SCIENTIFIC EQUIPMENT POLICY

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NEW DELHI
www.icar.org.in

SCIENTIFIC EQUIPMENT POLICY

भाकृअनुप
ICAR

Indian Council of Agricultural Research
New Delhi

Printed: June, 2021

Design & Production
Punit Bhasin and Ashok Shastri
DKMA

Printed by Dr. S.K. Singh, Project Director, Directorate of Knowledge Management in Agriculture; Lasertypeset at M/s Dot & Design, 208, Reshabshree House, Ranjeet Nagar Commercial Complex, New Delhi 110008 and printed at M/s Chandu Press, 469, Patparganj Industrial Area, Delhi 110092

त्रिलोचन महापात्र, पीएच.डी.
सचिव एवं महानिदेशक

TRILOCHAN MOHAPATRA, Ph.D.
SECRETARY & DIRECTOR GENERAL

भारत सरकार
कृषि अनुसंधान और शिक्षा विभाग एवं
भारतीय कृषि अनुसंधान परिषद
कृषि एवं किसान कल्याण मंत्रालय, कृषि भवन, नई दिल्ली 110 001

GOVERNMENT OF INDIA
DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION
AND
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
KRISHI BHAVAN, NEW DELHI 110 001
Tel.: 23382629; 23386711 Fax: 91-11-23384773
E-mail: dg.icar@nic.in

FOREWORD

Hi-tech analytical equipment/instruments and instrumentation systems are integral part of the state-of-the-art scientific research facilities as these help in accurate measurement and processing. Creation, operation, maintenance and replacement of scientific equipment are imperative for quality and competitive research.

With a view to optimize the use of existing equipment resources by the researchers of ICAR; pan-India sharing of expensive facilities; and reducing redundant purchases of equipment, the ICAR constituted a Committee to develop guidelines. Based on its recommendations, the document entitled "Scientific Equipment Policy" is being brought out for publication.

The Governing Body of the ICAR in its meeting held on 29th June, 2020 has appreciated and approved the new guidelines for adoption in the Council.

I congratulate the Committee members and the Agricultural Engineering Division of the ICAR for their valuable inputs in developing this document.

8th February, 2021
New Delhi

(Dr. Trilochan Mohapatra)

भाकृअनुप
ICAR

ACKNOWLEDGEMENTS

The Committee on Scientific Equipment Policy likes to express its sincere and whole hearted thanks to Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR for his foresight in creating an equipment policy for ICAR, for instituting this Committee and further for providing his valuable inputs at various stages for finalizing the Scientific Equipment Policy document.

The Committee also extends its sincere thanks to the Additional Secretary, DARE and Secretary, ICAR for his valuable guidance all through for drafting the recommendations.

The committee also thanks to all the Deputy Directors Generals and other Senior Officers for their outstanding support and cooperation during the process of discussions and in finalizing the recommendations.

The committee also extends its sincere appreciation and a note of thanks to all the Directors of ICAR Institutes, Vice-Chancellors, Directors and scientific staff of selected CSIR Institutes and IITs who provided valuable information for the formulation of the recommendations.

Member Secretary of this Committee Dr. Indra Mani and his team of Scientists in the Division of Agricultural Engineering ICAR-IARI are appreciated, by the rest of the Committee, for their strenuous efforts in collating the information and drawing a conceptual framework that formed the basis of our discussions and for the overall coordination in formulation and finalization of the recommendations.

K. Alagusundarm
On behalf of Members of the Committee
Scientific Equipment Policy

भाकृअनुप
ICAR

CONTENTS

भाकृअनुप
ICAR

BACKGROUND

Experimental research works involve measurement of physical, chemical and biological quantities. Famous British physicist, mathematician and engineer Lord Kelvin (1824-1907) says: **"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and un-satisfactory kind"; he further added, "if you can't measure it, you cannot improve it".** Thus, for any scientific research experiment, use of appropriate scientific equipment with high values of static and dynamic characteristics is of paramount importance. The aim of measurement is to give reliable knowledge on objects or concepts. Measurements in the field of science leads to understand and improve upon the knowledge and to test verify the theories. On the other hand, the measurement in areas other than science helps as an information about a subject that is ready for development, manufacturing and trade.

Historically, simple instruments have been used for measurements. For example, thermometer has been used for temperature measurement, simple linear scales have been used for length measurements, plating techniques have been used for measuring biological loads in a media, wet chemistry methods have been used for quantifying chemical compositions and similar other simple techniques have been used. Such simple devises are cheaper to buy and less expensive to maintain, but slow, having poor precision & accuracy of measurements, limited frequency of measurement and generally limited to the human speeds and automation is not possible. Due to the advancement of measurement sciences, hi-tech analytical equipment/instruments and instrumentation systems have become integral part of latest research techniques worldwide. Such analytical measurement systems are exorbitantly expensive; their repair and maintenance costs are highly prohibitive; they require elaborate sample preparation methods; expensive standards for calibration and comparison and require highly trained manpower for operation and maintenance. It is beginning to be an expensive and money intensive affair for majority of Research and Development Institutions and Universities, be them in the public domain or privately owned.

It is inevitable, however, to create state-of-the-art scientific equipment facility, maintain them in good working order and make available suitable manpower for operation and

maintenance and the standards for measurement and comparison for a high quality and competitive research in the current world scenario. Accurate and precise measurement is basic requirement for trueness and veracity of a scientific finding. The progress of science and understanding of complex scientific phenomena depend greatly on easy access to technically advanced quality research instruments or scientific equipment to all the researchers in the system. Every researcher must be given fair, easy access & opportunity to use advanced laboratory measurement facilities as per the needs.

The costs of research, particularly in agricultural and biological research areas, have shot up phenomenally in the recent times due to the advancement and the requirement of hi-tech scientific equipment and instrument for accurate measurement purposes. It will be pertinent to mention that some of the equipment available in ICAR Institutes cost much higher than ₹40 million. In addition, most of the electronic based equipment available in different laboratories, demand high degree of maintenance costing a great sum of money. For effective quality and competitive scientific research, the current and future system requires effective use of scientific equipment allowing fair sharing by large number of researchers, maintain such equipment in good working order during their life cycle, encourage intra- and inter-Institutional, Inter-departmental and pan-India sharing of research facilities, reduce the financial burden on the Government by sharing expensive facilities, reduce redundant purchases of equipment and facilities, and increase the usage of facilities. Also, there is a need to explore the dynamics of research infrastructure funding and removal of different barriers which currently stall

Nanaji Deshmukh Plant Phenomics Center (ICAR-Indian Agricultural Research Institute, New Delhi)

or decelerate the effective sharing of such facilities both within and across the Institutions.

Indian Council of Agricultural Research is strongly convinced that the expensive, state-of-the-art research facilities created in various Institutes be used very effectively and conveniently shared by Scientists of the same Institute or other ICAR Institutes. ICAR is also convinced that such elaborate research facilities be allowed to be shared by Scientists of other organisations and institutes in the country on a payment basis depending upon the costs involved in usage. Such an initiative will reduce the burden on the government expenditures by avoiding redundant purchases and the available equipment will be used very effectively for the kind of money spent on its purchase, maintenance and operation. A research ambiance with effective sharing of expensive scientific equipment should become a culture with convenience. It becomes equally important to avoid multiple purchases of costly and less used scientific equipment. Multiple purchases, however, shall be permitted if such scientific equipment are used for large number of samples and warrant purchase of multiple equipment for meeting the time and cost effectiveness and to avoid undue waiting periods.

The number of samples tested in an equipment and its hours of operation must commensurate with the purchase, maintenance and operational costs. Maximizing these parameters will enhance the benefit cost ratio of the facility. Sharing scientific equipment will also help in collaborations between scientists of the same Institute or with the scientists of other ICAR Institutes and other National Institutes and Universities. Optimum number of hours of use of scientific equipment, based on the purchase and maintenance costs, may be made mandatory which would encourage researchers for sharing of scientific equipment with fellow researchers.

Rapid advancement of science and technology of measurement techniques makes the existing equipment obsolete more quickly than expected and leads to reduced life cycle and frequent replacement of the equipment. Frequent replacements require greater investment on purchase of equipment which further supports the idea of effective sharing of scientific equipment.

A well-articulated uniform scientific equipment policy, pan ICAR, for use, replacement and audit of costly equipment is an important requirement. This will contain guidelines for audit of scientific equipment resources and developing the concept of scientific equipment life cycle as well as all other aspects of scientific equipment procurement and management.

CONSTITUTION OF THE COMMITTEE

Secretary (DARE) & Director General (ICAR), vide office order F. No. IPTM/4-1/2017-Policy (Pt.) dated 31 May, 2017, constituted the following Committee to audit scientific equipment resources and developing the concept of scientific equipment life cycle as well as scientific equipment policy:

Deputy Director General (Agricultural Engineering)	Chairman
Asstt. Director General (Seeds)	Member
Asstt. Director General (Marine Fisheries)	Member
Asstt. Director General (PE)	Member
Asstt. Director General (TC)	Member
Asstt. Director General (IP&TM)	Member
Director (Finance)	Member
Director, CIPHET, Ludhiana	Member
Director, CIAE, Bhopal	Member
Head of Division, Agricultural Engineering IARI, New Delhi	Member Secretary

AUDIT OF EXISTING SCIENTIFIC EQUIPMENT RESOURCES

As part of ground work, the Committee collected information from selected science and technology institutes like IIT-Kharagpur; CSIR-CEERI, Pilani; CSIR-NPL, New Delhi; CSIR-CSIO, Chandigarh and others about their current policy and practice regarding scientific equipment management. Existing use pattern of scientific equipment and their management with respect to sharing, purchase and maintenance and replacement in different scientific organizations were thoroughly scrutinized and collated.

Open Top Chamber facility for Climate Change Research
(ICAR-Central Research Institute for Dryland Agriculture, Hyderabad)

The Committee had an intensive discussion in its first meeting and decided to seek information related to the list of equipment and facility available in the respective Institutes, the mode of usage and if there are any standard procedures followed for sharing with other researchers in the Institute or across other Institutes of ICAR. A list of information that were asked from the Directors of ICAR Institutes included the following:

a. A list of scientific equipment available in ICAR Institutes that cost higher than ₹.5 million.

b. The policy in place for auditing and monitoring repair and maintenance and life cycle of scientific equipment.

c. If a committee is in place for scientific equipment policy decisions, auditing and life cycle of scientific equipment. If so, who constitutes such a committee?

d. Whether the scientific research facility and the associated scientific equipment are allowed for use by other researchers in the same Institutes and from across other institutes of ICAR Pan India. If yes, what procedures are adopted for the same?

Following were the observations of the committee based on the information received from most of the institutes in ICAR:

a. ICAR Institutes do have great wealth of state-of-the-art modern scientific research facilities and scientific equipment for research.

b. These equipment are used effectively by the individual researchers, generally within the Division or across Divisions of the same Institute.

c. There is no specific scientific equipment policy committee to monitor the available scientific equipment resources in any of the ICAR institutes.

d. Most of the ICAR institutes conduct physical verification annually as their scientific equipment management policy to decide the life cycle and use of scientific equipment.

e. Majority of the ICAR institutes maintain a log book to monitor the usage of the equipment.

f. There is no online portal/system for indenting use of scientific equipment by other researchers.

Phenomics facility (ICAR-National Institute of Abiotic Stress Management, Baramati)

Phenomics facility (ICAR-Central Research Institute for Dryland Agriculture, Hyderabad)

g. Few Institutes extend their scientific equipment/facilities to researchers of other ICAR Institutes without any charges.

h. Majority of Institutes allow researchers from other Institutes to use their scientific facilities for testing their samples and the services are chargeable. The charges are fixed by internal committee and reviewed periodically.

I. As such there is no uniform method of doing these activities in ICAR Institutes.

These observations further necessitated immediate need to lay down procedure/guidelines for scientific equipment life cycle as well as scientific equipment policy. The Committee in its succeeding meetings prepared a draft of scientific equipment policy based on the information collected and analyzing views of the committee members. A number of meetings, in small groups, were also held to refine the draft report. The draft report was presented before the committee in its next meeting for preparing the final draft.

The draft report was submitted to Secretary, DARE and Director General, ICAR. Numerous valuable suggestions and directions for fine tuning the report were suggested by Secretary, DARE and Director General, ICAR. After incorporating all the changes and modifications in the report, the second version of the draft was presented in the meeting chaired by Secretary, DARE and Director General, ICAR which was attended by Additional Secretary, DARE and Secretary, ICAR and all Deputy Director Generals of ICAR on August 5, 2019. The committee members were present in the meeting to offer suggestions.

A number of valuable suggestions came up in this meeting. The Committee was asked to identify "National Level Scientific Equipment Facilities" in place in ICAR institutes. It also emerged from the discussions that a facility which shall be a standalone scientific equipment or collection of several such equipment for research in a specific subject area shall be called as "ICAR – Advanced National Scientific Facility". The report was further refined in a meeting, held on September 6, 2019, under the chairmanship of Secretary, DARE and Director General, ICAR. The committee was asked to include scientific equipment and facilities, costing more than ₹10 million, available in ICAR institutes and a few other important improvements.

In yet another meeting, the revised draft report was presented before the Secretary, DARE and Director General, ICAR on December 26, 2019. The committee received few more very important suggestions and was asked to include a list of scientific equipment available in ICAR institutes and costing ₹ 2.5 million and above.

Based on the directions from these three meetings the committee gathered information from ICAR Institutes on the following aspects:

1. List of "ICAR – Advanced National Scientific Facility" available in ICAR Institutes that are either standalone units or group of hi-tech analytical instruments costing more than ₹40 million useful for research on various areas of agricultural sciences and technology.
2. List of standalone scientific equipment/facility costing ₹10 million or above available in ICAR Institutes,

Nano Fiber Plant (ICAR-Central Institute of Research on Cotton Technology, Mumbai)

3. List of standalone Scientific Equipment costing more than ₹2.5 million but less than ₹ 10 millions, and
4. The replacement plan for the instruments or the facilities when they are obsolete or written off.

Following are the results of the survey conducted across ICAR Institutes on Scientific Equipment and Research Facilities:

The information received from the ICAR Institutes was encouraging and found that several of ICAR institutes have created "ICAR – Advanced National Scientific Facility" that are state-of-the-art facility for research in various agricultural and allied areas. A total of 34 such facilities that cost more than ₹40 million are available in ICAR Institutes. A list of such facilities are given in Annexure-I. These facilities are not only useful for agricultural related areas of research but also all other allied scientific areas of research.

ICAR Institutes also can boast of possessing modern individual equipment that cost greater than ₹10 million. There are about 75 such equipment available in various ICAR Institutes. A list of such equipment is shown in Annexure II.

In addition to these hi-tech instrument and laboratory facilities, ICAR Institutes also have numerous instruments or analytical equipment that cost more than ₹2.5 million and upto ₹10 million. There are 146 instruments or equipment available in various ICAR Institutes. A list of such instruments and equipment is shown in Annexure -III.

Tissue Culture Laboratory (ICAR-Central Potato Research Institute, Shimla)

There are no common or standard procedures followed in ICAR Institutes for replacement of obsolete or worn out instruments, equipment and research facilities. They are done based on needs and following standard government guidelines. The Committee felt that, depending upon the life cycle of scientific equipment, its usage and the need for the state-of-the-art scientific equipment, provision for replacement may be planned through a special committee at the institute level. Appropriate provision for funds need to be made available on an annual basis for purchase, operation and maintenance of the scientific equipment as has been done in other scientific organizations like CSIR Institutes, IITs and similar other Institutes.

Tissue Culture Research Facility (ICAR-National Research Centre for Banana, Tiruchirappalli)

Based on the information received from the Council, the inputs from Secretary (DARE) & Director General (ICAR), Additional Secretary (DARE) & Secretary (ICAR) and the discussions held with the committee members a final draft on Scientific Equipment Policy, Audit and Life Cycle of Scientific Equipment in ICAR Institutes was prepared. The draft report was once again presented before the Secretary, DARE and Director General, ICAR on May 14, 2020 through Video Conferencing. All the Deputy Director Generals, Additional Secretary (DARE) & Secretary (ICAR) and the Instrument Policy Committee members were also present in this meeting. Based the works done so far and the suggestions came up in the presentation on May 14, 2020, the recommendations of the committee were drawn. These recommendations were approved by the Governing Body (GB) of Indian Council of Agricultural Research in its 250th meeting held on June 29, 2020.

POLICY AND PROCEDURE

Institute Level

1. Every ICAR Institute should have a well-defined and effective scientific equipment procurement strategy based on the needs of the researchers. The mandates of the respective, current national research thrusts and the immediate and long term solutions required to solve the farming community problems need to be considered in fixing research priorities of the Institute and the equipment procurement strategies.

2. ICAR institutes should facilitate quick clearance and sourcing of scientific equipment to be purchased both from domestic and international markets as per the demand and availability.

3. Scientific equipment costing more than ₹10 million may be treated as costly ones and while procuring costly scientific equipment, the ICAR Institutes should ensure:
   a) Effective terms of service and maintenance after sale
   b) Service contracts (like AMC) for regular preventive maintenance and repair needs to be availed. It is advised that AMC need to be availed preferably for a period of three years for new equipment in addition to the regular warranty provided by the firm.
   c) Any other terms of service which will result in smooth installation, operation and maintenance of the equipment need to be drafted and mutually agreed between the Institute and the equipment supplier.

4. Director/Competent Authority may constitute a committee which shall be called as "Scientific Equipment Audit and Management" (SEAM) Committee at the Institute level to monitor scientific equipment/facility. The composition of the committee shall be:

a) Head of a Division/Project Coordinator	Chairman
b) Head of Finance	Member
c) Head of Administration	Member
d) Principal Scientist/ Senior Scientist	Member Secretary

Terms of reference for the SEAM Committee shall be:

- To conduct scientific equipment review on an annual basis and to submit its report to the Director/Competent Authority.
- To monitor proper usage of the scientific equipment in the Institute and to ascertain on regular basis that all the scientific equipment and facilities are in good working order.
- This will inter alia include:
  a. ensuring calibration of all such scientific equipment facility once in a year or at frequencies prescribed by the manufacturer,
  b. technical auditing of costly scientific equipment facility and to ensure maintenance of log book for all such equipment and facility,
  c. analyzing the records such as breakdown register, preventive maintenance register and other relevant records,

Fish Testing Referral Laboratory (ICAR-Central Institute of Fisheries Technology, Kochi)

d. fixing operational cost/charges for users within the institute from other ICAR Institutes and those from other National Institutes,

e. developing policies and procedures on all disposable dangerous components to ensure safety and use of proceeds in line with government directives and international safe disposal protocols. It should also assess environmental and health risks of the disposals, and

f. any other activity that ensures effective and efficient use of the scientific equipment facility.

National Referral Laboratory (ICAR-National Research Centre on Grapes, Pune)

5. The life cycle of costly scientific equipment should be decided by SEAM Committee at the institute level based on the frequency and hours of use and obsoleteness of the working principle. The committee should also take into consideration of any Government Regulations on deciding the life cycle of common instruments and equipment (such as computers, printers and other such equipment of common in usage).

6. Multiple purchase of same scientific equipment may be discouraged at the Institute level and/or at Divisional level in large Institutes, except for those which are frequently used. This should be monitored by the SEAM committee.

7. Purchase of any costly equipment should have recommendation of the SEAM committee and the approval of the competent authority.

8. Any scientific equipment/facility costing more than ₹40 million (such as Nanaji Deshmukh Plant Phenomics Center, ASHOKA, Gene Bank etc.) shall be called as "ICAR – Advanced National Scientific Facility". Long term sustainability of such facility should be ensured by providing proper funds for operation and maintenance. Funds should also be made available by the institute for running the costly scientific equipment/facility to avoid dependence on project money particularly after the completion of the project.

9. There should be a facility in-charge and if required a co-incharge who shall ensure that facility runs without any problem. Costly equipment in the lab or the "ICAR– Advanced National Scientific Facility" should be maintained by a Senior Technical Officer. If the facility is large and if the conditions demand then more than one Senior Technical Officer shall be placed for such maintenance purposes. The SEAM committee shall decide and recommend the manpower requirements to the competent authority.

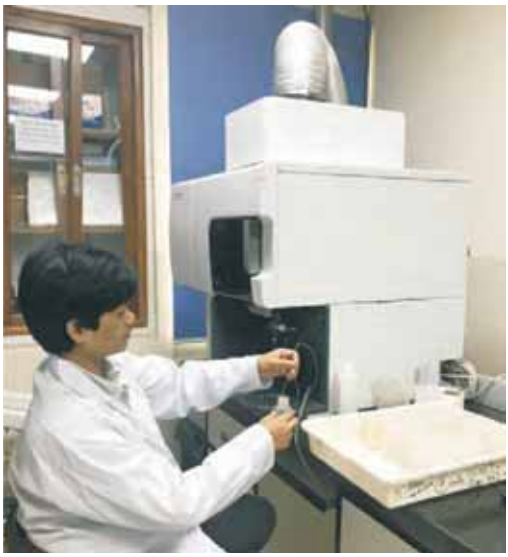
10. There should be a technical person responsible for scientific equipment/facility to ensure consumables, spare parts and other such materials for smooth functioning of the facility. Authorities should facilitate training of technical staff wherever possible. Any new person should be imparted with proper training on handling equipment before using it.

ASHOKA Super Computing Facility
(ICAR-Indian Agricultural Statistics Research Institute, New Delhi)

Food Quality Testing Laboratory
(ICAR-Central Institute of Post-Harvest Engineering and Technology, Ludhiana)

11. To ensure sharing of scientific equipment with other institutes, an online information system/portal detailing the scientific equipment facilities in an Institute should be created and maintained. This online portal should facilitate easy booking and placing an indent on-line for using such facilities for a charge. All ICAR Institutes should develop a web portal for this purpose. Following are some important points to consider for creating a web portal and other aspects of sharing of scientific equipment:
    a. The web portal should have readily accessible and updated information related to availability and working condition of scientific equipment/ facility in the Institute.
    b. Both the standalone scientific equipment and "ICAR - Advanced National Scientific Facility" should be made available for other ICAR-Institutes, SAUs' and other scientific organizations on chargeable basis.
    c. Charges are also applicable for intra-institutional researchers. Scientists are advised to include fund for analytical works/analysis under suitable heads while submitting proposal for external funding agencies.
    d. Private/non-governmental institutes whose research has been funded by government should be allowed and be charged double the rates of ICAR institutes.

e. The fees collected by an institution will be used towards the operation and maintenance of the equipment/facility including costs of the contractual manpower hired for running the facility. Such contractual manpower should have expertise in repair and maintenance of the equipment and some of them should also be able to operate the equipment. SEAM committee shall recommend the number of manpower requirement for the facility and the qualifications of such manpower to the competent authority.



Inductively Coupled Plasma - Optical Emission Spectroscope
(ICAR-Indian Agricultural Research Institute, New Delhi)

ICAR Level

12. A web portal shall be developed and maintained, under the supervision of ADG (ICT) at ICAR Head Quarters level listing: ICAR – Advanced National Scientific Facilities and all scientific equipment costing more than ₹2.5 million, available in the ICAR institutes.

13. The SMDs shall monitor such a portal in association with the ADG (ICT).

14. Periodic meetings with all the DDGs and the ADG (ICT) shall be conducted at the Head Quarters to monitor the progress and maintenance of the portal. Such meetings shall be chaired by the Secretary, DARE and Director General, ICAR.

Meat Testing Laboratory (ICAR-National Research Centre on Pig, Guwahati)

Engineering Prototype Fabrication Unit (ICAR-Central Institute of Agricultural Engineering, Bhopal)

National Level

15. A total of 34 Advance Scientific Equipment Facilities have been identified in different ICAR Institutes based on the availability of the state-of-the-art scientific equipment (A list of such "Advance Scientific Equipment Facilities" is shown in Annexure - I).

16. These facilities should be made available for other researchers as per guideline given in this document. The rates will be decided and notified by SEAM Committee of the respective institute.

17. The institutes having "ICAR – Advanced National Scientific Facility" should highlight the products/technologies/publications/services/revenue generated/ other achievements from these facilities on their web portal.

Horticultural Product Testing Referral Laboratory
(ICAR-Indian Horticultural Research Institute, Bengaluru)

FATE and CTGC facilities (ICAR-Central Research Institute for Dryland Agriculture)

18. Establishing linkage to the National Level portal related to scientific equipment – use and management:

    The Government of India has established a web portal called as I-STEM (Indian Science Technology & Engineering facilities Map). The web site of this portal is www.istem.gov.in. The main objective of this portal is linking researchers and resources of all research organizations in India. All the ICAR Institutes must ensure (mandatory) to list all their scientific equipment costing more than ₹2.5 million on this portal. ICAR institutes will follow I-STEM guidelines as given in the I-STEM portal.

Important Note:

1. The Director/Competent Authority will certify and submit a report annually, with respect to adherence to the guidelines provided in the scientific equipment policy and difficulties, if any, to the DDGs of the respective SMDs with a copy to ADG (ICT).

2. It is also advised that the Director/Competent Authority may adopt a flexi approach, depending upon the scientific strength and available facilities in the respective institute, for effective implementation of the guidelines on Scientific Equipment Policy.

Annexure-I

LIST OF ICAR – ADVANCED NATIONAL SCIENTIFIC FACILITIES IN DIFFERENT INSTITUTES

Sl. No.	Facility Name	Institute Name
1.	Nanaji Deshmukh Plant Phenomics Centre	ICAR-Indian Agricultural Research Institute, New Delhi
2.	National Phytotron Facility	
3.	Rice Genetics Facility	
4.	Referral Laboratory for Agrochemicals	
5.	Pesticide Residue Testing Facility	
6.	Transmission Electron Microscope and SNP genotyping facility	ICAR-National Rice Research Institute, Cuttack
7.	Advance Genomics Facility for Plants	ICAR-National Research Center on Plant Biotechnology, New Delhi
8.	Advanced Supercomputing Hub for OMICS Knowledge in Agriculture (ASHOKA)	ICAR-Indian Agricultural Statistics Research Institutes, New Delhi
9.	Fish Biotechnology Laboratory	ICAR-Central Institute of Fisheries Education, Mumbai
10.	Fish Nutrition Testing Facility	
11.	Referral Laboratory for Fish and Fish Products	ICAR-Central Institute of Fisheries Technology, Cochin
12.	Advance Genomics Facility for Fish	ICAR-National Bureau of Fish Genetic Resources, Lucknow
13.	Recirculating of aqua culture system facility	ICAR-Central Marine Fisheries Research Institute, Kochi
14.	Bioinformatics Facility & Referral Laboratory	ICAR-Central Fresh Water Aquaculture, Bhubaneswar
15.	Agricultural Machine Design and Prototype Development Facility	ICAR-Central Institute of Agricultural Engineering, Bhopal
16.	Post-Harvest and Food Testing Laboratory	ICAR-Central Institute of Post-Harvest Engineering and Technology, Ludhiana

Sl. No.	Facility Name	Institute Name
17.	Cotton Quality Testing Laboratory	ICAR-Central Institute for Research on Cotton Technology, Mumbai
18.	National Laboratory for Advance Material Characterization (NLAMC)	
19.	Natural Fibre Testing Centre	ICAR-National Institute of Natural Fibres Engineering and Technology, Kolkata
20.	Natural Resin and Gum Quality Evaluation Facility	ICAR-Indian Institute of Natural Resins and Gums, Ranchi
21.	DNA sequencing facility	ICAR-Research Complex for North Eastern Hilly Region, Umiam
22.	Plant phenomics facility	ICAR-National Institute on Abiotic Stress Management, Baramati
23.	Plant Phenomics Platform	ICAR-Central Research Institute for Dry Land Agriculture, Hyderabad
24.	Sophisticated Analytical Instruments Facility for Horticultural Crops	ICAR-Indian Horticultural Research Institute, Bengaluru
25.	Genomics Facility for Horticultural Crops	ICAR-Central Potato Research Institute, Shimla
26.	Sophisticated Analytical Instruments Facility for Grapes	ICAR-National Research Centre for Grapes, Pune
27.	Sophisticated Analytical Instruments Facility for Pomegranate	ICAR-National Research Centre on Pomegranate, Solapur
28.	Sophisticated Analytical Instruments Facility for Seed Spices	ICAR-National Research Centre on Seed Spices, Ajmer
29.	Meat Processing Facility	ICAR-National Research Centre on Meat, Hyderabad
30.	Food Quality Control Laboratory	ICAR-National Research Centre on Pig, Guwahati
31.	Laboratory for Embryo Biotechnology	ICAR-National Dairy Research Institute, Karnal
32.	Facility for Peptide Synthesis	ICAR-Indian Veterinary Research Institute, Izatnagar
33.	Advance Genomic Facility for Animals	ICAR-National Bureau of Animal Genetic Resources, Karnal
34.	Automated Nucleic Acid Sequencing facility	ICAR-Directorate on Foot and Mouth Disease, Mukteshwar

Annexure-II

LIST OF SCIENTIFIC EQUIPMENT FACILITIES IN ICAR INSTITUTES COSTING GREATER THAN ₹10 MILLION AND UPTO ₹40 MILLION

All Cost Figures are in ₹ Millions

S. No.	Institute Name	Instrument Name	Cost
1.	ICAR-Indian Agricultural Research Institute, New Delhi	Discovery Centre- Genomics, drone remote sensing and big data analytics	60.00
2.		Transmission electron microscope	12.20
3.		Microarray	20.40
4.		Confocal Microscope	19.40
5.		Automated DNA Analyzer	36.50
6.		Scanning Electron Microscope	14.90
7.		Inductively Coupled Plasma Mass Spectrometer (ICP-MS)	10.00
8.		LC-MS/MS	11.10
9.		NMR 400 MHz	32.50
10.		2D-LC-HRMS	22.50
11.		LC-HRMS with autosampler	25.20
12.		Satellite Data Reception Tera Scan	40.00
13.		Environment control chamber (8 Nos)	36.00
14.	ICAR-National Institute for Plant Biotechnology, New Delhi	Satellite Data Reception station	35.60
15.		Ultra-Flex Tof-Tof	15.80
16.		Sequenom	13.10
17.		24 Capillary System	13.90
18.		Gene Titan	22.50
19.		DNA fragment analyzer (Sanger sequencer)	25.00
20.		Illuminainfinium genotyping platform	20.00
21.		HiSeq1000 Sequencer	25.00
22.		454 GS FLX Sequencer	20.00
23.		Fluidgim (In Process)	12.10

S. No.	Institute Name	Instrument Name	Cost
24.	ICAR-National Rice Research Institute, Cuttack	Transmission Electron Microscope	19.70
25.		SNP genotyping system	13.70
26.	ICAR-Central Potato Research Institute, Shimla	Microarray facility with accessories (Real time PCR; Hybridization station, Washer, Scanner; Gel documentation unit)	11.90
27.		Transmission Electron Microscope	21.30
28.		High throughput SNP genotyping system	15.90
29.		Automated DNA sequencer	29.70
30.	ICAR-National Bureau of Plant Genetic Resources, New Delhi	Automated Genotyping System ABI 3730XL	29.00
31.		Automated SNP Genotyping system inclusive of IlluminaiScan and MiSeq System	28.50
32.	ICAR-Indian Institute of Horticultural Research, Bangalore	Transmission Electron Microscope	24.90
33.		GC – Electro Antenno Gram	10.00
34.		LC-MS/MS- (Thermo TSQ Endura)	12.80
35.		LC-MS/MS- (Agilent 6460)	15.00
36.	ICAR-National Research Centre for Grapes, Pune	Sciex API 2000 LC-MS/MS	10.00
37.		Sciex API 4000 QTrap LC-MS/MS	22.00
38.		Sciex API 5500 QTrap LC-MS/MS	25.00
39.		Agilent GC-MS/MS triple quad	11.00
40.		Shimadzu GC-MS/MS triple quad	12.00
41.		Thermo GC-MS/MS ion trap	11.00
42.		Leco GC x GC-ToF-MS	22.00
43.		Shimadzu Single quad and multi-dimensional GC-MS	12.00
44.		Waters Quatro premier LC-MS/MS	12.00
45.		Waters LC-MS/MS with atmospheric GC source	25.00
46.		Waters Q-ToF MS	30.00
47.		Thermo QExactiveOrbitrap MS	30.00
48.		Inductively Coupled Plasma Mass Spectrometer (ICP-MS)	10.80

S. No.	Institute Name	Instrument Name	Cost
49.	ICAR-Central Marine Fisheries Research Institute, Kochi	Liquid Chromatography (LCMSMS)	14.20
50.	ICAR-Central Tobacco Research Institute, Rajahmundry	Cigarette Smoking Facility	11.20
51.	ICAR-Central Marine Fisheries Research Institute, Kochi	Recirculating aqua culture system	13.70
52.	ICAR-Central Institute of Fisheries Technology, Cochin	LC MS-MS	21.00
53.		LC MS-MS	30.00
54.		High Pressure Food Processor System	15.70
55.	ICAR-Directorate of Foot and Mouth Disease, Mukteshwar	24-Capillary based Automated Nucleic Acid Sequencer- ABI3500 Genetic Analyzer	10.00
56.		4-Capillary based Automated Nucleic Acid Sequencer-ABI 3100 Genetic Analyzer	10.00
57.		Ion Proton Next Generation Sequencer	10.00
58.		Transmission Electron Microscope	10.00
59.		Confocal Microscope based high-throughput cell analysis platform	10.00
60.		LCMS	10.00
61.		Confocal microscope	10.00
62.	ICAR-National Institute of High Security Animal Diseases, Bhopal	Transmission Electron Microscope	15.80
63.	ICAR-National Dairy Research Institute, Karnal	Fluorescent activated cell sorting system	17.60
		High resolution mass spectrometer	25.00
64.	ICAR-Central Institute for Research on Cotton Technology, Mumbai	High Pressure Homogenizer	15.50
65.	ICAR-Central Research Institute for Dryland Agriculture, Hyderabad	FATE (Free Air Temperature & CO_2 elevation)	11.40
66.		CTGC (CO_2 Temperature and Gradient Chamber)	15.00

S. No.	Institute Name	Instrument Name	Cost
67.	ICAR-Central Research Institute for Dryland Agriculture, Hyderabad	SCADA (Supervisory Control and Data Acquisition)	14.20
68.		Smart Green House	18.20
69.	ICAR-National Institute of Abiotic Stress Management, Baramati	Plant Phenomics Facility	10.00
70.		Green house facility	10.00
71.	ICAR-Research Complex for NEH Region, Umiam	Flow Cytometer	16.00
72		DNA Sequencer 24 capillary	14.80
73.		DNA Sequencer 24 capillary	16.20
74.		Biochar Machine	11.30
75.	ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora	Genetix Analyzer 3130XL	10.00

Annexure-III

LIST OF SCIENTIFIC EQUIPMENT COSTING GREATER THAN ₹2.5 MILLION AND UPTO ₹10 MILLION

All Cost Figures are in ₹ Millions

S. No.	Institute Name	Instrument Name	Cost
1.	ICAR-Indian Agriculture Research Institute, New Delhi	Ultra-microtome	4.15
2.		Gamma Irradiation Facility	3.80
3.		Spectroradiometer (350-2500nm)	4.60
4.		Imaging Spectrometer (400-1000nm)	4.00
5.		Portable Photosynthesis system	2.70
6.		Pulsed NMR Grain analyser	2.80
7.		FATE (2 Nos) and TGT (2 Nos)	2.60
8.		NIR Grain Analyser	2.50
9.		Scanning electron microscope	4.20
10.		Fluorescent upright microscope	2.80
11.		Eddy covariance GHG flux tower	8.80
12.		Eddy covariance GHG flux tower (portable)	8.50
13.		UHPLC system	3.04
14.		Tetrad PCR System	2.96
15.		Photosynthesis and chlorophyll fluorescence system	2.60
16.		Flux Tower	8.80
17.		Ozone generator for free air	6.22
18.		Eddy covariance flux tower facility with data logging and download platform accessories	8.96
19.		Texture Analyser	2.50
20.		X-Ray Fluorescence Machine	2.90

S. No.	Institute Name	Instrument Name	Cost
21.		UPLC System with accessories	3.99
22.		Rapid Visco Analyzer	3.39
23.		LC-MS/MS	8.50
24.		GCMS	6.49
25.		Laboratory Flour Mill	2.89
26.		HPLC	3.00
27.		HPLC (PLR)	2.67
28.		HPLC	3.29
29.		Planetary Ball Mill 111 with accessories	3.05
30.		Accelerated Solvent Extraction with Turbo	2.84
31.		2D-LC-HRMS	2.30
32.		HFC/SFE extraction Unit	2.86
33.		UAV/drone aided phenotyping platform with accessories	2.80
34.		Phenotypic finger printing facility for microbes	3.50
35.		IRGA-6800	4.20
36.		IRGA-6400	2.50
37.		ICP-OES	3.30
38.		CHNS-O Analyser	2.60
39.		HPLC	2.50
40.	ICAR-Indian Institute of Wheat & Barley Research, Karnal	Thermal Cycler	2.69
41.		DNA Analyzer	4.19
42.		Propelled Plant Thresher	4.41
43.		Photosynthesis System	2.53
44.		Medium Term Germplasm Unit	4.26
45.	ICAR-Indian Institute of Maize Research, Ludhiana	Ultra-Performance Liquid Chromatography	2.75

S. No.	Institute Name	Instrument Name	Cost
46.	ICAR-Central Island Agricultural Research Institute, Port Blair	HPLC	2.60
47.		Laser Diffraction Soil Particle Analyzer	3.66
48.		Elemental Combustion System (CHNS)	2.70
49.		GC-MS	5.65
50.	ICAR-National Bureau of Plant Genetic Resources, New Delhi	Transmission Electron Microscope	8.90
51.		Ultra-Centrifuge	3.09
52.		Real-Time X-Ray Imaging System	9.00
53.		Karyotyping System with accessories	2.49
54.		GC/MS	4.00
55.		HPTLC	3.50
56.	ICAR-Indian Institute of Seed Science, Mau	Micro-Array System	3.57
57.		ABI AFLP System with all accessories	5.02
58.		Walk in Germinator	2.61
59.		Seed Processing Unit	4.21
60.	ICAR-Indian Institute of Sugarcane Research, Lucknow	NIR sugar analyser with software	2.90
61.		CHNS elements analyser	2.93
62.	ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora	FT-NIR spectroscopy	4.59
63.		Inductively Coupled Plasma-Optical Emission Spectrometer	3.68
64.	ICAR-Central Potato Research Institute, Shimla	Flow Cytometer	2.60

S. No.	Institute Name	Instrument Name	Cost
65.		Real-Time PCR System	5.18
66.		Automated DNA Sequencer	8.47
67.		Automated Work Station	7.14
68.		Automated DNA Sequencer	4.98
69.		Atomic Absorption Spectrophotometer	2.78
70.		Zeta Sizer	2.77
71.		Ultra-microtome	2.96
72.		ICP-OES Spectrometer	3.89
73.		Dynamic Mechanical Analyzer	3.98
74.		LCMS	9.05
75.		Potato Combine Harvester	4.74
76.	ICAR-Central Plantation Crops Research Institute, Kasargod	GC-MS	3.94
77.	ICAR-Directorate of Cashew Research, Puttur	Micowave Plasma Atomic Emission Spetrometer (MP-AES)	2.98
78.	ICAR-National Research Centre for Banana, Tiruchirapalli	HPLC	2.64
79.		Inductively Coupled Plasma - Optical Emission Spectroscopy	3.74
80.		GCMS with EAG	5.06
81.		Gamma Chamber (Lose dose irradiator)	2.88
82.	ICAR-National Research Centre for Grapes, Pune	Waters Acquity Ultra Performance LC	4.24
83.		Single Quadrupole GC-MS	5.02
84.		UPLC	5.01
85.	ICAR-Indian Institute of Spices Research, Kozhikode	Gas Chromatograph with ECD and FPD	2.71
86.		GC-MS	3.24

S. No.	Institute Name	Instrument Name	Cost
87.		Biological sample Analysis System	3.25
88.		Liquid Nitrogen plant	3.13
89.	ICAR-Central Tobacco Research Institute, Rajahmundry	Oxford Nuclear Magnetic Resonance Spectrometer	2.54
90.		Gas Chromatography Mass Spectrometer	4.00
91.		Ultra-Refrigerated Centrifuge	2.60
92.	ICAR-Central Institute for Subtropical Horticulture, Lucknow	GC-MS	5.55
93.		HPLC – MS System	6.49
94.	ICAR-National Research Centre on Seed Spices, Ajmer	GC-MS for essential oil analysis	3.80
95.	ICAR-Central Institute of Temperate Horticulture, Srinagar	Ultra-Centrifuge	3.92
96.		GC-MS	5.55
97.	ICAR-National Research Centre on Pomegranate, Solapur	Phase contrast Microscope with micrographic attachment	2.62
98.	ICAR-Central Institute for Arid Horticulture, Bikaner	Atomic Absorption Spectrophotometer	3.20
99.	ICAR-Central Institute of Agricultural Engineering, Bhopal	Gasifier with Gen-set system	7.00
100.		HMT CNC vertical machine	4.39
101.		Hyperspectral imaging system	3.61
102.		Spectroradiometer	3.46
103.		25 kWp solar power plant with battery backup	3.45
104.	ICAR-Central Institute for Research on Cotton Technology, Mumbai	Freeze Drier	6.93

S. No.	Institute Name	Instrument Name	Cost
105.		X-Ray Fluorescence Spectrometer (XRFS)	3.50
106.		Fibre High Volume Tester (HVI)	6.45
107.		Scanning Electron Microscope (SEM)	4.12
108.		Yarn evenness tester	3.00
109.		X-Ray Diffractometer	7.00
110.		Advanced Fibre Information System (AFIS)	7.13
111.		Fully Automatic High Volume Testing Instrument (HVI)	2.73
112.		Universal Testing Machine (UTM)	3.50
113.		Fabric Low stress Auto Tensile & Shear Tester	4.25
114.		Fabric Low stress Auto Compression Tester	3.57
115.		Compact Spinning Ring frame (lab model -18 Spindle)	5.71
116.		Friction Spinning machine	6.77
117.		BET Surface area analyser with accessories	2.50
118.		Atomic Force Microscope	6.97
119.		Analytical Ultracentrifuge	2.56
120.		Ultra-High-Pressure Homogenizer	2.87
121.		Fast Protein Liquid Chromotograph	2.55
122.		TGA- DSC	2.77
123.		Atomic Absorption Spectrometer	3.60
124.		GC- MS	5.46
125.		Automated rain out shelter	3.04
126.	ICAR-Directorate of Weed Research, Jabalpur	Face Facility	5.86
127.	ICAR-Central Research Institute for Dry Land Agriculture, Hyderabad	GC-450	5.00
128.		Growth chamber	2.50
129.		HPLC	5.00
130.		Gas Chromatographer	2.50

S. No.	Institute Name	Instrument Name	Cost
131.		Atomic Absorption Spectrophotometer with Graphite Furnace	3.06
132.		Hyperspectral Radiometer HiRes full range	5.50
133.	ICAR-Indian Institute Soil & Water Conservation, Dehradun	Atomic Absorption Spectrophotometer	2.59
134.		Atomic Absorption Spectrophotometer (at RC, Bellary)	2.54
135.		Atomic Absorption Spectrophotometer (at RC, Kota)	2.54
136.		Open path Eddy covariance system with automatic weather station (at RC, Ooty)	3.41
137.	ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar	SuperServer	3.00
138.	ICAR-Central Institute of Brackishwater Aquaculture, Chennai	Flow Cytometer	2.58
139.		Freeze Dryer	2.63
140.		Carbon Fraction Analyzer with accessories	2.95
141.		Ultra-centrifuge	4.00
142.		Inductively Coupled Plasma - Optical Emission Spectrometer	4.00
143.		Scanning Electron Microscope	7.50
144.		Vacuum Coater	3.15
145.	ICAR-National Institute of Animal Nutrition and Physiology, Bengaluru	ICP-OES with FIAS	3.40
146.		Micro Manipulation System	2.60




ISBN 978-81-7164-230-4