भाकृअनुप
ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
Krishi Bhawan, New Delhi-110 001

Dr.Shiv Prasad Kimothi
ADG(Coord.), New Delhi

F. No. 61-1/2020-A.C.
Dated 10th December, 2020

Applications are invited for **Ranking of ICAR Institutes for the year 2020.** The blank framework proforma for ranking is being enclosed. All the Directors of ICAR Research Institutes are requested to submit soft copy of completed ranking framework proforma by e-mail at skimothi379@gmail.com latest by 31st January, 2021.

(SHIV PRASAD KIMOTHI)

Encl:a/a

Distribution:

Directors of all ICAR Institutes

DDGs of all Subject Matter Divisions of ICAR

Copy to: PD, DKMA for uploading on the ICAR website

RANKING PERFORMANCE OF ICAR INSTITUTES: A FRAMEWORK

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
2020

PREFACE

The National Academy of Agricultural Sciences, vide its communiqué (letter # NAAS/VI.67/17/291 dated 30 November 2017), constituted the following Core Group of its Fellows to develop a suitable Framework for Ranking of the ICAR-Agricultural Research Institutes

1. J.C. Katyal, Formerly DDG (Education),ICAR,VC, CCS HAU, Convenor
2. B.S. Dhillon, VC, PAU, Member
3. Arvind Kumar, VC, RLB CAU and formerly DDG (Education), ICAR, Member
4. B. Venkateswarlu, VC, VNMKV, Member
5. R.K. Jain, Dean and Joint Director (Education), ICAR-IARI, Member

In order to strengthen and widen scope of the Committee further, the following scientists, representing quantitative methods/econometric fields were invited to act as its Members:

6. Rajender Parsad, Principal Scientist, ICAR-IASRI
7. Usha R. Ahuja, Principal Scientist, ICAR-NIAP

Consecutively, Anil Bawa, Executive Secretary, NAAS, was appointed to serve as Member Secretary.

For accomplishing the assigned task, the Committee met on 4 different occasions. As a follow up to the Recommendations emerging from the Minutes, each time the Convenor and the Delhi-based Members deliberated and took appropriate action to revise the Ranking Pro-forma. During these meetings, invited presence and contribution of A.K. Singh, Secretary NAAS and Sant Kumar, Principal Scientist, NIAP, proved highly valuable in right-tracking the positioning of various elements of performance ranking.

Apart from Meetings, the Committee reviewed the following documents for guidance:

- ICAR-Education Division Evaluation Pro-forma for Ranking of Agricultural Universities
- National Institute Ranking Framework of the MHRD
- India Today-MDRA Best Universities Ranking-2018 (Objective Questionnaire-General)
- Ranking of Indian Institutions in Agriculture &Allied Sciences for their Research Output during 1999-2008 (B.M. Gupta)
- An Assessment of the Impact of Agricultural Research in South Asia since the Green Revolution (Peter B.R. Hazell)
- Policy for Plenty: Measuring the Benefits of Policy Oriented Social Science Research. Impact Assessment, Discussion Paper No. 6, IFPRI, Washington (G.W. Norton and J. Alwang)
- Criteria for the Evaluation of Research Units: the HCERES, French Government.

The Committee deliberated and resolved to exclude ICAR-Institutes with Deemed to be University status i.e., ICAR-IARI New Delhi;ICAR-NDRI, Karnal; ICAR-IVRI, Izatnagar and ICAR-CIFE, Mumbai from the current exercise. As it stands, performance of these Institutes is being graded along with the Agricultural Universities. Additionally, on the basis of unique mandate of the ICAR-ATARIs, it was also decided not to club ranking of these technology-transfer setups with the ICAR Research Institutes.

The performance Ranking Pro-forma being proposed is divided into 6 main sections – each carrying different weight of marks given in parenthesis. It is structured as follows:

1. Institute Profile (5 marks)
2. Institute Performance (30 marks)
3. Recognitions and Awards for Faculty (10 marks)
4. Research Output and Outcome (38 marks)
5. Research Impact (12 marks)
6. Vision and Future Readiness of the Institute (5 marks)

By according higher weight to research output, outcome and impact in the proposed Ranking Pro-forma, the Committee was inspired by the well-known fact that eventually it is the application and practice of scientific innovations that largely attract and justify the sustenance of public support for agricultural research. In fact, the TOR also clearly spells out that among the parameters; '*the type of research technology that could generate farm output significantly*' ought to be a prominent criterion for ranking the ICAR-Research Institutes.

In order to facilitate and unify reporting of information by the Institutes, the Committee has developed a separate document on 'Guidelines for Filling/Evaluating the Pro-forma and Distribution of Marks foreach Performance Indicator',.Itforms an integral part of the Report. A principal feature of these guidelines relates to the methodology that helps in normalizing the output of large and small institutes for comparative assessment.

The Committee Members held a unanimous view that measuring impact of agricultural research need to be driven by the following outputs/outcome:

I. Sustainable improvement in farm productivity and income,
II. Enhanced food security (adequacy, accessibility, affordability, safety and nutritious quality), and
III. Improved environmental sustainability

It was also realized that measuring impact during lifetime of a research project/programme is an enigmatic exercise; albeit its management remains necessary to receive continued public funding and/or to stabilize its functioning as an Institution. An added concern to this riddle is the fact that several ICAR-Institutes lack needed capacity to undertake Scientometric Analysis evaluating output and outcome of their research. In order to fill this gap, the Committee, based on review of the available information, prepared a short note on this topic. The document "Approaches to Determine Impact of Agricultural Research for Ranking Performance of Research Institutes" is also being included to help applicants while filing the information, typically that required for Sections 4 (Output and Outcome of Research) and 5 (Impact of Research) of the Ranking Pro-forma.

Following 3 sub-documents constitute the Report of the Committee:

1. Ranking Performance of ICAR Research Institutes: A Framework,
2. Guidelines for Filling/Evaluating the Ranking Pro-forma and Distribution of Marks for each Performance Indicator, and
3. Approaches to Determine Impact of Agricultural Research for Ranking Performance of the Research Institutes

In addition to deliberations among the Committee Members and review of the relevant publications on the subject, 2 interface meetings involving representatives of ICAR

Headquarters, selected ICAR-Institutes' Directors and In-charges PME Cell were organized to capture insight and feedback on the content and context of the three documents listed above. These brain storming sessions were organized at ICAR-NAARM, Hyderabad on July 20, 2018 and at NASC, New Delhi on July 28, 2018. The viewpoints expressed by the stakeholders were incorporated in the final Report as per need and appropriateness.

The proposed framework for Ranking Performance of the ICAR-Institutes is expected to inspire self-competition for Institutional excellence and visibility. The framework is also seen to provide a useful platform for progressive documentation of Institutes' Output, Outcome and Impact.

It is with great pleasure that the Committee submits this report to the National Academy of Agricultural Sciences (NAAS). It also places on record its gratitude for the excellent logistic and professional support provided by the NAAS-Secretariat.

B.S. Dhillon Member	Arvind Kumar Member
B. Venkateswarlu Member	R.K. Jain Member
Rajender Parsad Member	Usha R. Ahuja Member
Anil K Bawa Member Secretary	
J.C. Katyal Convener	

PART I: PROFORMA

1. INSTITUTE PROFILE

S. #	Elements/Attributes/Accomplishments on which information is sought	Response
1. INSTITUTE PROFILE		
1.1	Name of the Institute/Bureau/Directorate/NRC	
1.2	Year of establishment and up-gradation, if any (Please give in chronological order)	
1.3	Prior to current status, was the Institute: AICRP/NRC/Bureau/Directorate? If yes, give dates (from - to):	

AICRP (from-to)	NRC (from-to)	Directorate (from-to)	Any other entity (from-to)

1.4	Regional Centre(s)/Station(s), if any, give name and location of each	
1.5	Vision	
	Mission	
	Mandate	
1.6	Research Goal	
	Main Objectives	
	Major Programmes	
1.7	Name of the Divisions (only those for which HODs areselected through ASRB)	
1.8	Staff strength (give number sanctioned/filled; unfilled since when (range in years): as on March 31 of the year of application	

1.8.1	Director	Joint Director(s)	Head (Regional Station)	Project Coordinator	Head of Divisions

1.8.2 Scientific (give information on posts filled by Direct Recruitment only): Give number as on March 31 of the year of application

Principal Scientist		Senior Scientist		Scientist		Total	
Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled

1.8.3	Total scientific man months (taking into account scientists transferred, superannuated and joined)	Year 1	Year 2	Year 3	Total/Average

1.8.4	Proportion of scientists from outside the State in which Institute is located	

1.8.5 Technical, Administrative and Support Staff, provide number as on March 31 of the year of application

Technical		Administrative		Support Staff	
Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled

<table>
<tr><td>1.9</td><td colspan="7">Budget (Rs. in lakhs) ICAR. As per EFC/SFC for last 3 years till March 31 of the year of the application. Total and year wise distribution of grant-in-aid sanctioned/spent and proportion spent of sanctioned (constraints, if any in fully utilization of funds, may be given as Annexure)
<table><tr><td>Year</td><td>Capital</td><td>Salaries</td><td>General</td><td>North-East/TSP</td><td>Total Amount</td><td>% utilized</td></tr><tr><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Total Amount</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>% utilized</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Budget per scientist*</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>*May be computed by subtracting the budget received for national facilities like research and development infrastructure</td></tr>
<tr><td rowspan="4">1.10</td><td colspan="7">Research facilities:highlight those which are unique and common for the Institute scientists and being utilized by trans-disciplinary scientists/divisions/Institutes and also used for extending services to other agencies</td></tr>
<tr><td colspan="3">Central laboratory/Gene bank/ Phytotron/ Phenomics/ Genomics facility/ Computing portal/ Computing facilities/ Central repositories/IT facilities/ (include name, size (wherever applicable) and services being extended to)...</td><td colspan="4"></td></tr>
<tr><td colspan="3">Ship/Boat/Animal house/ /Museums/ATIC…</td><td colspan="4"></td></tr>
<tr><td colspan="3">Green-house/Polyhouse/Glass house/FATE/CTG facilities (Climate controlled and Open)...</td><td colspan="4"></td></tr>
<tr><td></td><td colspan="3">Research farm/Technology demonstration farm/Water harvesting structures/Pilot plants/Workshops
a. Area (in hectares)
b. Total Experimental Area (in hectares),
% irrigated = / % rainfed =
In case of facilities, other than farm, please indicate size, number of structures, number of items developed… may be included</td><td colspan="4"></td></tr>
<tr><td>1.11</td><td>New facilities created during the last 3 years of value:
• Rs. 50-100 lakhs
• Rs 100-300 lakhs
• ≥ 300 lakhs</td><td>Year 1</td><td>Year 2</td><td>Year 3</td><td>Total</td></tr>
</table>

<table>
<tr><td rowspan="8">1.12</td><td colspan="7">Whether the Institute/Centre has following bodies/arrangements in place and meetings are held regularly: Please highlight the ones not in place or non-functional. Along with Yes/No, mention date of meeting, wherever applicable</td></tr>
<tr><td></td><td>RAC</td><td>IRC</td><td>IMC</td><td>PME Cell</td><td>AKMU</td><td>ITMC/ITMU/IPR Unit</td></tr>
<tr><td>Yes/ No</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Business Development Cell/Incubation Centre, if applicable</td><td>Status of QRT</td><td>Implementation of e-governance activities</td><td>Documentation and Research Data Management</td><td>Digitisation of Library</td><td>LAN/ Internet Connectivity</td></tr>
<tr><td>Yes/ No</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Grievance Committee</td><td>Staff Welfare Committee</td><td>Women Cell</td><td>Maintenance of Post Based Roster</td><td>Asset Register</td><td>Water Harvesting System</td></tr>
<tr><td>Yes/ No</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1.13</td><td colspan="3">Medical/Sports infrastructurefacilities</td><td colspan="4"></td></tr>
<tr><td>1.14</td><td colspan="3">Institutional level solar/renewable energy sources used</td><td colspan="4"></td></tr>
<tr><td>1.15</td><td colspan="3">Number of outstanding audit-paras, also indicate those which are older than 3 years</td><td colspan="4"></td></tr>
<tr><td rowspan="2">1.16</td><td colspan="3" rowspan="2">Outstanding Advance (Rs. in lakhs), details may be given in Annexure</td><td>Year 1</td><td>Year 2</td><td>Year 3</td><td>Total</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>1.17</td><td colspan="3">Whether the Institute is involved in Pension Cell Management of more than one Institute? If yes, give the number of pensioners?</td><td colspan="4"></td></tr>
<tr><td>1.18</td><td colspan="3">Whether the Institute is providing Medical facilities to employees of other Institutes or Pensioners? Give number and brief details</td><td colspan="4"></td></tr>
<tr><td>1.19</td><td colspan="3">ISO Certification Number</td><td colspan="4"></td></tr>
<tr><td>1.20</td><td colspan="3">Whether Institute is providing Management/ Administrative support to AICRP Cells/Network Project Units</td><td colspan="4"></td></tr>
</table>

2. INSTITUTIONAL PERFORMANCE (LAST 3 YEARS)
(Give details as Annexure on each item)

<table>
<tr><td>2A.1</td><td colspan="5">Institutional Awards/Recognitions (PS. Last 3 year condition does not apply for 2A)</td></tr>
<tr><td>2A.1(a)</td><td>Outstanding ICAR Institution Award (mention category and year)</td><td colspan="4"></td></tr>
<tr><td>2A.1(b)</td><td>Best Annual Report Award (mention category and year)</td><td colspan="4"></td></tr>
<tr><td>2A.1(c)</td><td>Other Institutional Level Award(s), if any, from ICAR/ Central / State Governments/Other Public Agencies</td><td colspan="4"></td></tr>
<tr><td>2B.2</td><td>Network /Linkages during last 3 years</td><td colspan="4"></td></tr>
<tr><td>2B.2(a)</td><td>MOUs signed for multi-institutional / Agencies research:
a. In-country Public Institutions
b. In-country Private Institutions/Agencies
c. Foreign institutes/ Agencies
Provide number and key words describing MOU. Add details as Annexure</td><td colspan="4"></td></tr>
<tr><td rowspan="2">2B.2(b)</td><td rowspan="2">Number and brief on inter-disciplinary projects/ programmes of the Institute. Add details as Annexure</td><td>2-disciplines</td><td>3-disciplines</td><td>≥ 4 disciplines</td><td>Total</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">2B.2(c)</td><td rowspan="2">Number and brief on inter-institutional projects/ programmes. Add details as Annexure</td><td>2-Institutes</td><td>3-Institutes</td><td>≥ 4 Institutes</td><td>Total</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">2B.2(d)</td><td rowspan="2">Number of publications having authorship from ≥ 2 Institutes. Add details as Annexure</td><td>2-Institutes</td><td>3-Institutes</td><td>≥ 4 Institutes</td><td>Total</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>2B.2(e)</td><td>Other multi-agency (e.g., public private partnership…at least one private organization) programmes/projects, specify with brief details. Add details as Annexure</td><td colspan="4"></td></tr>
</table>

2B.3	**IPR related accomplishments during the last 3 years. Give verifiable proofs to substantiate (add as Annexure)**				
		Filed/Applied	Approved / Granted	Revenue generated, wherever applicable	Cost to manage and maintain IPR/ patent
	Patents				
	Trademarks				
	Copyrights				
	Facilitation for Geographical Indications (GI)				
	PPV&FRA Registration				
	Germ-plasm Registration and/or submission in Gene Bank				
	Gene Sequence submission to database				
	Research data submission to central repository				

2B.4	Total financial resources /revenue generated (Rs. in lakhs) in the form of research grant, contract research projects, consultancy and customized training programs during the last 3 years: Details along with supporting evidence may be given in Annexure

Kind of resource /revenue generated	Other ICAR sources e.g. NAHEP, NASF, Extra Mural fund, Awarded Projects…	DBT/DST/CSIR/Central and State Departments/PSU…	International organizations	Private sector	Total Amount
Research grant (as projects)					
Contract research					
Consultancy*					
Customized training programmes*					
Contract Service..*					
Licensing of IPR					

Sale of products/ technologies/ farm produce**					
Other income…(specify)					
Total Amount					
Intellectual fees paid					
Total Institutional Income (Revenue Generation)***					
Net research grant****					
% of Total Amount received through EFC/SFC as in 1.9					
Revenue target fixed					
Institutional Income % of target fixed					

* As per ICAR Rules and Guidelines for Professional Service Functions

** Farm produce includes Inputs (seeds/planting material/fingerlings/machinery/nuclear breeder seed/vaccine/ method/process/online service/analytical services/Vaccinations/diagnostic kits…}

*** includes only the Institutional Income including overhead charges

**** Total Amount – Intellectual Fees paid–Total Revenue Generation

(In case of collaborative projects, include the budget pertaining to your Institute only and not of whole project)

2B.5	Provisioning for HRD(training/capacity building initiatives). Give details on amountspent, wherever applicable : (last 3 years)									
2B.5.1	Capacity Building of Institute Scientists/Technicians/Administrative Staff									
		Scientific			Technical			Administrative		
		With in Institute	Outside Organizations(India)	International	Within Institute	Outside Organizations(India)	International	Within Institute	Outside Organizations(India)	International
	Number of persons									
	Total number of days									
	Amount spent (Rs. in lakhs)									

2B.5.2	Capacity Building Programmes organized (Excluding e-courses like MOOC, Coursera, etc.)			
		Number of programmes	Total number of days	Number of persons trained

	Training Programme conducted under CAFT/Summer/Winter School/Short Courses funded by the Education Division			
	Training Programme conducted under HRM funded by Institute			
	Customized/Sponsored Training Programmes: National			
	Customized/Sponsored Training Programmes: International			
	Training imparted to farmers, extension workers and others			
	Visitors' Seminar/ Seminars/ Workshops/Conferences			
	Any other, specify			
	Total			
2B.6	Quality and Service {Inputs: seeds/planting material/ fingerlings/ machinery/nuclear breeder seed/ vaccine/ method/ process/ testing kits/testing laboratory/online service/…}	Number/Quantity:		

3. RECOGNITION AND AWARDS FOR FACULTY (last 3 yearsin active service)

3.	**RECOGNITIONS AND AWARDS**	
3.1	Recognitions	
3.1.1	Number of scientists selected for Research Management Positions, give details	
3.1.2	Number of scientists selected for National Professor /other Professorial Chair Positions, give details	
3.1.3	Number of scientists selected for National Fellow Positions, give details	
3.1.4	Number of scientists hired as consultants by National/ International Organizations and give name of the agency andgive details	
3.1.5	Number of scientists invited to lead/be part of official delegation to National Institutions and International Conventions, give details	
3.1.6	Number of scientists invited as lead speakers during International Conventions/ Conferences/ Symposia/ Seminars/ Consultation meetings organized by public system…Give details	
3.1.7	Number of scientists invited to Chair a session during International Conventions/ Conferences/ Symposia/ Seminars/ Consultation Meetings… Give details	
3.1.8	Number of scientists on National Level Expert Group Meetings, such as Chairman/ Convener/ Member Public Task force and other Policy Making	

	Bodies/Committees of International/National/State/QRT/RAC including Member of Other University Boards or Academic Councils… Give details	
3.1.9	Number of scientists elected/serving as President, Secretary of Professional Societies and Chair/Chief/ Executive Editor (or equivalent) positions of NAAS Rated Journals/Listed in Thompson Scientific	

3.2	Awards/Fellowshipsconferred. Give number and details on the following:	
3.2.1	National and International awards of high repute such as Padma Awards, Rafi Ahmad Kidwai Award, Shanti Swarup Bhatnagar Award, Norman E. Borlaug Award, National Award from Ministry of Government of India…	
3.2.2	Awards by ICAR, CSIR, DST, DBT, NRDC, National Science Academies, Central/State Governments…. and not covered in 3.2.1 and 3.2.4	
3.2.3	Fellowships of the National Academies (NAAS, INSA, NASI, IAS, INAE, …)	
3.2.4	Young Scientist Award from ICAR, DBT, CSIR, DST, National Science Academies, Associate-ship of the National Science Academies and the State Government Agencies (exclude awards by Professional Societies)	
3.2.5	National and International Level Professional Societies and Academies (not covered above) Awards/Recognition (Fellowship; Lifetime Achievement Awards…) if not covered above	
3.2.6	Awards conferred by the Private Sector	
3.2.7	Others (including student getting admission abroad or high ranking Institutions, student awards), if any (provide details)	

4. OUTPUT AND OUTCOME OF RESEARCH
(Last 5 years, if not mentioned otherwise)

4.	**OUTPUT AND OUTCOME OF RESEARCH**					
4.1	Bibliometric (peer reviewed papers, having NAAS rating or included in SCOPUS, CABI, Scimago, DOAJ…and in other non-NAAS rated journals)					
4.1.1	Number of research papers with NAAS score (latest NAAS Journal Rating)	≥ 9.0	6.0 - 9.0	3.0-6.0	< 3.0	Total
	Number					
	% of total papers					
	Total Score					
4.1.2	Research papers in non-NAAS rated Journals included in SCOPUS, Scimago, DOAJ…					

4.1.3	Research papers in non-NAAS rated Journals (not included in any of the category above)				
4.2	Other Publications				
4.2.1	Books /Monographs (authored/edited) with ISBN and more than 100 pages				
4.2.2	Books published by ICAR/DST/DBT/ FAI/ CSIR… of more than 100 pages				
4.2.3	Technical Bulletin/ Extension Bulletin / Manual/ Conference Proceedings…				
4.2.4	Book Chapters				
4.2.5	Popular Articles				
4.2.6	Pamphlets/ Leaflets				
4.2.7	Others, if any, specify				
4.3	**Citations of Publications**				
4.3.1	Total number of publications (P) (Research papers+other publications)				
4.3.2	Number of papers/scientist				
4.3.3	Number of citations (C) of publications (P) in last five years				
4.3.4	Number of citations/scientist (for all publications)				
4.3.5	Hirsch index (H-index) : 5 Years; i-10 Index: 5 Years (only for publications of last 5 years)	Total		Per scientist per year	
4.4	**Extension Activities**	Year 1	Year 2	Year 3	Total
4.4.1	TV Talks (Number)				
4.4.2	Radio Talks (Number)				
4.4.3	Press/Media coverage (Number)				
4.4.4	Interface meetings organized and organizations represented in Interface meetings: number of meetings (number of organizations represented)				
4.5	**Teaching:** PG Diploma/M.Sc. /Ph.D. affiliated to a recognized University, if any (give name)				
4.5.1	Credits offered and taught	Year 1	Year 2	Year 3	Total
4.5.2	Number of students admitted				
4.5.3	Number of students passed out				
4.6	Technologies/ Innovations/ Inventions/ Discoveries having social/economic/ environmental application of topical relevance (give output and potential application/usefulness) : all sub-headings for last 3 years	Year 1	Year 2	Year 3	Total
4.6.1	Number and name of Crop or Horticultural varieties / Animal strains /Animal breeds/varieties developed (verifiable documents may be included as Annexure)				
4.6.2	Number and name of Machinery/ Implements				

	Technologies/ Package of Practices developed (verifiable documents may be included as Annexure)				
4.6.3	Number and name of new Processes/ Products/Policy briefs/ Policy papers/ Protocols generated/ developed under the aegis of National (e.g., ICAR/DST/DBT…), International (e.g. World Bank, FAO, CGIAR…) Organizations, National Academies (e.g., NAAS, INSA, NASI, IAS, INAE, …): verifiable documents may be included as Annexure				
4.6.4	Information technology/ Statistical methodologies: Portals/Database/Software package/ Mobile apps/ DSS/ Algorithm /National facility implementation/Analytical model /Online Atlas of Resource Maps and other IT tools developed in-house as evident from use across Institutes and Organizations (verifiable documents to be included as Annexure)				
4.6.5	Value chain/Model villages: Development and establishment of a Value chain/Model village/ a Seed village/ a Custom hiring centre/ a Contract farming arrangement/a Climate smart village… (verifiable documents to be included as Annexure)				
4.6.6	Innovative Extension Methodologies: Innovative Extension methodologies or Approaches / Farmer Field Schools/ Farmer Interest Groups/Farmer Producer Organizations established and documentation of Success Stories (verifiable documents may be included as Annexure)				
4.6.7	Service functions: Advisory services to stakeholders/Online services developed and being provided (verifiable documents may be included as Annexures)				
4.6.8	Diversification: Number and names of alternative Crops/Varieties/Breeds/Implements/Management practices… introduced in an area serving the cause of income, environmental security, natural resources' conservation/protection and emerging biotic/abiotic stresses (i.e. building resilience through efficient and competitive farm diversification); verifiable documents may be included as Annexure				
4.6.9	New Training Modules covering a wide range of subjects; verifiable documents may be included as Annexure				

*In the above include only those in which Institute faculty is contributor. Exclude those developed through AICRP Centres in which name of Institute faculty as contributor is not given

5. IMPACT OF RESEARCH

5.	**IMPACT OF RESEARCH**(during the last 5 years of the technologies developed in last 10 years). For guidance in filing information refer to Part III,'Approaches to Assess Impact of Agricultural Research...' Responses in this section connect science (research findings translating into technology and innovation) to practice and application for creating economic, socio-political and environmental impact	
5.1	Impact of Varieties/ Machinery/ Technologies/ Methodology/Information systems/ Value chain models/ Others generated in terms of:	
5.1.1	Spread of Varieties / Machinery/ Technologies/ Methodology/ Strains/ Processes/Products/Portals/Policy Briefs/Policy papers/Protocols generated/developed during last 10 years. Provide factual and verifiable details such as growth in demand for breeder seed/planting material/machinery of all kinds for efficient crop/land/input/water/ energy/ produce management/bio-fertilizers/ soil testing kits/vaccines/ inoculants.... /spread or area coverage area coverage in hectares, locations and states; % reduction in extension gap during last 10 years, etc.	
5.1.2	Improvement in productivity, quality of produce with safety and stakeholders' relevance (increasing output, improving quality and lowering cost of cultivation/farming, reduction in drudgery…) leading to increase in economic output. Confirm with evidence based data from frontline demonstrations/ KVKs/ ORPs/ AICRPs…	
5.1.3	Increase in efficiency in use of natural resources (land and water) and inputs (agro-chemicals, energy, labour…); diversification of farming; efficient conversion of feed to economic produce.... with concurrent reduction in cost of production and improvement in productivity. Confirm with evidence based data (refer to 5.1.2 above).	
5.1.4	Expected increase in income of stakeholders: Confirm with evidence based data or provide details on information, if generated by employing presumptions to arrive at the numbers	
5.1.5	Contribution to export earnings (Rs. in lakhs). Confirm with evidence based data or provide details on information, if generated by employing presumptions to arrive at the numbers	
5.1.6	Contribution to import savings (Rs. in lakhs). Confirm with evidence based data or provide details on information, if generated by employing presumptions to arrive at the numbers	
5.1.7	Entrepreneurship and employment generation with factual and verifiable details.	
5.1.8	Ecosystem services: Improvement in natural resources'	

	health measured by reduction in green house gas emissions/land degradation/water stocking/soil C build up and containment of contaminants and pollutants with verifiable quantitative indicators	
5.1.9	Promotion of integrated use of resources (INM, IPM, hybrid sources of energy…) with factual and verifiable details	
5.1.10	Spread/ extent of service functions/ models/ methodologies / online services being provided with factual and verifiable details.	
5.1.11	Any other success stories, making impact. Provide verifiable details	
5.1.12	Impact of Training Programmes for HRD/ HR Policy in terms employability of Degree/Diploma holder Students /Facilitation of Start-Ups in terms of success of incubatees…	

6. VISION AND FUTURE READINESS OF THE INSTITUTE

6.	Vision and future readiness of the Institution to respond adequately and effectively to emerging researchable scenes/scenarios and country's national and international imperatives driven by unforeseen shifts in socio-economic vulnerability and resilience; conservation plus efficient use of land and water in the face of developing multi-functional agricultural compulsions, changing carrying capacity and uneven climatic patterns; diversification aligned with market exigencies that are pro-farmers' livelihoods, food and nutrition security and safety; health of natural resources; networking and partnerships influencing sustainable growth of agriculture in all its aspects; employment of material, machines and artificial intelligence for retaining and attracting youth in agriculture… . Describe in 5 bullet points	

PROPOSED SCORING

The variables / indicators used in deriving value for ranking of ICAR institutions and weight assigned to each indicator are given below:

S.#	Broad Heading	Proposed Weightage
1.	Quality of governance measured in terms of vision statement, distribution of funding as per prioritized areas of research, functioning of statutory bodies, outstanding audit paras, compliance with ICAR Guidelines such as Research Data Management, IPR Policy other e-governance activities	**5**
2.	**Institutional Performance**	**30**
2.1	Institute Awards and Recognitions	4
2.2	Network/Linkages	5
2.3	IPR	5
2.4	Financial Resources Generated (External Grants & Institutional Income)	6
2.5	HRD/Capacity development	7
2.6	Quality and Service functions	3
3.	**Recognition and Awards for Faculty**	**10**
3.1	Recognitions	4
3.2	Awards and Fellowships	6
4.	**Output and Outcome of Research**	**38**
4.1	Research Papers	11
4.2	Other Publications	5
4.3	Citations	2
4.4	Extension Activities	4
4.5	Teaching	
4.6	Technologies/Methodologies/Products/Processes/Service functions	16
5.	**Impact of Research**	**12**
6.	**Vision and Future Readiness of the Institute**	**5**
	Total	**100**

PART II: GUIDELINES FOR FILLING/EVALUATING THE RANKING PRO-FORMA AND DISTRIBUTION OF MARKS FOR EACH PERFORMANCE INDICATOR

Guidelines

1. On account of inherent disparity in the size of ICAR-Research Institutes in terms of manpower and other resources, normalization in performance measurement (typically output) has to be done on per scientist per year basis. Expectedly, infusion of this refinement will minimize the discrepancy in performance arising fromvarying number of scientists across Institutes.
2. Number of scientists in a year is to be computed by taking total scientific man months in a year divided by 12. The total scientific man months is the sum of the scientists actually working in the Institute during each month of the year (ns_1+ns_2……+ns_{12}, where ns_1represents number of scientists in April, ns_2 represents number of scientists in May…..ns_{12} represents number of scientists in March of the next year). This would eliminate the degree of difference caused by moving-out or moving-in of scientists due to superannuation, transfers and new entrants during the year.
3. A general expression for obtaining normalized score, wherever applicable utilizes the formula: {(Total Computed Score×maximum assignable score to the item) ÷ (expected score per scientist per year)} to establish pan-Institute relational data links. Expected score per scientist per year is explained at the appropriate place in the main part of guidelines.
4. In order to make a transparent and unbiased assessment and also to right-track and validate submission of data/information by an Institute, each entry has be backed up by verifiable documentary records/evidence (for quantitative indicators) or a Director's self-approved certificate (for qualitative facts) in the form of Annexure.
5. While filling up the Ranking Pro-forma, efforts should be made to compile the information from the sources already available, possibly in the Digital Media.
6. Even though no score is allocated for certain parameters, an Institute is still expected to provide correct and complete figures with records. This is necessary, because every information has direct/indirect bearing on the performance assessment for ranking.
7. In the guidelines … (3 dots) called 'ellipsis', have often been placed at the end of a quote. It denotes that some elements or some words might have been left out; the applicant is expected to add appropriate input(s) to make it complete.

1. INSTITUTE PROFILE/GOVERNANCE

S.#	Elements/Attributes/ Accomplishments for allocation of marks and instructions for filing the response	Maximum score	Remarks
1	**INSTITUTE PROFILE**(give details on each element, attribute and accomplishment that are clear and verifiable, add Annexure)	**5**	
Item Nos. 1.1 to 1.4 seek information only and not allocated any marks			
1.5	**Vision**. A clear statement on what an Institute would like to be in the futuristic scenario, give 0.5 marks, otherwise no marks. **Maximum Score: 0.5 marks**		
	Mission. Outlines the purpose for which the Institute was created to servescience and society. Routine information and is not allocated marks		
	Mandate. A clear statement on what the Institute intends to offer in way of scientific and technical advice and support to all stakeholders for reducing cost of inputs, improving value of output and sustaining quality of natural resources. Routine information and is not allocated marks.		
1.6	**Research Goal**. A statement describing main aim of the Institute research. For instance, the goal of the ICAR-IISS, Bhopal may read as: 'The stated goal of the ICAR-IISS research is to sustain soil health and contain soil degradation by multi-disciplinary and multi-institutional projects and programmes'. A clear statement gets 0.5 marks, otherwise no marks. **Maximum Score: 0.5 marks**		
	Main Objectives. Aim-setting-direction of research to accomplish the stated goal of the Institute. Routine information and is not allocated marks		
	Major Programmes. A brief narration on various research programmes in fulfillment of each objective. Since programmes could be large in number, as per directions of the ICAR, each Institute is to give programmes in order of priority along with the method of priority setting. If the programme listing is in the order of priority and it is drawn by following an established method of priority setting, give 1.0 mark, otherwise 0.50 marks. Provide verifiable proof **Maximum Score: 1 mark**		
1.7	Routine information and is not allocated marks		
1.8	Routine information and is not allocated marks		
1.9	Budget Utilization: – Budget utilization≥95%, give1.0 mark; – Budget utilization 90-95%,give 0.75 marks, and – Budget utilization <90% no marks **Maximum Score: 1 mark**		
1.10	Routine information and is not allocated marks		
1.11	New facilities created during the last 3 years of value: Score 0.05 for every multiple of Rs. 40.00 lakhs (e.g., ≥Rs. 40 lakhs equals 0.05 marks; ≥ Rs. 80 lakhs equals 0.1		

	marks……, ≥Rs. 400 lakhs equals 0.5 marks). **Maximum Score: 0.5 marks**		
1.12	• **Functioning of statutory bodies** (RAC/ IRC/ IMC/ PME Cell/ AKMU/ Grievance Committee/ Staff Welfare Committee/Women Cell)**: Total score: 0.5marks**, if all Statutory Bodies are in place and meetingsheld regularly as is evident from the minutes. Any missing element attracts 0 marking • Maintenance of Post Based Roster/Asset Register: **Total score: 0.5marks**, if both are in place, otherwise no marks • Compliance with ICAR guidelines,such as Research Data Management, IPR Policy; e-governance activities… **Total score: 0.5 marks**; Compliance full marks, otherwise 0 marks Documentary evidence/certification for the above is necessary. **Maximum Score: 1.5 marks**		
1.13	Routine information and is not allocated marks		
1.14	Routine information and is not allocated marks		
1.15	Outstanding audit paras: **Total score: 0.5 marks** ≤5 outstanding audit paras: 0.5 marks; 5-10outstanding audit paras 0.25 marks and ≥10 outstanding audit paras no marks; **Maximum Score: 0.5 marks**		
1.16	Outstanding Advances to the staff (Rs. in lakhs), if any for more than one year If Nil, give 0.5 marks, otherwise no marks **Maximum Score: 0.5 marks**		
1.17	Whether the Institute is involved in Pension Cell Management of more than one Institute? If yes, give the number of pensioners? Routine information. No marks allocated. If yes, give 0.5; otherwise 0 marks **Maximum Score: 0.5 marks**		
1.18	Whether the Institute is providing Medical facilities to employees of other Institutes or Pensioners? Give number and brief details. If yes, give 0.5 marks, otherwise 0 marks **Maximum Score: 0.5 marks**		
1.19	ISO Certification Number If yes, give 0.5 marks, otherwise 0 marks **Maximum Score: 0.5 marks**		
1.20	Whether Institute is providing Management/ Administrative support to AICRP Cells/ Network Project Units, Give details If yes, give 0.5 marks, otherwise 0 marks **Maximum Score: 0.5 marks**		

PS. Aggregate of marks for items covered through 1.1 to 1.20 is limited to 5 marks

2. INSTITUTIONAL PERFORMANCE (LAST 3 YEARS). MAXIMUM 30 MARKS

2A.1	**Institutional Awards/Recognitions.Maximum Score: 4 marks (PS. Last 3 year condition does not apply)**		
2A.1(a)	Outstanding ICAR Institution Award (mention category and year). Give 4 marks		
2A.1(b)	Best Annual Report Award (mention category and year) Give 2 marks for each award		
2A.1(c)	Other Institutional Level Award(s) from ICAR/Central / State Governments/Other Public agencies…Give 1 mark for each award from ICAR/Central / State Governments and Give 0.50 marks for each award from public institution other than above		
PS. Aggregate award of marks for items 2A.1(a), 2A.1(b), 2A.1(c) is limited to a maximum of 4 marks			
2B.2	**Network /linkages. Maximum Score: 5 marks (PS. Last 3 years condition applies)**		
2B.2(a)	MOUs signed for multi-Institutional/Agency research. Provide number and key words describing each MOU. Add details as Annexure - In-country Public Institutions. Give 0.25 marks for each MOU - In-country Private Institutions/Agencies. Give 0.25 marks for each MOU - Foreign institutes/ Agencies. Give 0.50 marks for each MOU **Maximum Score: 1 mark**		
2B.2(b)	Number and brief on inter-disciplinary projects/ programmes of the Institute. Add details as Annexure – Give 5.0 marks for each project per year having ≥ 4 disciplines; Give 3.5 marks for each project per year having 3 disciplines; Give 2.0 marks for each project per year having 2 disciplines; – Total score for 3 years obtained above is divided by 3 times the average number of scientist per year. Denote this score as Computed Score. – As the projects involve several scientists, therefore, assume that each scientist per year is expected to earn 0.5 score. The maximum attainable score is calculated as follows: (computed score×maximum score assigned (2.0 in this case))÷(expected score per scientist per year). The score is then taken as score for 2B.2(b) **Worked Out Example:** – Suppose average scientific strength per year: 80 – Suppose number of Inter-disciplinary Projects: 10		

	(4 involving ≥ 4 disciplines; 3 involving 3 disciplines and 3 involving 2 disciplines) per year; Total Score: 3× (**5**×4+**3.5**×3+**2**×3)=106.5 – Computed score per scientist per year: 106.5÷(3×80)=0.44375 – Maximum Attainable Score: (Computed Score per scientist per year×maximum score assigned) ÷ (score per scientist per year) =(0.44375×2.0)÷0.5 = **1.775** **Maximum Score: 2.0 marks**		
2B.2(c)	Number and brief on inter-Institutional projects. Add details as Annexure. – Give Score 5.0 for each project per year having ≥ 4 organizations; Score 3.5 for each project per year having 3 organizations, Score 2.0 for each project per year having 2 organizations; – The lead organization would get a full score and partner organization score is calculated by multiplying with 0.75 of the above scores; – Total score for 3 years obtained above is divided by 3 times the average number of scientist per year. Denote this score as Computed Score. – As the projects involve several scientists from different Institutes, therefore, assume that each scientist per year is expected to have 0.5 score. Now maximum attainable score is calculated as follows:(computed score×maximum score assigned (2.0 in this case)) ÷ (expected score per scientist per year). The score is then taken as score for 2B.2(c) **Worked out example:** Example for 2 Institutes having average number of scientists per year, respectively, 60 (1st Institute) and 40 (2nd Institute) **Step 1.** Assign: (a) Score 5.0 per project per year involving 4 organization; (b) Score 3.5 per project per year involving 3 organization and (c) Score 2.0 per project per year involving 2 organizations. Say, 1st Institute is running 4 projects in category (a) for 3 years, the total assigned score would be 60 (**5**×4×3). The same Institute is also running 2 projects each in category (b) for 3 years, the total score would be 21 (**3.5**×2×3). Aggregate assigned score, thus, would be 81 (60 + 21) for the 1st Institute. Say, 2nd Institute is running 3 projects in category (a) for 3 years, the total assigned score would be 45 (**5**×3×3). The same Institute is also running one project each in category (b) for 3 years, the total score would be 10.5 (**3.5**×1×3). Aggregate assigned score, thus, would be 55.5		

	(45 + 10.5) for the 2nd Institute. **Step 2.** Aggregate assigned score for 3 years (in the above case 81 and 55.5, respectively) is divided by 3 times the average number of scientists/ year (i.e., 60 and 40 scientists). Designate this score (81÷ (3×60)) i.e.,0.45 for the 1st Institute and 55.5÷ (3×40) i.e., 0.4625 for the 2nd Institute) as Computed Score. **Step 3.** Assume that each scientist, who is involved in several other projects, gets 0.5 marks for contribution of his/her time. Then the maximum allowable score would be equal to {Computed Score×Maximum Score assigned to this item of accomplishment (2.0 for the present element)} ÷ Assumed allowable score per scientist per year. Hence 1st Institute gets: (0.45×2.0)÷ 0.5 = 1.80 and the 2nd Institute gets (0.4625×2.0) ÷ 0.5 = 1.85 **Maximum Score: 2.0 marks**		
2B.2(d)	Number of publications having authorship from ≥ 2 Institutes/organizations. Add details as Annexure – Give Score 4.0 for each research paper or book/monograph having authors from ≥ 4 Institutes/organizations; Score 3.0 for each research paper or book/monograph having authors from 3 Institutes/organizations; Score 2.0 for each research paper or book/monograph having authors from 2 Institute/organizations; – The lead organization would get a full score and partner organization score is calculated by multiplying with 0.75 of the above scores; – Total score for 3 years obtained above is divided by 3 times the average number of scientist per year. This score is denoted as Computed Score. – Assume that each scientist per year is expected to have 1.5 score for collaborative publications. Now maximum attainable score is computed as (computed score×maximum score assigned (1.5 in this case)) ÷ (assumed expected score per scientist per year). The score is then taken as score for 2B.2(d) **Worked Out Example:** – Suppose average scientific strength per year: 100 – Suppose publications having authorship from ≥ 2 Institutes/organizations: 40 (15 involving ≥ 4 Institutes/organizations; 10 involving 3 Institutes/organizations and 15 involving 2 Institutes/organizations) per year; Total Score: 3× (**4**×15+**3**×10+**2**×15)=360 – Computed Score per scientist per year: 360÷(3×100)=1.20		

	– Maximum Attainable Score is calculated as follows: (Computed Score per scientist per year×maximum score assigned) ÷ (score per scientist per year) =(1.20×1.5) ÷1.5 = **1.20.** **Maximum Score: 1.5 marks**		
2B.2(e)	Other multi-agency (e.g., public/ private partnerships…) programmes/projects, give brief details. Add details as Annexure – Give score 4.0 for each year of partnership having ≥ 2 public-private agencies at least one from private sector; – The lead organization would get a full score and partner organization score is calculated by multiplying with 0.75 of the above scores; – Total score for 3 years obtained above is divided by 3 times the average number of scientist per year. Denote this score as Computed Score. – Assume that each scientist per year is expected to earn a score of 0.5 for collaborative publications. Now maximum attainable score is calculated as follows: (computed score×maximum score assigned (1.0 in this case)) ÷ (assumed expected score per scientist per year). The score is then taken as score for 2B.2(e) **Maximum Score: 1 mark** **Example: Similar to as given in 2B.2(b)**		
PS. Aggregate award of marks for items 2B.2(a) through 2B.2(e) is limited to a Maximum Score of 5 marks			
2B.3	**IPR related accomplishments during the last 3 years. Give verifiable proofs to substantiate (add as Annexure). Maximum 5 marks**		
	– Give score 5.0 for each approved patent/trademark/ facilitation for Geographical Indication and commercialized and score 3.50 for each approved patent/ trademark/ GI but not commercialized. – Give a score of 3.0 for each Registered Copyrights/ PPV&FRA Registration; – Give score of 1.5 for each Germ-plasm Registration/ Gene Sequence Submission to Database; and – Give score 0.75 for each 10 publications/technologies/data sets submitted to the Central Repository; – The lead organization would get a full score and partner organization score may be obtained by multiplying with 0.75 of the above scores; – Total score for 3 years obtained above is divided by 3 times the average number of scientist per year. Denote this score as Computed Score. – Several scientists may be involved in one IPR related accomplishment, therefore, assume that each scientist		

	per year is expected to earn a score of 0.25 asnarrated above for IPR related accomplishments. Now maximum attainable score is calculated as follows: – (computed score×maximum score assigned (5.0 in this case)) ÷ (assumed expected score per scientist per year, 0.25 in this case). The score is then taken as score for 2.3 **Maximum Score: 5 marks**		
2B.4	Total financial resources/revenue generated (Rs. in Lakhs). **Maximum 6 marks** (a) External Research Grant Generated: **Maximum Score: 4.0 marks** – Give score of 5.0 for each multiple of Rs. 10.0 lakhs earned in 3 years – Total score for 3 years obtained above is divided by 3 times the average number of scientists per year. Denote this score as Computed Score. – Assume that each scientist per year is expected to have 1.0 score as per above criterion. Now maximum attainable score is calculated as follows: (Computed score×maximum score assigned (6.0 in this case)) ÷ (assumed expected score per scientist per year, 1.0 in this case). The score is then taken as score for (a) **Worked Out Example** – Assumed Average scientific strength per year: 80 – Suppose the External Research Grant Generated in 3 years: 400 lakhs ; Total Score: (400÷10) ×5=200 – Computed Score per scientist per year: 200 ÷(3×80)=0.833 – Given Score: (Computed Score per scientist per year×maximum score assigned) ÷ (assumed score per scientist per year) =(0.8333×4) ÷1 = **3.33** (b) Revenue Generated: **Maximum Score: 3.0 marks** Give0.25 marks for each multiple of 1% more revenue generated than targeted. If revenue generated is 10% more than target, the Institute gets 2.5 marks		
	PS: For 2.4(a) and 2.4(b) is limited to a maximum of 6.0 marks		

2B.5	Provisioning for HRD (training/capacity building initiatives). **Maximum Score: 7 marks**		
2B.5.1	• Capacity building of Institute Scientists/ Technicians/ Administrative Staff. – Give 0.40 marks, for each multiple of 0.5% of the staff sent for training of 2-5 days at the National Institutes. Give 0.50 marks, for each multiple of 0.5% of the staff sent for training of 2-5 days at the International Institutes. – Give 0.80 marks, for each multiple of 0.5% of the staff sent for training of ≥5 days at the National Institutes. Give 1.0 mark, for each multiple of 0.5% of the staff sent for training of ≥5 days at the International Institutes. **Example:** – Assumption: If 1.0% of staff was sent for training of 2-5 days and – of which 0.5 % received International training: 0.40×3+0.40×0.25=1.30 – If 1.5% of staff was sent for training of ≥5 days in National Institutes: 0.80×3=2.40 **Total Score: 1.30+2.40=3.70** **Maximum Score: 4 marks**		
2B.5.2	Capacity building of staff from other Institutes/ Agencies (Excluding e-courses like MOOC, Coursera, etc.) – **International Trainings:** Give 1.0 mark for each 10-day training session conducted, involving at least on an average of 10 foreign participants; add 0.5 marks for each addition of 5 training days – **National Trainings (**CAFT/ Summer/ Winter School/ Short Courses / Customized Training programmes): Give 0.80 marks for each 10-day training session conducted, involving at least on an average of 20 participants; add 0.5 marks for each addition of 5 training days – Training Imparted to farmers, extension workers and others: Give 0.20 marks for each 5 day training session conducted, involving at least on an average 20 participants, add 0.10 marks for each addition of 2 training days – Visitors' Seminar/ Seminars/Workshops/ Conferences…: Give 0.20 marks for each day programme conducted, if participation is ≥25 participants (In the above take total number of training days and total number of persons trained, average number of participants per day can be computed as ($np_1 \times nd_1 + np_2 \times nd_2 + \ldots$) ÷		

	(nd_1+nd_2+…), where np_1 is number of participants in training 1, nd1 is number of days of training 1 and so on…; and then one can work out, if on an average number of participants are less than specified number, then training days may be adjusted so that the minimum number of participants per day is maintained). Similar computations may be done each group of training programmes. **Maximum Score: 5 marks**		
	PS. Aggregate of score for items 2.5.1 and 2.5.2 is limited to 7 marks.		
2B.6	Quality and Service {Inputs: seeds/ planting material/ fingerlings/ machinery/ vaccine/ bio-fertilizers/ method/ process/ testing kits/testing laboratory/online service/ …} a. Sale value of inputs like seed/planting material/ fingerlings/machinery/bio-fertilizers... Give 0.2 marks for each multiple of Rs. 5 lakhs earned in 3 years b. Give 0.2 marks for each multiple of 100 samples analyzed c. Give 0.5 marks for each testing/diagnostic kit distributed/sold… d. On-line advice through expert/decision support/information systems/service. • Give 0.25 marks for each multiple of 50 log on users/hits • Give 0.1 marks for answering each multiple of 50 calls **Maximum Score: 3 marks (a+b above)**		

3. RECOGNITION AND AWARDS FOR FACULTY

(during the last three years in active service**)**

3	**RECOGNITIONS AND AWARDS FOR FACULTY**	**10**	
3.1	**Recognitions: 3.1 to 3.8. Maximum Score: 4.0 marks**		
3.1.1	Number of scientists selected for Research Management Positions – Give 0.5 marks for each		
3.1.2	Number of scientists selected for National Professor /other Professorial Chair Positions – Give 0.5 marks for each		
3.1.3	Number of scientists selected for National Fellow Positions – Give 0.25 marks for each		
3.1.4	Number of scientists hired as consultants by National/International organizations and name of the agency. – Give 0.25 marks for each to consultancy awarded by CGIAR/UN/FAO… organizations – Give 0.15 marks for each to consultancy awarded by National Organizations		

3.1.5	Number of scientists invited to lead/be part of the Official Delegation to National Institutions and International Conventions. – Give 0.50 marks each for Lead member and 0.25 marks each for being a member		
3.1.6	Number of scientists invited as Lead Speakers during International Conventions/ Conferences/ Symposia/ Seminars/ Consultation meetingsorganized by public system … – Give 0.25 marks for each invite		
3.1.7	Number of scientists invited to Chair a Session during International Conventions / Conferences/ Symposia/ Seminars/ Consultation Meetings… – Give 0.25 marks each invite		
3.1.8	Number of scientists on National level Expert Group Meetings such as Chairman /Convener/ Member Public Task Force and other Policy Making Bodies/Committees of International/National/State/QRT/RAC/University Board/Academic Council Member of other University … – Give 0.2 marks each for acting as Chairman/Convener and 0.1 marks each for being a member		
3.1.9	Number of Scientists elected/serving as President, Secretary of Professional Societies and Chair/Chief/Executive Editor (or equivalent) positions of NAAS Rated Journals/Listed in Thompson Scientific – Give 0.25 marks for each position		
	Normalized Scoring for 3.1 • Total score for Recognitions for 3 years is obtained by adding scores earned under items 3.1.1 through 3.1.9. • Total score for 3 years obtained above is divided by 3 times the average number of scientists per year. Denote this score as Computed Score. • Assume that each scientist per year is expected to earn a score of 1.0 as per above criterion. Now maximum attainable score is calculated as follows:(Computed score×maximum score assigned (4.0 in this case)) ÷(assumed expected score per scientist per year, 1.0 in this case). The score is then taken as score for 3.1. **Maximum Score: 4.0 marks**		
3.2	Awards/Fellowships conferred. Give number and details on the following: **Maximum Score: 6.0 marks**		
3.2.1	National and International awards of high repute such as Padma Awards, Rafi Ahmad Kidwai Award, Shanti Swarup Bhatnagar Award, Norman E. Borlaug Award...and National Award from a Ministry of the Government of India – Give 5.0 marks for each Padma Awards – Give 3.0 marks for other categories of Awards listed above (other than the Padma Awards)		

3.2.2	Awards by ICAR, CSIR, DST, DBT, NRDC, National Science Academies, Central/State Governments…. and not covered in 3.2.1 above and items covered under 3.2.4 – Give 1.5 marks for each Award other than that given by the State Governments – Give 1.0 mark for each Award conferred by the State Governments		
3.2.3	Fellowships of the National Academies (NAAS, INSA, NASI, IAS, INAE, …) – Give1.5 marks for each Fellowship		
3.2.4	Young Scientist Award from ICAR, DBT, CSIR, DST, National Science Academies, Associate-ship of the National Science Academies and the State Government Agencies (exclude awards by Professional Societies) – Give 1.0 mark for each award		
3.2.5	National and International level Professional Society and Academy Awards/Recognition (Fellowship; Lifetime Achievement Award…), if not covered above – Give 0.50 marks for each award		
3.2.6	Awards conferred by the Private Sector – Give 0.50 marks for each award		
3.2.7	Others(including student getting admission abroad or high ranking Institutions, student awards), if any (provide details) – Give 0.25 marks for each such award		
	Normalized Scoring for 3.2 • Total score under Recognitions for 3 years is obtained by adding marks obtained from 3.2.1 through 3.2.7 • Total score for 3 years obtained above is divided by 3 times the average number of scientists per year. Denote this score as Computed Score. • Assume that each scientist per year is expected to earn a score of 2.0 as per the above criterion. • Maximum attainable score would equal:(Computed score×maximum score assigned (6.0 in this case) ÷ (assumed expected score per scientist per year, 2.0 in this case). The score is then taken as the score for 3.2. **Maximum Score: 6.0 marks**		
PS. Aggregate score of all items covered under 3.1 (4 marks)and 3.2 (6 marks) is limited to 10 marks			

4. OUTPUT AND OUTCOME OF RESEARCH
(last 5 years, if not mentioned otherwise)

4	**OUTPUT AND OUTCOME OF RESEARCH:**	**38**	
4.1	Bibliometric (Peer reviewed papers, having NAAS rating or included in SCOPUS, CABI, Scimago, DOAJ…and in other non-NAAS rated journals). **Maximum Score: 11 marks**		
4.1.1	Research papers in NAAS Rated Journals – Add NAAS Scores for all the papers. While computing the NAAS score, care may be taken that if the first author is from the Institute then the full score may be taken into consideration. However, if the first author is from some other institution, then only 75% of the score may be taken into consideration.		
4.1.2	Research papers in non-NAAS rated journals included in SCOPUS, Scimago, Directory of Open Access Journals… – Give a score of 2.0 for each publication, if first author from the Institute and 1.5 if the first author is from some other institution.		
4.1.3	Research papers in non-NAAS rated Journals (not included in any of the category above) – Give a score of 0.50 for each publication, if first author from the Institute and 0.375 if the first author is from some other institution.		
	Normalized Scoring for 4.1 – For Total Score: Add scores obtained under 4.1.1., 4.1.2 and 4.1.3. – Score per scientist per year: Divide total score by 5 times the average number of scientists per year. Average number of scientists per year is calculatedfrom the total number of scientists available during the last 5 years – For computing maximum attainable score for research papers; assume that each scientist per year is expected to have at least one publication with a score of 6 as narrated above. The score is then obtained by: (Score obtained per scientist per year×maximum score assigned, 11 in this case) ÷6. **Maximum Score: 11 marks**		
4.2	**Other publications. Maximum Score: 5 marks**		
4.2.1	Books /Monographs (authored/edited) with ISBN and of more than 100 pages – Give 1.0 mark for each publication, if first author from the Institute and 0.75 marks if the first author is from some other institution.		
4.2.2	Books published by ICAR/DST/DBT/ FAI/ CSIR… of more than 100 pages – Give 0.75 marks for each publication, if first author from the Institute and 0.50 marks, if the first author is from some other institution.		

4.2.3	Technical Bulletin/ Extension Bulletin / Manual/ Conference Proceedings…(minimum of 15 pages) – Give 0.50 marks for each publication, if first author from the Institute and 0.30 marks, if the first author is from some other institution.		
4.2.4	Book Chapters – Give 0.50 marks for each publication, if first author from the Institute and 0.30 marks, if the first author is from some other institution.		
4.2.5	Popular Articles – Give 0.20 marks for each publication, if first author from the Institute and 0.10 marks, if the first author is from some other institution.		
4.2.6	Pamphlets/ Leaflets – Give 0.20 marks for each publication, if first author from the Institute and 0.15 marks, if the first author is from some other institution.		
4.2.7	Others, if any, specify – Award 0.15 marks for each publication, if first author from the Institute and 0.10marks, if the first author is from some other institution.		
	Normalized Scoring for 4.3 – For Total Score: Add scores obtained for items covered under 4.3.1 through 4.3.8. – Score per scientist per year: Divide the total score by 5 times the average number of scientists per year. Average number of scientists per year is computed from the total number of scientists available during the last 5 years – For computing maximum attainable score for other publications, assume that each scientist per year is expected to have publicationsworth a score of 3 as narrated above. The score is then calculated as follows: (Score obtained per scientist per year×maximum score assigned, 5 in this case) ÷3.		
4.3	**Citations of Publications: Maximum Score : 2 Marks**		
4.3.1	Total number of publications (Research papers plus other publications): Routine information and is not allocated marks		
4.3.2	Number of papers/scientist Routine information and is not allocated marks		
4.3.3	Number of citations C of publications (P) in last five years: Routine information and is not allocated marks		
4.3.4	Number of citations/scientist (for all publications): **Maximum Score: 1 mark** – Give 0.75 marks for each multiple of 5 citations per scientist		

4.3.5	Hirsch index (H index) : 5 Years; i-10 Index: 5 Years (only for all publications of last 5 years): **Maximum Score: 2 Marks** – Give 1.0 mark for H-index of 5 and add 0.1 for each additional H-index of 1		
	PS: **Aggregate score of all items 4.2.4 (1 mark) and 4.2.5 (2 marks) is limited to 2 marks**		
4.4	**Extension Activities (last 3 years only): Maximum Score: 4 marks**		
4.4.1	TV Talks (Number) – Each TV talk presented in a National Channel may be given a score of 1.0 and Local Channels may be given a score of 0.50		
4.4.2	Radio Talks (Number) – Each radio talk in a National Channel may be given a score of 0.75 and Local Channels may be given a score of 0.40		
4.4.3	Press/Media coverage (Number) – In National Channels /Newspapers: give a score of 0.75; in local press/media give a score of 0.40		
4.4.4	Interface meetings organized and organizations represented during these meetings – Give 0.75 marks for each interface meeting represented by 5 or more organizations; 0.50 marks where 3-4 organizations were represented and 0.25 marks, if less than 3 organizations were being represented.		
	Normalized Scoring for 4.4 – For Total Score: Add scores obtained for items covered under 4.4.1 through 4.4.4. – Score per scientist per year: Divide the total score by 3 times the average number of scientists per year – For computing maximum attainable score for extension, assume that each scientist per year is expected to have activities earning him a score of 0.50 as narrated above. The score is then computed as follows:(Score obtained per scientist per year×maximum score assigned, 4 in this case) ÷0.50.		
4.5	**Teaching: PG Diploma/M.Sc. /Ph.D. affiliated to a University** **Maximum Score: 4 Marks**		
4.5.1	Credits offered and Taught – Give score of 2 for each multiple of 5 Credits offered and taught during a year and add for 3 years – Total score for 3years obtained above is divided by 3 times the average number of scientists per year. Denote this score as Computed Score. – Assume that each scientist per year is expected to have 1 score as per above criterion. Now maximum attainable score calculated as follows: (Computed score×maximum		

	score assigned (5.0 in this case)) ÷ (assumed expected score per scientist per year, 1 in this case). The score is then taken as score for 4.5.2 **Example:** Average scientific strength per year: 60 – Suppose the number of credits taught and offered in a year: 90 – Score ina given year = (90÷5)×2=36 – Computed Score per scientist per year: 36 ÷60=0.60 – Given Score: (Computed Score per scientist per year×maximum score assigned) ÷ (assumed score per scientist per year) =(0.6×5) ÷1 = **3.00**		
4.5.2	Routine information and is not allocated marks		
4.5.3	Routine information and is not allocated marks		
	PS: **Aggregate score of all items 4.4 (4 marks) and 4.5 (4 marks) is limited to 4 marks**		
4.6	Technologies/ Innovations/ Inventions/ Discoveries having social/ economic/ environmental application of topical relevance (give output and potential application/usefulness) : all sub-headings for last 3 years : **Maximum Score: 16 marks**		
4.6.1	Number and name of Crop or Horticultural Varieties/ Animal strain/Animal breed/variety developed (verifiable documents may be included as Annexure): – Give4.0 marks for each variety/strain approved, released and notified by the Central Variety Release Committee and give2.0 marksfor a variety approved and notified for release by the State Level Release Committee and give 1.5 marks for notified/release by Other Agencies, as applicable. In either case, the marks would be given, if the claim is reinforced by the receipt of the indents for breeder seed placed by the DAC&FW/State Government/Other Agencies. If no such claim is reinforced, then scores of 1.0 and 0.5 may be given. In case the principal inventor is from some other institution, then the scores may be given by multiplying with 0.75 of the above scores.		
4.6.2	Number and name of Machinery/ Technologies/ Package of Practices developed (verifiable documents may be included as Annexure) – Give4.0 marks for each product, process and package of practice...developed and transferred to the stakeholders with extent of coverage and machinery developed, licensed and commercialized. If not transferred to stakeholders, then give2.0marks. In case the principal inventor is from some other institution, then the scores may be given by multiplying with 0.75 of the above scores.		

4.6.3	Number and name of new Processes/ Products/Policy briefs/ Policy papers/ Protocols generated/ developed under the aegis of National (e.g. ICAR/DST/DBT…), International (e.g. World Bank, FAO, CGIAR…) Organizations, National Academies (e.g., NAAS, INSA, NASI, IAS, INAE, …): verifiable documents to be included as Annexure: – Give2.0 marks for each process/ Policy Brief/ Policy Paper/ Protocols generated/ developed with acceptance status by the stakeholders and application. If not accepted/applied by stakeholders, then give0.25marks. In case the principal inventor is from some other institution, then the score to be given willbe multiplied by 0.75 of the above scores.		
4.6.4	Information technology/ Statistical methodologies: Portals/ Database/ Software package/ Mobile apps/ DSS/ Algorithm /National facility implementation/ Analytical model/ Online Atlas of Resource Maps and other IT tools developed in-house as evident from use across Institutes and organizations (verifiable documents to be included as Annexures) – Give 2.0 marks each for multi-institutional/ national/ international database/ software/ methodology or commercialized or used by stakeholders across institutions or give1.0 mark for each institute / university level database/ software/ methodology. In case the principal inventor is from some other institution, then the marksto be given will be multiplied by 0.75 of the above scores.		
4.6.5	Value chain/Model villages: Development and establishment of a Value chain/Model village/ a Seed village/ a Custom hiring centre/ a Contract farming arrangement/a Climate smart village… (verifiable documents to be included as Annexure) – Give 1.0 mark for each such activity. In case the principal inventor is from some other institution, then the marks to be given will be multiplied by 0.75 of the above scores.		
4.6.6	Innovative Extension Methodologies: Innovative extension methodologies or approaches / Farmer field schools/ Farmer interest groups/FPO established and documentation of success stories (verifiable documents may be included as Annexure) – Give 1.0 mark for each such activity. In case the principal inventor is from some other institution, then the marksto be givenwill be multipliedby 0.75 of the above scores.		

4.6.7	Service functions: Advisory services to stakeholders/ Online services developed and being provided (verifiable documents may be included as Annexure) – Give 1.0 mark for each such activity. In case the principal inventor is from some other institution, then the marks to givenwill be multiplied by 0.75 of the above scores		
4.6.8	Number and names of alternative crops/varieties/ breeds/implements/management practices... introduced in an area serving the cause of environmental security, natural resources' conservation and emerging biotic/abiotic stresses (i.e. building resilience through efficient and competitive farm diversification): verifiable documents to be included as Annexure – Give 1.0 mark for each such activity. In case the principal inventor is from some other institution, then the marks to be given will be multiplied by 0.75 of the above scores.		
4.6.9	New Training Modules/Coursesincluding MOOC covering wide spectrum of subjects during last 5 years – Give 2.0 marks for each such activity. In case the principal Inventor is from some other institution, then the marks to be given will be multiplied by 0.75 of the above scores.		
	Normalized Scoring Item 4.6: – For Total Score: Add scores obtained in 4.6.1 through 4.6.9. – Score per scientist per year: Divide total score by 3 times the average number of scientists per year – For computing maximum attainable score for Technologies/ Innovations/ Inventions/ Discoveries, assume that each scientist per year is expected to earn a score of 2.0 as per above. The score to be given is then calculated as follows: (Score obtained per scientist per year×maximum score assigned, 16 in this case) ÷2.0.		

5. IMPACT OF RESEARCH

5	IMPACT OF RESEARCH (during the last 5 years of the technologies developed in last 10 years). For guidance refer to enclosed note "Approaches to Assess Impact of Agricultural Research...." Responses in this section connect science (research findings translating into technology and innovation) to practice and application for creating agro-economic, socio-economic and environmental impact: **Maximum Score: 12 Marks**	**12**	
5.1	Impact of Varieties/ Machinery/ Technologies/ Methodology/ Information Systems/ Value Chain Models/ others generated in terms of:		
5.1.1	Spread of Varieties / Machinery/ Technologies/ Methodology/ Strains/ Processes/ Products/ Portals/Policy briefs/ Policy papers/Protocols generated/developed during the last 10 years. Provide factual and verifiable details such as growth in demand for seed/planting material/machinery... for efficient crop/land/input/water/ energy/ produce management/ bio-fertilizers/ bio-pesticides/soil testing kits/ vaccines/ inoculants.... /spread or area coverage in hectares, locations and states; % reduction in extension gap during last 10 years... – Give 4.0 marks for each impact creating contribution		
5.1.2	Improvement in productivity, quality of produce with safety and stakeholders' relevance (increasing output, improving quality and lowering costs of cultivation/ farming, reduction in drudgery…) leading to increase in economic output/income. Confirm with evidence based data from frontline demonstrations/ KVKs/ ORPs/ AICRPs… – Give 4.0 marks for each impact creating contribution		
5.1.3	Increase in efficiency in use of natural resources (land and water) and inputs (agro-chemicals, energy, labour…); diversification of farming; efficient conversion of feed to economic produce.... with concurrent reduction in cost of production and improvement in productivity. Confirm with evidence based data (refer to 5.1.2 above). – Give 4.0 marks for each impact creating contribution		
5.1.4	Expected increase in income of stakeholders: Confirm with evidence based data or provide details if information is generated by employing presumptions to arrive at the numbers – Give 2.0 mark for each impact creating contribution		
5.1.5	Contribution to export earnings (Rs. in lakhs). Confirm with evidence based data or provide details if information is generated by employing presumptions to arrive at the numbers – Give 2.0 marks for each Rs. 100 lakhs earnings from export. (Research contribution may be taken as 50%; if the earning is Rs 200 the qualifying earning will be Rs 100 lakhs)		

5.1.6	Contribution to import savings (Rs. in lakhs). Confirm with evidence based data or provide details if information is generated by employing presumptions to arrive at the numbers – Give 2.0 mark for each Rs. 100 lakhs savings by substituting export (Research contribution may be taken as 50%, follow instruction as above for calculations)		
5.1.7	Entrepreneurship and employment generation with factual and verifiable details. – For helping establish 10 entrepreneurships or creating 100 new jobs, award 3.0 marks each		
5.1.8	Ecosystem services: Improvement in natural resources' health measured by reduction in green house gas emissions/ land degradation / Water stocking/Soil C build up and containment of contaminants and pollutants with verifiable quantitative indicators – Give 4.0 mark for each impact creating contribution		
5.1.9	Promotion of integrated use of resources (INM, IPM, hybrid sources of energy…) with factual and verifiable details. – Give 4.0 marks for each impact creating contribution		
5.1.10	Spread/ extent of service functions/ models/ methodologies/ online services being provided with factual and verifiable details. – Give 4.0 marks for each impact creating contribution		
5.1.11	Any other success stories, making impact. Provide verifiable details – Give 2.0 mark for each impact creating contribution		
5.1.12	Impact of Training Programmes for HRD/HR Policy/Employability of Degree/Diploma holder Students/ Facilitation of Start Ups in terms of success of incubatees… – Give 3.0 marks/year for 100% employability of Degree/Diploma holders within 6 months of their passing out. – Give 2.0 marks/ year for 75-100% employability of Degree/Diploma holders within 6 months of their passing out. – Give 1.5 marks for each multiple of 4 incubatees/Start Ups success		
	Normalized Scoring 5.1: – For Total Score: Add scores obtained in 5.1.1 through 5.1.13. – Score per scientist per year: Divide total score by 5 times the average number of scientists per year. Average number of scientists per year may be computed based on last 5 years – For computing maximum attainable score for Impact of Research, assume that each scientist per year is expected to have a score of 2.0 as per above. The score is then obtained by: (Score obtained per scientist per year×maximum score assigned, 12 in this case) ÷ 2.0.		
PS: Aggregate score of all items 5.1.1 to 5.1.12 is limited to 12 marks			

6. VISION AND FUTURE READINESS OF THE INSTITUTE

6.	Vision and future readiness of the Institution to respond adequately and effectively to emerging researchable scenes/scenarios and country's national and international imperatives driven by unforeseen shifts in socio-economic vulnerability and resilience; conservation plus efficient, use of land and water in the face of developing multi-functional agricultural compulsions, changing carrying capacity and uneven climatic patterns; diversification aligned with market exigencies that are pro-farmers' livelihoods, food and nutrition security and safety; health of natural resources; networking, and partnerships influencing sustainable growth of agriculture in all its aspects; employment of material, machines and artificial intelligence for retaining and attracting youth in agriculture… Describe in 5 bullet points. Each bullet caries 1.0 mark and it is left to the Ranking Committee to consider whether the submission is award-worthy (1.0 or < 1.0 mark) or otherwise (no marks) **Maximum Score: 5 marks**	**5 Marks**	

General recommendations:

1. All Institutes may be asked to submit the filled in Pro-forma along with necessary supporting documents for ranking based on achievements till 31st March of the year of the application and the same may be submitted by 31st July of that year.
2. The first time ranking process may be completed before 31st December of the year of application. The process may be repeated Bi-annually.
3. Based on the information submitted in the Ranking Pro-forma, a multi-disciplinary Committee may be constituted for performance evaluation.
4. On the basis of scores obtained, the Institutes may be graded into following 6 categories:
   90-100 A+; 80-90 A; 70-80 B+; 60-70 B; 50-60 C and <50 D

5. PART III: Approaches to Measure Impact of Agricultural Research (IAR)

The chief purpose of rating impact* of agricultural research (IAR) for diverse stakeholders is to systematically examine the outcome* in terms of changes due to application of science, technology and innovation. Together the measurements on output* of science, technology and innovation refer to 'scientometric' assessment. In reality, however, the appraisal of agricultural research focuses primarily on the science - covering 'bibliometric' (publications, citations, impact factor…) and 'exploitable consequences' of research (patents, copyrights…). In contrast, influence of agricultural research on primary beneficiaries (producers and consumers) for whom investment in agriculture research is made in the first place is studied less and more often in a casual manner. Several factors contribute to the existing IAR-gap between academic and application part of research. The prominent contributors to this state of affairs include; absence of ex-ante analysis, fractured benchmark information, providing no space for beneficiaries' view point while conceptualizing research, exclusive focus on productivity enhancement without concern for environmental effects of doing that, weak infusion of progress monitoring and evaluation indicators, lack of skills on impact assessment, imperfections in input and output market value frameworks caused by exclusion of private partners and above all lop-sided attention to science of science policy (i.e., applying science while founding R&D management policies). This goes on without making even ex-post facto review of the economic change across stakeholders due to technological interventions.

Norton and Alwang (1998) have outlined following 3 approaches to quantify ex post facto foot print of agricultural research: (i) employing time-series data at the national level for assessing aggregate productivity effects of technology. This analysis leans on production function, cost function, or profit function approach for building benefit-cost ratio to describe possible gain to producers and consumers over time; (ii) gathering producer-level data for estimating rates of adoption and farm-level changes due to technological interventions, and (iii) employing data from field demonstrations to estimate impact with and without the application of technology (known as contrafactual, which means what would have happened without the application of technology). Norton and Alwang went on to state that information of this genre when combined with adoption estimates and market-level data and models is useful in estimating the aggregate impression of research findings on producers and consumers and also for working out rates of return to research investments in a cost–benefit analysis. The first two methods depend on econometric practices, whereas the third is founded on mathematical calculations with field level technology testing or by making professionally planned case studies.

For institute ranking purpose the research output, outcome and impact need to fulfil the following basic goals:

- Sustainable improvement in farm productivity and income
- Enhanced food security (adequacy, accessibility, affordability, safety and nutrition) and
- Improved environmental sustainability

In order to rank the ICAR Institutes, the assessment framework comprises of bibliometric excellence, patents/other IPR granted, awards and recognitions conferred as performance indicators. It also includes evidence on consequences of agricultural research application in practice (real life improvement in productivity, profitability, food security and environmental sustainability) as a prominent criterion for scoring. As stated earlier, in the absence of ex ante

analysis, case studies and adequate contrafactual proof, evaluating research output in quantitative terms is faced with questions and riddles. This situation persists even though ample proxy evidence exists on significant response to application of modern technologies having direct increase in productivity/profitability and indirect influence on food security and environmental sustainability. Rise of India of 1960s from being a famished nation to state of self-sufficiency and even over-abundance of today is largely a result of scientific research and development (R&D). There is no exaggeration projecting scientific endeavour taking at least 50% credit for the overall growth in food production. Agricultural Institutes, individually and/or jointly, have seldom claimed openly this contribution. When translated into money alone, the astronomical sum equivalent to food security build up far exceeds the investment on R&D (IRR ~ 20%). Incidentally, transforming public investment into pecuniary gains is more commonly appreciated and is also understood better for securing sustainable funding.

Passivity of Research Institutes to paraphrase technology as money persists although wealth of data from farmers' fields is available to do that. For instance, front line demonstrations, operational research projects, experiments in cultivators' fields, AICRPs and Krishi Vigyan Kendras offer wealth of crucial information for translating productivity gains into income attributable to: introduction of new crop genotypes, improved animal breeds, better machinery, more efficient management of natural resources and man-made inputs, professional control of biotic and abiotic processes, superior management of produce, right type of price and market management instruments. Perhaps, lack of clear understanding on decoding and employing approximate performance indicators turning research output into food security and environmental sustainability is a major hindrance.

Some suggestions on transforming experimental evidence as output and outcome quantifying possible field level impact are presented below in a tabular form. The collated information, spanning across Subject Matter Divisions, provides examples as how to generate quantitative response to items covered under Section 5 'Impact of Research' of the Ranking Pro-forma.

Technology	Output	Outcome	Performance indicator	Impact	Possible data source
1. Crop Sciences					
Genetic enhancement	Higher yielding varieties having superior cooking, processing and nutritional quality; tolerance to biotic/abiotic stresses	Higher productivity and income; reduced cost of agro-chemicals; secured soil and environmental quality	Yield; spread in area (seed); market acceptance; agro-chemical use; soil health; GHG emissions	Increased income; reduction in cost; reduced farm distress; greater food security; less environmental problems	FLDS, KVKS, AICRPs, ECFs…
2. Horticultural Sciences					
Varietal improvement; quality planting material, Processing	Higher yielding; better shelf-life; marketability, nutrition, and processing quality	More productivity/ profitability; less loss	Yield; storability; market acceptance	Increased income; reduced farm distress	FLDS, KVKS, AICRPs, ECFs…

3. Animal Science					
Improved breeds; superior feeds; effective and efficient disease management, and processing	Higher yielding; more efficient converters of feed to economic produce; new wholesome feeds from indigenous resources; economic, and efficient vaccines for effective disease management; loss-free, energy efficient, practical methods of value added processing	More productivity; lower management costs; higher profitability	productivity; farm produced feeds with maximum utilization of native materials; low cost disease management practices; % age coverage/change in improved breed stock	Increased income with greater resilience of farm enterprise	AICRPs/Networks
4. Fishery Sciences					
Efficient breeds; cheap feeds from recyclable waste; effective disease management processing	Higher yielding; fast growing; more adaptable to less favorable conditions; more efficient feed converters; practical methods of loss free processing	More productivity; lower management costs; higher profitability	Efficient yielders; adaptability across rearing environments; % age coverage/change in improved breed stock; cost of farm produced feeds	Increased income with greater resilience of farm enterprise	AICRPs/Networks
5. Natural Resources Management					
Land use as per suitability and holistic management; efficient use, supply and management of water, agro-chemicals, energy and organic resources; rainwater harvesting; conservation agriculture practices	Diversified land use; savings in input use with no yield penalty; higher C sequestration with lower C footprint; diversification; sustainable soil health,	Sustained growth in productivity/ profitability; balanced and need-based input use; decrease in degradation of natural resources; contained GHG emissions; spread of Conservation Agriculture (CA)	Cost of cultivation; productivity; income; balanced use of agro-chemicals; diversification index; soil quality index	Higher and stable income; less vulnerability; greater resilience; improved soil health supporting superior compliance of SDGs	FLDs, KVKs, AICRPs, ECFs…
6. Agricultural Engineering					
Farm machinery suiting diverse soils, crops, climates, cultural and social situations for efficiency, conservation of natural	Savings in labor cost with right-tracked timeliness; conservation of Natural Resources; effective management of farm inputs and containment of adversaries; reduced	Adoption of standard agricultural practices; spread of Conservation Agriculture (CA); drop in cost of cultivation;	Economics of cost of cultivation; efficient use of agro-chemicals; area under CA; ergonomic breakthroughs; post harvest and storage losses, processing and	Increased income; reduced cost of cultivation; minimized losses; limited physical stress and more safety; stable income from	FLDS, KVKS, AICRPs, ECFS…

resources (NR), timeliness; reduced post-harvest losses and loss-free storage, farm-level processing; protected agriculture	drudgery; minimization of post-harvest and storage losses; increased possibility of farm-level processing; infusion of high value low volume agriculture	efficient control of pest and diseases; check on post harvest losses; more work output with less fatigue; higher income and employment	farm level income	small and marginal farm holdings; check on carbon foot print;	
7. Social Sciences					
Databases on enhancing speed and accuracy of research; DSS filling extension and technology gaps; policy instruments on strategic planning, conservation of NR, minimizing price volatility by rational price support and coherent subsidy regimes on efficient use of inputs and resources; methodologies to enhance precision on inferences	Software/ databases capturing issues on institute management, extension models on bridging research innovation gap, Statistical methodologies for increasing the precision of inferences; policy briefs as advocacy/lobbying tools and policy papers/instruments on providing issues based clear recommendations to policy makers	Software / data management infusing speed with efficiency, enhanced application of new technologies, funding for alternative programs and practices	Software for automation and management, level of technology application and adoption, policies mainstreaming science for sustainable development in all its aspects	Fact based institute management, effective technology transfer for farmers, farms and farming, support for science base of agriculture mainstreamed in political thought and action; Use by stakeholders with ease; increased precision on inferences in agricultural research	In-Institute Casual and Classical writings, logged on user re[orts
8. Agricultural Education (AE)					
Sustaining quality of AE in terms of employability, technology transfer/ adoption/appli cation and environmental security	Informed human resource having concern for sustainable growth of agriculture	Human resource having (i) zeal to launch agri-service start ups and (ii) capacity to translate experimental evidence into practice and change ; (iii) increased precision on inferences	Agri-service start ups; number of real time transfer of technological solutions and their application	Spread and application of science driven growth of agriculture that maximizes economic benefits and minimizes adverse outputs on application of a technology	

Whether it is technology led increase in productivity, reduction in cost of farming due to efficient use and professional management of inputs, reduced losses, or higher income, several economic methods of calculation are employed. A few are briefly described:

1. Income: Value of produce – cost of inputs.
2. Benefit to cost ratio: benefit due to intervention/cost of intervention. If the ratio of B to C is >1, the intervention is economically favourable
3. Return on investment (ROI): benefit due to intervention×probability of success/cost of intervention. If the ROI value is >1 in the face of changing influence of probability of success driven by location (varying bio-physical attributes across sites) and situation (varying socio-economic conditions of farmers) variables, the intervention will be attractive enough to adopt.

In order to assess the worth of natural resources' management practices, valuation is possible by assigning an economic cost to saved soil from degradation, water from over-use, energy from waste. Professor Rattan Lal has proposed $ 3 for each ton of soil rescued from erosion and $ 2 for each kilo litre of water stashed from runoff harvesting. These pricing measures may be applied, while translating response to soil and water conservation technologies into economic benefits

PS: refer to an * superscripted on some terms mentioned on page 1. **Output** means immediate results from application of a new research finding; **outcome** stands for short- or medium-term gain/change attributed to adoption of an intervention, and **impact** signifies long-term change in response to infusion and application of a technology. Normally, impact may not be visible during the life of a project (https://www.fundsforngos.org › Free Resources for NGOs).

Acronyms

AICRP	All India Coordinated Research Project
AKMU	Agricultural Knowledge Management Unit
ASRB	Agricultural Scientists Recruitment Board
ATARI	Agricultural Technology Application Research Institute
ATIC	Agricultural Technology Information Centre
CABI	Commonwealth Agricultural Bureaux International
CAFT	Centre for Advanced Faculty Training
CGIAR	Consultative Group on International Agricultural Research
CIFE	Central Institute of Fisheries Education
CSIR	Council of Scientific and Industrial Research
CTG	Controlled Temperature Grid
DBT	Department of Biotechnology
DOAJ	Directory of Open Access Journals
DSS	Decision Support System
DST	Department of Science and Technology
ECFs	Experiments on Cultivators' Field
EFC	Expenditure Finance Committee
FAI	Fertilizer Association of India
FAO	Food Agriculture Organization
FATE	Free Air Temperature Enrichment
FLD	Frontline Demonstration
GHG	Green House Gas
GI	Geographical Indication
HOD	Head of Department
HRD	Human Resource Development
HRM	Human Resource Management
IAS	Indian Academy of Sciences
ICAR	Indian Council of Agricultural Research
IFPRI	International Food Policy Research Institute
IISS	Indian Institute of Soil Science
IMC	Institute Management Committee
INAE	Indian National Academy of Engineering
INM	Integrated Nutrient Management
INSA	Indian National Science Academy
IPM	Integrated Pest Management
IPR	Intellectual Property Rights
IRC	Institute Research Committee
ISBN	International Standard Book Number
IT	Information Technology
ITMC	Institute Technology Management Committee
ITMU	Institute Technology Management Unit
IVRI	Indian Veterinary Research Institute
KVK	Krishi Vigyan Kendra
LAN	Local Area Network
MOU	Memorandum of Understanding
NAAS	National Academy of Agricultural Sciences
NAHEP	National Agricultural Higher Education Project

NASF	National Agricultural Science Fund
NASI	National Academy of Sciences, India
NDRI	National Dairy Research Institute
NGO	Non-Governmental Organization
NRC	National Research Centre
NRDC	National Research Development Corporation
ORP	Operation Research Project
PME	Prioritization, Monitoring and Evaluation
PPV&FRA	Protection of Plant Varieties and Farmer Rights Authority
PSU	Public Sector Undertaking
QRT	Quinquennial Review Committee
RAC	Research Advisory Committee
R&D	Research and Development
ROI	Return Over Investment
SFC	Standing Finance Committee
TOR	Terms of Reference
TSP	Tribal Sub Plan
UN	United Nations

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