain adequate body temperature. Animal should be brought outside when the temperature is adequate and should be brought back to shed before sunset. Animal should be provided mineral mixture, common salt, Luke warm water or even jaggery water. Floor should be covered with wood husk, straw and even cow mats and replaced at regular interval to avoid any moisture retention. Vaccination and insurance of animal is pivotal.

West Bengal

Performance of kharif crop is highly affected by uncertainty of weather like depleting rainfall pattern, late onset of monsoon, uneven and erratic rainfall, intensive rainfall in very short span causing flood like situation or short/ long dry spell. So, farmers are advised to be remained updated about weather forecast being publicized through different electronic media. Crop wise advisories for farmers of the state of West Bengal are mentioned below in summarized form.

CEREAL CROPS

Rice

Select varieties depending upon land situation, cropping pattern, soil character and climatic vulnerabilities usually occurs in the state. In medium to upland condition medium to short duration high yielding (<125 days) like Gontra Bidhan-1, Gontra Bidhan-3, MTU-1153, MTU-1010, IET-4786, IET-4094, CR Dhan-802, Uttar Sona etc. or short duration varieties like Annada, Anjali etc. are usually recommended depending upon the next crop preference. Long duration (>135 days) paddy varieties like MTU-7029, CR Dhan-800, Dhiren and Swarna Sub-1 are preferred in medium-to-medium low land where as in low land having temporary water stagnation problem submergence tolerance rice varieties like Swarna Sub-1, CR Dhan 801 and Ranjit Sub- 1 are recommended. In low land having permanent water stagnation problem deep water rice varieties like Sabita is recommended. In order to cope up with drought like situation drought tolerant varieties like CR Dhan 801, CR Dhan-802, Sahabhagi etc. are to be cultivated. For saline lands, select the improved salt tolerant rice varieties Chinsura Nona 2 (Gosaba 6), Nona Sampad, Nona Suvarna or local variety Dudheswar.

Seed bed preparation (between May 20 to June, 5) and transplanting (June 10 to June 25) should be accomplished in time. Ideally, 25-35 days age old seedlings should be transplanted depending upon duration of the variety used. Seeds should be treated

with brine water solution followed by treatment with Mancozeb + Carbendazim or T. viridae. Community nursery, tier nursery and alternative methods such as DSR through drum seeder are very good options to combat with flood or drought like situation, as per applicability.

Use pre-emergence herbicide like Butachlor 5 G (20-25 kg/ha), Pretilachlor (0.75-1.0 kg a.i./ ha) or post-emergence herbicide like Bispyribac-Sodium 10% SC (250 ml/ha) or triafamone (20%) plus ethoxysulfuron (10%) at 15-20 DAT.

Soil application of Zinc through 40-50 kg of zinc sulphate heptahydrate (21%) or 20-30 kg zinc sulphate monohydrate (33%) per ha and boron through solubor 20% at puddling is advocated, if the previous crop had shown zinc and/or boron deficiency symptom.

The crop yield is mostly affected by pests like yellow stem borer, brown plant hopper & leaf folder and diseases like blast, sheath blight, bacterial leaf blight and false smut. Root dipping of the seedlings in Pseudomonas fluorescens (mixed in water @ 10 g/L) for 30 min, before transplantation, will give protection against stem rot. Apply cartap hydrochloride 4 G @ 25 kg/ ha at the time of transplanting or chlorantraniliprole 0.4 G @ 10 kg/ha after 18 days of transplanting to manage stem borers and other lepidopteron insects in the main field. One can also use pheromone traps @ 35/ ha.

Follow skip row planting (skip two rows after every 10 rows of planting) to prevent brown plant hoppers severity. Spray Dinotefuran 20 SG @ 0.25 g/L or buprofezin 25 SC @ 1.5 ml/L as prophylactic measure. Apply Emamectin Benzoate 0.4 g/L to control leaf folder. Use Tricyclazole 0.6 g/L to control blast, Validamycin 2.5 ml/L or cow-based biopesticide (4 L/15 L water) to control sheath blight and Streptomycin sulphate + Tetracycline combination 300 g + copper oxychloride 1.25 kg/ha. If necessary, repeat 15 days later. If crop faces any short- or long-term dry spell or faces flood like situation contingent measures shall have to be adopted depending upon the growth stages. Contact KVK of your district or block Agriculture office for necessary contingent measure to be taken.

Maize

Short duration hybrid maize varieties are suitable for cultivation during kharif season. Some preferred varieties are: Early duration (78-85 days) varieties like Dekan 109 and Prakash; medium duration (85-95 days) varieties like Dekan 107, Ranjit and Ganga Safed; and late varieties (95-125 days) like PS-740, D course- 9081, 900 M Gold, P-3522, P-3396.

Crop should be planted preferably in upland/medium upland and coarse textured soil having good drainage facility as maize is very sensitive to moisture stress and excess moisture condition.

Weeds can be controlled manually by two hoeing at about 15 to 30 days after sowing or by spraying of Atrataf/ Atragold/ Atrazine @ 2.0 kg/ha on medium to heavy textured soils and 1.25 kg/ha in light soils as pre-emergence or within 10 DAS using 500 litres of water. Weeds can also be controlled with post emergence application of Laudis 420 SC (tembotrione) 262.5 ml/ha in 375 L of water at 20 DAS.

Crop should be planted in rows along wind direction. Earthing up to be done 20-25 days after sowing. Treat seeds with Mancozeb + Carbendazim (2 g/kg) or T. viride (10 g/kg) using 10-12 ml water per kg seed to prevent foliar and sheath diseases.

Fall Army Worm is the prevalent pest hampers maize yield. Installation of pheromone trap @ 5 per ac at 30 DAS followed by spraying of NSKE @ 5 ml/L water at 35-40 DAS or spraying of novaluron 5.25% + Emamectin benzoate 0.9% SC @ 40 g a.i./ha at 45 DAS or spraying of Btvarkurstaki 17600 IU/mg @ 2.5 ml/L of water at 60 DAS or spraying of spinetoram 11.7 SC @ 35 g a.i./ha at 70 DAS and spraying of chlorantraniliprole 9.5% + lambda cyhalothrin 4.6% ZC @ 85 g a.i./ha at 85 DAS to be applied depending upon the stages of appearance.

COMMERCIAL CROPS

Jute

The is the main cash crop of summer season of the state of West Bengal which faces severe challenges due to scarcity of water in retting ponds. Jute semilooper, stem weevil, yellow mite and root knot nematode are major pests and stem rot and wilt are major diseases of jute. Spray Emamectin benzoate and Indoxacarb or alternatively B. thuringiensis and B. bassiana for controlling jute semilooper. Cypermethrin 0.03% or quinalphos @ 2 ml/L are used to control the Stem weevil. Dicofol 0.04% or Fenazaquin 0.02% are effective in managing the yellow mite. Spraying of Carbendazim @ 2 g/L of water or Copper oxychloride @ 4 g/L of water and Mancozeb @ 5 g/L of water is recommended for management of stem rot and validamycin 3% EC @ 2 ml/L water and Streptocyclin @ 1 ml/L water may be used against bacterial wilt. Covering jute bundle with polythene and use of CRIJAF Sona/NINFET Sathi powder during retting at pond reduces retting period and improve fibre quality. A solution of DAP and liquid molasses (7 kg DAP + 2 kg molasses in 10 L water followed by addition of 90 lit water) can also be used to improve fibre quality. During this process use of mud, banana plants or water hyacinth must be avoided.

PULSE CROPS

Black gram

Up or medium upland with well drainage facility is suitable for the crop. Improved varieties like PU-31/ PU10/VBN-8/WBU-109 etc. to be collected from reliable source for high er yield. Seed should be treated with fungicides Mancozeb or Carbendazim @2 g/kg seed and after seven days of chemical treatment inoculation of seed with Rhizobium @ 1.5 kg / 30 kg of seed (for one ha) followed by mixing of 5 g T. viridae/kg seed is recommended for better performance.

Apply pendimethalin @ 2 ml/L pre-emergence herbicide followed by one manual weeding at 20-25 days after sowing will manage weed population. For better performance of the crop foliar spraying of micronutrient mixture @ g/lit water twice i.e. at 21 DAS and at pre-flowering stage and DAP @ 2 g/L water during flowering stage is advocated.

YMV is the major disease and for controlling the disease infected plants must be rogued, installation of yellow sticky traps @ 15/acre need based spraying of acetamiprid 20 SP @ 250g/ha is recommended to control the disease. For pod borer or leaf eating caterpillar, spray Cartap 1 g/L or acephate 1 g/L twice at 10 days interval.

OILSEED CROPS

Sesame

Use improved varieties like Suprava, Unnat Rama and Savitri. Seed dressing with Azotobacter and PSB followed by soil application of T. viridae + P. fluorescence (with 50 kg FYM) @ 1.5 kg to be followed. For better crop performance integrated basal application of Zn- 5 kg + sulphur- 25 kg + boron- 1 kg + RD of NPK per ha followed by 2 foliar sprays of 0.25% boric acid at 40 and 60 after sowing is advocated. Crop yield is adversely affected due to stem and collar rot. Foliar spray of T. viridae + P. fluorescence (oil-based) @ 5 ml/L each at flower initiation stage followed byfoliar spray of difenoconazole 25 EC @ 0.5 ml/L of water depending upon the field condition. Spray imidachloprid 17.8 SL @ 1 ml/L of water to control phyllody of sesame.

VEGETABLE CROPS

Okra and Brinjal

Select improved varieties of okra like Pusa Makhmoli, Azad Kranti, Arka Anamika, Arka Abhay etc. Some improved varieties of brinjal are Pusa Purple Long, Sweta, Pusa Bhoirab, Punjab barshati, Punjab Sadabahar etc. (long varieties) and Pusa Uttam, Pusa Purple round, Punjab Neelam etc. (oval varieties). Planting of grafted seedlings (VNR-212) raised in pro-trays can be a good option. Seeds must be treated with Mancozeb + Carbendazim @ 2 g or T. viridae @ 10 g by dissolving in 10-12 ml water per kg seed. Use 45-60 mesh net covers to prevent viral vectors like whiteflies.

Select upland or medium up-land with good drainage facility for planting of seedling. Planting should be done in broad raised bed and furrow to avoid or minimize damage of planted seedling during heavy rain. Ensure mulching to reduce nutrient loss and conserve moisture. To improve fruit setting and to minimize flower or immature fruit drop spray soluble B @ 1.5 g/L and NAA 4.5% W/W (Planofix) @ 0.2 ml/L, alternately at 10-12 days interval.

Fruit and shoot borer can be controlled by installation of pheromone trap @ 15 nos./acre or leucilure @ 15 nos./acre followed by spraying of tetraniliprole@ 0.5 ml/lit or broflanilide@ 0.3 ml/L. Spraying of Flonicamid @ 0.5 g/L or Afidopyropen@ 1 ml/L to control aphid and jassid is recommended. To control whitefly installation of 60 yellow sticky traps/ha and spraying of Pyrifluquinazon @ 1 g/L or Dimpropyridaz @ 0.5 ml/L at 15-day intervals advocated or alternatively moringa root extract (10%) + Afidopyropen/Flupyradifurone in 10:1 ratio is advocated. For managing red spider mite, Spiromesifen @ 1 ml/L, Etoxazole@ 1.5 ml/L or diafenthiuron@ 1 ml/L are to be sprayed at weekly interval. Barrier cropping with maize may be suitable option for sucking pest management.

For controlling YMV disease in okra infected plants must be rogued, installation of yellow sticky traps @ 15 nos./acre and need based alternate spraying of Acephate (1.5 g/L) + neem oil and Imidachloprid (0.5 ml/l) + neem oil or admire @ 2 g/litre + neem oil and Hostathion @ 1 ml/L + neem oil or spraying of acetamiprid 20 SP @ 250 g/ha is recommended to control the disease. For managing nematode problem in brinjal, use VEPAM (15 days before sowing) and drench the soil with Fytolan (2.5 g/L

of water) after 7 days of sowing to control. To overcome bacterial wilt use grafted brinjal seedlings. Apply bleaching powder @ 15-18 kg/ha to soil before 1 month of planting to reduce the chance of bacterial wilt. Apply organic amendments like neem cake (5 q/ha) to reduce wilt incidence. Consider pre-colonized Trichoderma harzianum or Pseudomonas fluorescens in soil applications for biocontrol.

Chilli

Select improved varieties like Andhra Jyoti, Punjab Lal, and Arka Lohit, Arka Tejasvi etc. Seeds must be treated with Mancozeb + Carbendazim @ 2 g or T. viridae @ 10 g by dissolving in 10-12 ml water per kg seed.

Select upland or medium up-land with good drainage facility for planting of seedling. Planting should be done in broad raised bed and furrow to avoid or minimize damage of planted seedling during heavy rain. Ensure mulching to reduce nutrient loss and conserve moisture.

To improve fruit setting and to minimize flower or immature fruit drop spray soluble B @ 1.5 g/L and NAA 4.5% W/W (Planofix) @ 0.2 ml/L alternately at 10-12 days interval. Chilli leaf curl complex is the main threat and for controlling leaf curl complex a holistic approach is required. Scientific management of nursery bed through covering with 45 nylon mesh; carbofuran 3 G @ 2.5 kg/bigha during final land preparation and sowing of maize around the main field as border crop at 15 days prior to transplanting of chilli seedlings; spraying of castor oil @ 3 ml/L of water at 20 DAT; spraying Ofchlorfenapyr 10 SC @ 75 g a.i./ha at 35 DAT; spraying of Pymetrozine 50 WG + moringa root extract 10% w/v as tank mix @ 200 g a.i./ha + 5 ml/L of water at 55 DAT and spraying of Spirotetramat 11.01% + Imidacloprid 11.01% SC @ 55 g a.i./ha at 70-75 DAT.

To control whitefly in the main field installation of 60 yellow sticky traps/ha and spraying Pyrifluquinazon of @ 1 g/L or Dimpropyridaz @ 0.5 ml/L at 15-day intervals is advocated or alternatively moringa root extract (10%) + Afidopyropen/Flupyradifurone in 10:1 ratio can be used. Spraying of Flonicamid @ 0.5 g/L or Afidopyropen@ 1 ml/litre to control aphid and jassid is recommended.

Barrier cropping with maize may be suitable option for sucking pest management. Marigold can be grown as trap crop for shoot and fruit borer, along with pheromone traps and Heli NPV. For controlling mites spraying of Diafenthiuron @ 12.5 g/15 L of water is or Etoxazole@ 1.5 ml/L is recommended.

Cucumber and Pumpkin

Select improved varieties for cultivation. Some improved varieties of cucumber are Japanese Long Green, Poinsette, Pusa Barkha, KPCH 2, Pusa Barkha, Pusa Uday, Pusa Barkha, Pusa Long Green, Swarna Sheetal etc. Some improved varieties of pumpkin- Arka Surjamukhi, Arka Chandan, Solan Badami can be grown.

Seeds must be treated before sowing in nursery bed with Mancozeb + Carbendazim 2 g or Trichoderma viridae 10 g by dissolving in 10-12 ml water per kg seed. Select upland or medium up-land with good drainage facility. Seeds should be done in broad raised bed to avoid or minimize damage of planted seedling during heavy rain.

Ensure mulching to reduce nutrient loss and conserve moisture. To improve fruit setting and to minimize flower or immature fruit drop spray soluble B @ 1.5 g/L and NAA 4.5% W/W (Planofix) @ 0.2 ml/L, alternately at 10-12 days interval. Train plants on trellis for better growth. Prune excess branches for sunlight and spray copper fungicides. Apply Ethrel @ 1.5-2.0 ml/10 L at 2-3 leaf stage and again after 7 days for enhanced flowering. Prefer foliar feeding over top dressing during rainy spells. Install cue-lure traps @ 20 nos./acre and replace lures every 15-20 days for controlling fruit fly. Palam traps can also be installed to control male fruit fly.

To control whitefly in the main field installation of 60 yellow sticky traps/ha and spraying Pyrifluquinazon of @ 1 g/L or Dimpropyridaz @ 0.5 ml/L at 15-day intervals is advocated or alternatively moringa root extract (10%) + Afidopyropen/ Flupyradifurone in 10:1 ratio can be used. Apply bleaching powder @ 15-18 kg/ ha to soil before 1 month of planting to reduce the chance of bacterial wilt. Apply organic amendments like neem cake (5 q/ha) to reduce wilt incidence. Consider pre-colonized Trichoderma harzianum or Pseudomonas fluorescens in soil applications for biocontrol. For controlling fungal diseases apply spray Bavistin 1 g + mancozeb 2 g/L of water or Trichoderma viridae @ 3 g/L of water.

Bitter gourd/ Bottle gourd/ Ridge gourd

Varieties recommended for bitter gourd- Meghna-2, Pusa Domausami, Pride of Surat, Priya, Arka Harit etc.; for bottle gourd- Pusa Summer Prolific long, Pusa Summer Prolific Round, Pusa Manjari, Pusakomal, Samrat etc.; and ridge gourd- Pusa Sadabahar, Punjab Sadabahar, Arka Sujata, Arka Sumit etc. Seeds must be treated before sowing in nursery bed with Mancozeb + Carbendazim 2 g or Trichoderma viridae 10 g by dissolving in 10-12 ml water per kg seed.

Select upland or medium up-land with good drainage facility. Seeds should be sown in broad raised bed to avoid or minimize damage of planted seedling during heavy rain. Ensure mulching to reduce nutrient loss and conserve moisture. To improve fruit setting and to minimize flower or immature fruit drop spray soluble B @ 1.5 g/L and NAA 4.5% W/W (Planofix) @ 0.2 ml/L alternately at 10-12 days interval. Train plants on trellis for better growth. Prune excess branches for sunlight and spray copper fungicides. Apply Ethrel @ 1.5-2.0 ml/10 L at 2-3 leaf stage and again, after 7 days for enhanced flowering. Prefer foliar feeding over top dressing during rainy spells. Install cue-lure traps @ 20 nos./ac and replace lures every 15-20 days for controlling fruit fly. Palam traps can also be installed @ 20 nos./ac to control male fruit fly. To control whitefly in the main field installation of 60 yellow sticky traps/ha and spraying Pyrifluquinazon of @ 1 g/L or Dimpropyridaz @ 0.5 ml/L at 15-day intervals is advocated or alternatively moringa root extract (10%) + Afidopyropen/ flupyradifurone in 10:1 ratio can be used. For controlling fungal diseases apply spray Bavistin 1 g + Mancozeb 2 g/L of water or Trichoderma viridae @ 3 g/L of water.

Onion

Select improved varieties are- Agri Found Dark Red, Arka Kalyan, Arka Pragati, Bheema Dark Red and Patna Red. Seeds must be treated with Mancozeb + Carbendazim 2 g or T. viridae 10 g by dissolving in 10-12 ml of water per kg seed. Seedlings should be raised in raised bed nursery covering with low-cost polythene

structure. Control weed applying pendimethalin @ 2 ml/L water as pre-emergent herbicide or oxyfluorfen @ 1 ml/L at 10-15 DAT and/or oxygold @ 2 ml/L water, if weed infestation is heavy and yellowing of tip occurs. Select upland or medium up-land with good drainage facility. Saplings or vine cutting should be planted in broad raised bed to avoid or minimize damage of planted seedling during heavy rain. Use farm yard manure as much as possible. Application of $ZnSO_4$ @ 6 kg/ac as basal and spraying of chelated zinc @ 0.5 g/L of water and boron @ 1-1.5 g/L of water is recommended for better crop performance. In order to control thrips & aphids use Dimethoate @ 2 ml/L or Imidachloprid @ 1.5 ml/L of water. Tip burn is very common in kharif onion and to control it spray hexaconazole @ 2 ml/L water/acre.

Early Cauliflower and Cabbage

Farmers may sow seeds @ 250-300 gram/ac in the month of July and August under the low-cost shade house or net house for best result to get early seedling. Raised sapling may be planted in broad raised bed in open. However, for better result, one can cultivate it under poly-tunnel also.

Elephant Foot Yam

Keep rhizosphere clean and ensure good drainage facility to reduce chance of collar rot disease. If symptoms appear then application of FYM and neem cake mixture (10:1) inoculated with Trichoderma harzianum @ 2.5 kg/t of FYM-neem cake mixture (KAU POP 2024) or spraying of Carbendazim + Mancozeb @ 2 g/L water is recommended.

SPICE CROPS

Betel Vine

Treat soil with formalin at 1:50 ratio at least 30 days prior to planting. Treat vine cuttings by soaking in Streptocyclin solution (1 g/4 L of water) for 25 min followed treatment with 0.5% Bordeaux mixture. Select upland or medium up-land with good drainage facility. Saplings or vine cuttings should be planted in broad raised bed to avoid or minimize damage of planted seedling during heavy rain. Use 50% agro-shade net to maintain favourable micro-climate. Prune vines at 2 m height. Maintain boroj height of 2.5 m and apply soil rings at base after 2 m growth.

Maintain the boroz organically, as much as possible, with only organic manure, bio-pesticides and life saving irrigation. Avoiding inorganic fertilizers will increase plant defence against biotic and abiotic stresses. Spray micronutrient mixture having Ca, Zn, Mn, B and Mo @ 2 g/L of water at 2 months interval. Tricontanol (0.05%) should be sprayed thrice monthly during post-monsoon. To control whitefly in the main field installation of 60 yellow sticky traps/ha & spraying pyrifluquinazon of @ 1 g/L or Dimpropyridaz @ 0.5 ml/L at 15-day intervals is advocated or alternatively moringa root extract (10%) + Afidopyropen / Flupyradifurone in 10:1 ratio can be used. Pre- and post-monsoon soil drench with 1% Bordeaux mixture followed by soil amendment with T. harzianum and P. fluorescens mixed compost/mustard oil cake during the month of May can prevent collar rot and during June to October can control Phytophthora foot rot and leaf rot.

Ginger

Weeding and earthing up should be done within 45 to 60 days after planting. Crop may be affected by rhizome rot, blight, anthracnose disease which can be controlled by soil application of Trichoderma and Pseudomonas @ 7.5 kg/ha or spraying of Carbendazim + Mancozeb @ 2 g/L of water. Pests like rhizome borer, leaf roller, aphid, scale insect may damage the crop and these can be controlled by apply Neem oil 10000 PPM @ 2 ml/L of water.

Turmeric

Weeding and earthing up should be done within 45 to 60 days after planting. Crop may be affected by rhizome rot, blight, anthracnose disease which can be controlled by soil application of Trichoderma and Pseudomonas @ 7.5 kg/ha or spraying of Carbendazim + Mancozeb @ 2 g/L water. Pests like rhizome borer, leaf roller, aphid, scale insect may damage the crop and these can be controlled by apply Neem oil 10000 PPM @ 2 ml/L of water.

FRUIT CROPS

Mango

To control fruit drop spray NAA 4.5% W/W (Planofix) @ 0.2 ml/L at 10-12 days interval. For better fruit development, spray n-triacontanol (Miraculan) @ 0.5 ml/L at 15 days interval. Keep sufficient moisture in the orchard basin. Mulching with straw or grass may be practiced for better soil moisture conservation. Apply Emamectin benzoate @ 0.5 g/L or Spinetoram @ 0.6 ml/L to control fruit and shoot borer. Install methyl eugenol pheromone traps @ 30/ha and change lure every 15-20 days interval for controlling fruit fly of mango. In order to control anthracnose disease in mango spray Trifloxystrobin + Tebuconazole @ 0.5 g/L water.

Guava

Farmer are advised not to take full crop but to take only 30-40 % of present fruit stand and rest 60-70% should be sacrificed to obtain a good harvest in next winter (when the market price of the produce usually remains high). To remove/shed major portion of flower or small fruit, spray 15% urea solution (150 g/L of water) or 50 ppm NAA (Planofix @ 1.1 ml/L) and stop irrigating the crop. To control further fruit drop, spray NAA 4.5% W/W (Planofix) @ 0.2 ml/L at 10-12 days interval.

Wrapping of fruits should be done with transparent polythene packets with a paper piece inside it to protect the fruit from direct sunlight. For better fruit colour and quality, apply amonium sulphate as source of N-fertilizer. For better fruit growth, soluble fertilizers like 19:19:19 @ 3 to 5 g/lit and any mixed micronutrient @ 1.5 to 2 g/L may be applied at 10-12 days interval. Spray N-triacontanol (Miraculan) @ 0.5 ml/L at 15 days interval. Install methyl eugenol pheromone traps @ 30 nos./ha and change lure every 15-20 days interval or spray poison bait (10 g jaggery + 2 ml dichlorvos in 1 L of water) for controlling fruit fly of mango. Apply T. harzianum to the root zone, mixed with compost, to prevent Fusarium wilt.

Litchi

Maintain sufficient moisture during hot summer of May to prevent fruit cracking. Regular watering is compulsory. Mulching with straw or grass around the tree basin is helpful for better soil moisture conservation. Fresh water spray upon the fruits and leaves during day time in hot and dry periods may also be helpful. To control fruit drop, spray NAA 4.5% W/W (Planofix) @ 0.2 ml/L at 10-12 days interval. For better fruit development, spray N-triacontanol (Miraculan) @ 0.5 ml/L at 15 days interval. Remove the insect affected dried branches and shoots arising from stem and branches during June. Spray Fipronil @ 1 ml/L to control leaf roller and leaf miner and Dicofol 18.5 EC @ 1.5 ml/L, two times at 7 days interval to prevent mites. To control stem borer/bark eating caterpillars, clean the holes from infested portion with help of cycle spoke and insert diesel or petrol-soaked cotton in the hole and plug the hole with wet clay soil. Spray dichlorvos (0.05%) to control the leaf eating weevil. Clean the orchard after last monsoon rain and paint the trunk up to 1-1.2 m by 1% Bordeaux mixture (lime: copper sulphate: water, 5:5:50). Prune and destroy infected shoots due to mite and spray Propergite 57 EC @ 2 ml/L to protect the plants from weevil and semilooper infestation.

Papaya

Seed must be soaked in water for overnight and treated with fungicide before sowing. Saplings are to be planted during September in raised beds to prevent water stagnation. After monsoon apply 500 g Ammonium Sulphate, 750 g SSP and 500 g MOP at 60 cm away of the basin of the established plants. Support papaya plants with stakes to prevent damage during strong winds. Remove weeds and apply mulch to conserve soil moisture. Spry Ethelyn 1 ml/4 L of water and Cycosol @ 2 ml/L of water at post kharif or early rabi season. Ensure proper drainage to avoid root rot and spray copper oxychloride @ 3 g/L to control fungal diseases. Use neem oil sprays to manage aphids and whiteflies in papaya. For sucking pest apply dimethoate 30 % @ 2 ml/L or imidacloprid 17.8 % @ 1 ml/3 L of water.

Banana

When the leaves become dry, cut them and dispose from the field to avoid insect. During the month of August, when the bunch becomes heavy, stake the plant with bamboo to avoid uprooting. After denavelling, apply GA3 1 g/30 L of water. To avoid Panama Wilt infestation, keep the orchard clean and remove the disease prone branches and spry Carbendazim 2 g/L of water, Streptocyclin 1 g/10 L of water. To avoid losses from scratching mite, use transparent polythene to cover the bunches. Apply Indoxacarb 14.5 % SC @ 1 ml/L or Spinosad 45 % SC @ 1 ml/L of water.

Coconut

Ensure proper drainage to avoid waterlogging. Apply 2-5 kg organic manure with 100 g urea, 150 g phosphate, and 75 g potash in a ring 25 cm wide and 1 m away from the trunk before the rainy season. Split doses of urea, SSP, MOP, boron, zinc and magnesium to be applied before (Apr.-May) and after monsoon (Aug.-Sept.) as per plant age. Use Metarhizium anisopliae in manure pits. Apply phorate 10 G + sand in crown and leaf axils at 6-month intervals for controlling

Rhinoceros Beetle. For controlling red palm weevil burn infested palms, avoid trunk wounds, apply phorate-sand mix in leaf axils every 3 months. Use pheromone traps. To control bud rot, remove infected tissues, drench crown with Copper oxychloride (3 g/l), apply Bordeaux paste, and prophylactic spray with Bordeaux mixture. Eriophyid mite can be controlled by root feeding with 10 ml Monocrotophos + 10 ml water followed by. Dicofol or Triazophos (5 ml/L) after 15 days. Spray soap water, Neem oil (3 ml/L), Spinosad (1 ml/4 L), Dimethoate (2 ml/L), or Imidacloprid (1 ml/3 L) to control the attack of spiraling whitefly.

FLOWER CROPS

Marigold

Well-drained sandy loam is ideal. Prepare raised seedbed and cover with paddy straw mulch or polythene during rainy season for raising seedlings. Cultivate improved varieties like Cracker Jack, Yellow Supreme, Glitters (African) Jeepsi and Flaming Fire (French/China) and local varieties like Bhangor, Saptorshi, Vangor, Sirakul, Seta and Basanti. Use ridge and furrow method during Kharif for drainage. Staking is needed during rainy season. Pinch shoot apex 40 days after transplanting to promote branching and uniform flowering. Remove early buds till 60-75 days after sowing. Regular harvesting boosts yield. Use gloves to prevent skin issues. If symptoms of collar rot appear spray thiophenate methyl @ 1 g + Chlorothalonil @ 2 g/L water.

Rose

Prune regularly to remove dead or damaged stems and promote new growth. Apply 1 kg compost, 100-150 g neem cake, 8-10 g urea, 15-20 g phosphate and 7-8 g potash per plant before monsoon. Apply 50 g of a mixture (5 kg neem cake, 2 kg bone meal, 1 kg urea, 1 kg potash, 250 g MgSO4) twice during flowering. Foliar application of micronutrients ($MnSO_4$, $MgSO_4$, $FeSO_4$, B) and GA_3 (250 ppm) for better flower production is recommended. To control scale mite, apply Imidacloprid (1 ml/10 L) twice at 20-day intervals. Control powdery mildew, black spot and die-back by applying Bavistin (1 g/L) twice at 10-day intervals, Carbendazim (1 g/L) twice at fortnightly intervals and chlorothalonil (1-2 g/L) or Mancozeb (2 g/L), respectively. Harvest when buds are fully developed but not fully open. Use sharp secateurs to cut stems, leaving a few leaves for new growth. Place harvested roses in water immediately and store in a cool environment.

LIVESTOCK

Dairy Cattle

Farmers are advised to clean the floor of animal housing regularly with phenol@1 ml/L of water and white washing of the feeding and watering trough to prevent infection. Disinfect the farm premises with suitable chemicals such as 1% hypochloride + bleaching powder (7 g/1 L of water) or 1% sodium hypochlorite or 0.5% hydrogen peroxide or 2% Sodium hydroxide etc. with proper care. Do summer management of animals and provide them plenty of clean water along with supplementation of mineral mixture @ 50-60 g/day in extreme hot season to combat with the heat stress.

Comfortable and ventilated housing should be there and practice regular deworming after every quarter. Provide daily molasses-based anti-heat drink (molasses, wheat bran, salt, water) or jaggery-gram flour beverage to reduce heat stress. Check feed for fungal contamination. Start cultivating J-1006 maize post-flood for fodder. Use enriched straw (with molasses, urea, minerals), tree leaves, aquatic weeds, and silage for nutritional improvement. Frequent cleaning and sanitation of milk utensils and equipment's should be practised with suitable detergent. Maintain hygiene during feeding and milking; wash hands, teats, and feed utensils. Conduct timely vaccinations against FMD, HS and BQ, and Deworm animals with proper anthelmintics. Contact Veterinarian posted at the nearby Block under State Govt.

Sheep, Goat and Pig

The floor of the animal shed should be clean and dry to preventfoot rot and other diseases. In case of foot rot of goat and sheep, wash affected feet (foot bath) with 10% $ZnSO_4$ or $CuSO_4$ daily until lesions subside. In severe case, provide antibiotic Enrofloxacin @7 mg/kg b wt. Construct elevated low-cost shelters for goats and pigs in flood-prone areas with proper ventilation. Provide plenty of clean water along with supplementation mineral mixture @ 20-30 g/day in extreme hot season to combat with the heat stress. Provide daily molasses-based drink (molasses, wheat bran, salt, water) or jaggery-gram flour beverage to reduce heat stress. Practice regular deworming once in pre-monsoon and post-monsoon each. Give enterotoxaemia vaccination @ 2 ml s/c to pregnant Ewe/Doe before one month of expected date of lambing/kidding. 25-50 g molasses per day may be provided to each pregnant Ewe/ Doe to prevent pregnancy Toxaemia.

Poultry

Adopt hardy breeds like Vanaraja or Hit CARI for better heat tolerance. Provide electrolyte-enriched water frequently and maintain a balanced diet. Follow vaccination schedules to prevent disease outbreaks. Poultry birds may be fed with green leaves along with grinded maize/rice. Poultry sheds should be properly cleaned and disinfected with 60-70 g of $KMnO_4$ mixed with 120-150 ml formaline solution per 10 cubic feet space. Place the birds in the sheds after 24 hours of fumigation. Disinfect the premises of poultry houses with 1% hypochloride + bleaching powder (7 g/L of water). The saw dust should be dried completely before using as bedding material. Apply hydrated lime powder @ 1-2 kg per 10 sq. ft area in the shed before birds are placed in the shed. All the equipments in the shed should be disinfected using hot water.

Fisheries

Strengthen/repair pond dykes and avoid deciduous plants like bamboo. Prefer planting banana, coconut, arecanut, cucurbits or solanaceous crops. Remove pond bottom mud to prevent gas buildup and ensure proper de-weeding while retaining some Eichhornia for shade and evaporation control.

Ensure 1-1.5 m water depth and use polythene lining or dyke plantation to reduce seepage. Lime dry pond before stocking (500-1000 kg/ha) and monitor water pH (7.5-8.5), DO (>5 mg/L), and salinity as per species requirement. Ponds which

cannot be dried, mahua oil cake @ 250 ppm should be applied to kill all existing aquatic animals before stocking fish. This should be followed by application of raw cow dung @ 5000 kg/ha after 7 days.

Use inorganic (soaked SSP + urea) and organic (cow dung) fertilizers to sustain natural food. Maintain appropriate stocking densities: 10000-15000/ha for carps; 8-10 PL/m^2 for P. monodon; 20-30 PL/m^2 for shrimp. Choose stocking size based on desired harvest and pond capacity. Feed carp with 25-30% protein feed and shrimp with 35-40% protein commercial pellets (2-3% body weight); feed 2-3 times/day adjusting for growth and water conditions. Provide aeration during hypoxia risk and closely monitor fish health and behaviour during culture and netting.

Bee Keeping

The hives should be placed at an elevated place to protect them from submergence. The weak colonies should be transferred to nucleus hives or united into a strong colony. Dearth feeding should be followed with sugar syrup (1:1) and pollen substitute. Protection should be taken against wasps, wax moth and small hive beetles. Honey extractors and other equipments should be washed periodically with hot clean water.

Nutri-garden

During the coming rainy season, cultivate Amaranth (red and green), Ipomoea, Basella (red and green), Bramhi as leafy vegetables. The leafy vegetables are important as laxative and for immunity build-up. An adult should intake 150 g of leafy vegetable per day. Pumkin, ashgourd, brinjal and ridge gourd can be cultivated in the nutrition garden. Cow pea must be cultivated as it supplies good amount of protein to the diet. In case of excess rainfall vegetable seedlings can be grown on egg trays.

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