Azadi Ka Amrit Mahotsav

ANNUAL REPORT

(DARE)

2021-22

सत्यमेव जयते

Department of Agricultural Research and Education
Ministry of Agriculture and Farmers Welfare
Government of India

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FOREWORD

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THE government has adopted several developmental programmes, schemes, reforms and policies that focus on higher income for the farmers. Department of Agricultural Research and Education/Indian Council of Agricultural Research (DARE/ICAR) provides scientific and technological support for enhancing production and productivity for sustainable agriculture through innovative approaches. DARE/ICAR through their research, education and extension programmes, are committed for transforming Indian agriculture from food self-sufficiency to enhancing profitability.

ICAR with 113 institutes spread across the country, is one of the largest national agricultural research systems in the world. Nation is celebrating 75 years of its independence as Azadi Ka Amrit Mahotsav. DARE/ICAR have planned various activities to be undertaken for 75 weeks preceding 15 August 2022. These include awareness campaigns and lectures by eminent persons on the thematic areas for reaching out to maximum stakeholders particularly farmers on various new developments in different sectors of agriculture. This journey of 75 weeks shall culminate with congregation of farmers who have been successful in doubling their income, students and academicians with release of the compendium on farmers' success stories.

National programmes have been conducted on balanced use of fertilizers, National Fish Farmers Day, Food and Nutrition for Farmers, World Bee Day and World Milk Day. Lecture series includes lectures on identified agricultural research topics by prominent Agricultural Scientists. Till date, 42 such lectures have already been organized. ICAR has published a booklet titled Azadi Ka Amrit Mahotsav – Commemoration of 75th year of India's Independence celebrating various programmes and activities proposed. This booklet is available on ICAR website (www.icar.org.in).

Central Agricultural University (CAU), Imphal is the oldest fully residential University established in the year 1993 and is having 13 constituent colleges covering North East Hill States under its jurisdiction except Assam. During the year under report, the University carried out 28 Intramural Research Projects (IRPs) out of which 7 IRPs were newly sanctioned, 13 ongoing and 8 completed under University Funded Research Programmes. Out of the 110 Externally Funded Research Projects, 33 were newly sanctioned, 65 are ongoing and 12 were completed. The Directorate of Extension of CAU, Imphal organized Regional Agri Fair (RAF) 2020-21 during 8-10 March 2021 at Central Agricultural University, Central Farm, Lamphelpat, Imphal, Manipur and sponsored by Minister of Agriculture and Farmers' Welfare, Government of India. It also organized a national conference on 'Priorities in Crop Protection for Sustainable Agriculture' during 16-18 March 2021 at College of Agriculture, CAU, Imphal. In addition, the Directorate organized a number of webinars and workshops for the farmers, unemployed youths and extension functionaries. "Mobile Based Agro-Advisory" project financed by the MeitY, GoI, and has been implemented by DIC, New Delhi and CAU, Imphal, for farmers of Tripura, Mizoram, Arunachal Pradesh, Manipur, Meghalaya.

In the 75th year of Independence when our country is celebrating 'Azadi Ka Amrit Mahotsav', Dr Rajendra Prasad Central Agricultural University (DRPCAU) has added another feather in its crown and made us proud when Sukhet Model of Madhubani district, conceptualized and operationalized by DRPCAU found a mention in 80th edition of "Mann Ki Baat" address to nation by Hon'ble Prime Minister Shri Narendra Modi on Sunday 29 September 2021. Highly impressed by the workflow of waste management model of Sukhet, Hon'ble Prime Minister stressed upon need of replicating it at every Panchayat of the country. He said Sukhet Model is an eco-friendly and pollution-free model enhancing the cleanliness drive in villages, thus augmenting the "Swachh Bharat Abhiyan". The management in Sukhet Model addresses the cooking fuel issues of villagers by supplying

gas cylinders in lieu of bio-degradable wastes. It promotes not only use of clean energy but also cleanliness of the surroundings.

The 1st prize of Pandit Deen Dayal Upadhyay Krishi Vigyan Rashtriya Protshahan Puraskar-2020 was conferred on Krishi Vigyan Kendra, Piprakothi in the category of "Excellence for Agricultural Institution" on the occasion of 93rd ICAR Foundation Day celebrated on 16 July 2021. DRPCAU, Pusa bagged the most prestigious "University of the Year (in existence for more than 30 years) 2020-21" award presented by Federation of Indian Chamber of Commerce and Industry (FICCI) in collaboration with Ministry of Education, Ministry of Commerce and Industry held during 25 to 27 February 2021. The University has the honour to find a place in best top ten among government universities of the country by India Today-MDRA Survey 2021 for second consecutive year. DRPCAU became first Agricultural University in India ranked under top ten till date. The University also got 3rd spot in best student-teacher ratio.

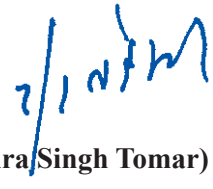
The Rani Lakshmi Bai Central Agricultural University is the first Agricultural University in the country, which was established as an institution of national importance by an Act of Parliament by Government of India on 5 March 2014. The University made stupendous growth in all the spheres of its mandated activities, e.g. academics, research and extension education including infrastructure development. The University took several initiatives to foster sustained growth and quality outcomes by improving efficiency, infrastructure, instruction materials, laboratories and human resources.

In the international cooperation field, Consultative Group on International Agricultural Research (CGIAR) was established to foster global partnership that unites international organizations engaged in research for a food-secured future. CGIAR research is dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring sustainable management of natural resources. India is a donor member country to CGIAR from decades and also a voting member in CGIAR System Council, representing South Asia Constituency of the Council along with two alternate partner countries, viz. Bangladesh and Sri Lanka. India has assumed important role in CGIAR System as a permanent voting member. Annual Review Meeting with the Consultative Group on International Agricultural Research Centers (CGIARs) was held virtually on 3-4 February 2021 to discuss their ongoing activities with focus on India as well as their future plans.

BRICS is an association of five major emerging economies, viz. Brazil, Russia, India, China, and South Africa. India hosted the most recent 13th BRICS summit on 9 September 2021 virtually. A virtual Meeting of BRICS-Agriculture Experts was held on 26-27 July 2021 in Sushma Swaraj Bhawan, New Delhi, India under the Chairmanship of Secretary, DARE and Director General, ICAR in which BRICS Action Plan 2021-24 was formulated.

India hosted the 8th Meeting of Agriculture Experts of Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Countries virtually. Dr Trilochan Mohapatra, Secretary, DARE and DG, ICAR chaired the daylong meeting, which was co-chaired by Dr Thanda Kyi, Deputy Director General, Department of Planning, Ministry of Agriculture, Livestock and Irrigation, Republic of the Union of Myanmar. Experts of Agricultural Ministries from Bangladesh, Bhutan, India, Nepal, Sri Lanka, Myanmar and Thailand participated in the meeting. The Chairman highlighted the UN Food System Summit 2021 and the transformations that are happening in the agriculture and food systems globally. He exhorted to enhance the engagement and deepen the cooperation in agriculture and allied sectors amongst the BIMSTEC Member States by encouraging the exchange of knowledge, germplasm, students and experts.

Perusal of the above shows that in spite of continuing Covid-19 Pandemic in 2021 also, significant developmental initiatives have been undertaken by DARE/ICAR in the field of agricultural research and technology development for Indian farmers. I hope this year's Annual report will be useful for all concerned with Agricultural Research and Education in India.



(Narendra Singh Tomar)
Minister of Agriculture and Farmers Welfare
Krishi Bhawan, New Delhi 110 001

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OVERVIEW

Department of Agricultural Research and Education (DARE)

The Department of Agricultural Research and Education (DARE) was established in the Ministry of Agriculture in December 1973. The Department of Agricultural Research and Education (DARE) coordinates and promotes agricultural research and education in the country. It has the following four autonomous bodies under its administrative control:

- Indian Council of Agricultural Research (ICAR)
- Central Agricultural University (CAU), Imphal
- Dr Rajendra Prasad Central Agricultural University, Pusa, Bihar
- Rani Laxmi Bai Central Agricultural University, Jhansi, Uttar Pradesh

DARE provides the necessary government linkages for the Indian Council of Agricultural Research (ICAR), the premier research organisation for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country.

Besides this, it has Agricultural Scientists Recruitment Board (ASRB) as Attached Office and Agrinnovate India Limited (AgIn), a Government of India enterprise under it's control.

Indian Council of Agricultural Research

The Indian Council of Agricultural Research is an autonomous organization under the Department of Agricultural Research and Education, Ministry of Agriculture and Farmers Welfare, Government of India. Formerly known as the Imperial Council of Agricultural Research, it was established on 16 July 1929 as a registered society under the Societies Registration Act, 1860 on the recommendations of the Royal Commission of Agriculture. It was reorganized in 1965 and again in 1973, with its Headquarters located in Krishi Bhawan, New Delhi, with support facilities in Krishi Anusandhan Bhawan 1 and 2 and NASC Complex, Pusa, New Delhi. The Union Minister of Agriculture and Farmers Welfare is the President of ICAR. The Principal Executive Officer of the ICAR is the Director General, who also functions as Secretary, Department of Agriculture Research and Education, Government of India. The General Body of the ICAR Society, headed by the Union Minister of Agriculture and Farmers Welfare is the supreme authority of the ICAR. Its members include; Ministers for Agriculture, Animal Husbandry and Fisheries, and the senior officers of the various state governments, Members of Parliaments and the representatives from industry, research institutes, scientific organizations and farming community. The Governing Body headed by the community Director General, who is also the Secretary, DARE is the chief executive and decision making authority of the ICAR. The Governing Body consists of eminent agricultural scientists, educationists, public representatives and representatives of the farmers. It is assisted by the Accreditation Board, Regional Committees, Policy and Planning Committee, several Scientific Panels and Publications Committee. In scientific matters, the Director General is assisted by 8 Deputy Directors General, one each in (i) Crop Science, (ii) Horticulture Science, (iii) Natural Resource Management, (iv) Animal Science, (v) Agricultural Engineering, (vi) Fisheries Science, (vii) Agricultural Education, and (viii) Agricultural Extension, who are also assisted by Assistant Directors General, and are the Heads of their Subject Matter Division (SMDs) for the entire country. SMDs are responsible for extending all technical and financial guidance and support to the research Institutes, National Research Centres and the Project Directorates within their respective Divisions. In addition, Assistant Directors General of National Agricultural Science Fund (NASF), Coordination, Plan Implementation and Monitoring, Intellectual Relations and Human Resource Management also assist the Director General in their respective job roles.

The research set up of the ICAR includes 113 institutions, viz 72 research Institutes, 6 National Bureaux, 23 Project Directorates and Agricultural Technology Application Research Institutes, and 12 National Research Centres. It also has 82 All-India Coordinated Research Projects + Network Research Projects. The ICAR-Directorate of Knowledge Management in Agriculture (DKMA) functions as communication arm of the ICAR responsible for delivery of information/knowledge generated by the network of the ICAR and its institutions; and addresses mandate of ICAR through Publications, Information, ICT, and Public Relations Unit. The ICAR promotes research, education and frontline extension activities in 74 Agricultural Universities,

which include 63 State Agricultural Universities, 4 Deemed Universities, 3 Central Agricultural Universities, and 4 Central Universities with agricultural faculty by giving financial assistance in different forms.

Central Agricultural University (CAU), Imphal

This University was established by an Act of Parliament which came into effect on 26 January 1993. The University became functional with the joining of first Vice-Chancellor on 13 September 1993. The jurisdiction of the University extends to seven North Eastern Hill States, viz Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Nagaland and Tripura with headquarters at Imphal in Manipur.

During the period October 2020 to September 2021, in CAU, Imphal, a total of 546, 248 and 52 students including 1 foreign student were admitted in various Under-graduates, Masters and Ph D programmes, respectively during the academic year 2021-22. A total of 337 UG and 147 PG students completed their degrees and 15 students were also awarded Ph D degrees during this period.

Dr Rajendra Prasad Central Agricultural University (DRPCAU), Pusa

Dr Rajendra Prasad Central Agricultural University, Pusa was established on 7 October 2016. In its archive, the University owes legacy to state agriculture university, Rajendra Agricultural University, Pusa established in 1970 and earlier to that Agricultural Research Institute and College, Pusa established in 1905.

Sukhet Model of Madhubani district, conceptualized and operationalized by DRPCAU found a mention in 80th edition of "Mann Ki Baat" address to nation by Hon'ble Prime Minister Shri Narendra Modi on Sunday 29 September 2021. Highly impressed by the workflow of waste management model of Sukhet, Hon'ble Prime Minister stressed upon need of replicating it at the every Panchayat of the country. He said Sukhet Model is an eco-friendly and pollution-free model enhancing the cleanliness drive in villages, thus augmenting the "Swachh Bharat Abhiyaan".

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Dr Rajendra Prasad Central Agricultural University has bagged the most prestigious "University of the year (in existence for more than 30 years) 2020-21" award presented by Federation of Indian Chamber of Commerce and Industry (FICCI) in collaboration with Ministry of Education, Ministry of Commerce and Industry held on 25th to 27th February 2021.

The University is now under top 10 best among Government Universities of the country according to India Today-MDRA survey, 2021 for second consecutive year. Agriculture Today - Agri-Education Awards 2021-Excellent Green Campus Initiative was awarded to Dr Rajendra Prasad Central Agricultural University for exemplary contribution towards agricultural education in India and beyond.

Rani Lakshmi Bai Central Agricultural University (RLBCAU), Jhansi

The Rani Lakshmi Bai Central Agricultural University is the first Agricultural University in the Country, which was established as an institution of national importance by an Act of Parliament by Government of India on 5 March 2014. The University made stupendous growth in all the spheres of its mandated activities, e.g. academics, research and extension education including infrastructure development. The University took several initiatives to foster sustained growth and quality outcomes by improving efficiency, infrastructure, instruction materials, laboratories and human resources. Two colleges, namely College of Veterinary and Animal Sciences, and College of Fisheries are being established at Datia, Madhya Pradesh.

Agricultural Scientists Recruitment Board (ASRB)

The Agricultural Scientists Recruitment Board (ASRB) was established with the approval of Cabinet on 1 November 1973 as an independent recruitment agency in pursuance of the recommendations of

the Gajendragadkar Committee. The Government of India has approved restructuring Board as per their decision in the meeting of the Union Cabinet held on 1 August 2018 and issued vide Notification No. 25/CM/2018 (i) dated 06.08.2018; Case No. 213/25/2018 (item-7). The decision has been formally notified in the GOI Gazette on 9 August 2018.

During the year, recruitment process for 61 RMP posts has been completed, comprising Deputy Directors General, Assistant Directors General, Directors, Project Directors and remaining were Joint Directors of National Institutes. The constraints due to COVID-19 and urgency of recruitment of Research and Management Positions (RMP) and Career Advancement of Senior Scientists to Principal Scientists, ASRB switched to virtual mode and established three Video Conferencing facilities with the help of NIC. ICAR institutes were designated as ASRB Remote Centres to provide safe, secure and seamless Video Conferencing facility to the experts and candidates in the nearby ICAR institute/own institute. This enabled ASRB to continue recruitment process even during the Covid 19 pandemic. A combined examination for ARS 2021 (preliminary) for 222 vacancies of Scientists, Senior Technical Officers and National Eligibility Test was conducted in Online Mode at 32 centers across the country. A total of 68,473 candidates had registered for the examination and 47,326 candidates actually appeared in the examination.

Agrinnovate India Ltd.

Agrinnovate India Ltd. (AgIn), a Government of India enterprise, was incorporated under the Companies Act, 1956 (No.1 of 1956) on 19 October 2011 and owned by Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. The Company has successfully been able to turn a new leaf in the recent past by initiating effective partnerships with ICAR institutes and private companies.

The Company has successfully been able to attain a turnaround in the recent past and has efficiently handheld partnerships with several ICAR institutes and private companies. The company's revenue from operations touched ₹3,90,57,458 for the first time since the inception of the Company and the revenue per business manager rose to ₹97 lakh in the financial year 2020-21. AgIn handled several ICAR institutions and helped transfer a total of around 105 technologies earning a gross revenue of ₹4.60 crore. These technologies emerged form crop science (29%), dairy and veterinary sciences (13%) and horticulture (58%).

Other Activities

India is a donor member country to CGIAR from decades and also a voting member in CGIAR System Council, representing South Asia Constituency of the Council along with two alternate partner countries, viz. Bangladesh and Sri Lanka. India has assumed important role in CGIAR System as a permanent voting member.

Now, the CGIAR is going through a transition/change process and research will now be grouped in different Initiatives under the One CGIAR (effective January 2022, after the termination of the CGIAR Research Programs by 31 December 2021). The new Initiatives will work on identified areas, bringing together relevant CG Centers and the global demand, innovation and scaling partners.

The following MoUs signed in the recent past with the foreign organizations/Universities for collaboration in Agricultural Research and Education are under process in consultation with ICAR for implementation:

a. MoU between Indian Council of Agricultural Research, New Delhi and Hawassa University, Ethiopia
b. MoU between Indian Council of Agricultural Research, New Delhi and Heinrich Heine University (HHU), Dusseldorf, Germany
c. MoU between Indian Council of Agricultural Research, New Delhi and the Donald Danforth Plant Science Centre (DDPSC), Saint Louis, USA
d. MoU between Indian Council of Agricultural Research, New Delhi and Asia Pacific Association of Agricultural Research Institutions (APAARI), Bangkok, Thailand
e. MoU between Indian Council of Agricultural Research, New Delhi and the Faculty and Graduate School of Agriculture, Kyoto University, Kyoto, Japan

The ICAR and Afghan National Agricultural Sciences and Technology University (ANASTU) have also signed a MoU for long-term cooperation in agricultural research and teaching. ANASTU was formally inaugurated by the President Hamid Karzai

on 15 February 2014 at Kandahar in the presence of Hon'ble Minister of External Affairs, Government of India and Professor M S Swaminathan. A long-term plan has been developed for ANASTU so that it becomes a self-sustaining First Agricultural University of Afghanistan by 2028.

The DARE along with ICAR has played a crucial role in making agriculture sustainable through use of eco-friendly management and innovative technologies which helped the country to achieve the production of food grains four times, horticultural crops six times, fish nine times and eggs 27 times since 1951. This enabled the nation not only to be food and nutrition secure but also improved livelihood of the farmers.

(TRILOCHAN MOHAPATRA)
Secretary, Department of Agricultural Research
& Education and Director General,
Indian Council of Agricultural Research

02

BODIES UNDER DARE AND THEIR ACTIVITIES

CENTRAL AGRICULTURAL UNIVERSITY, IMPHAL

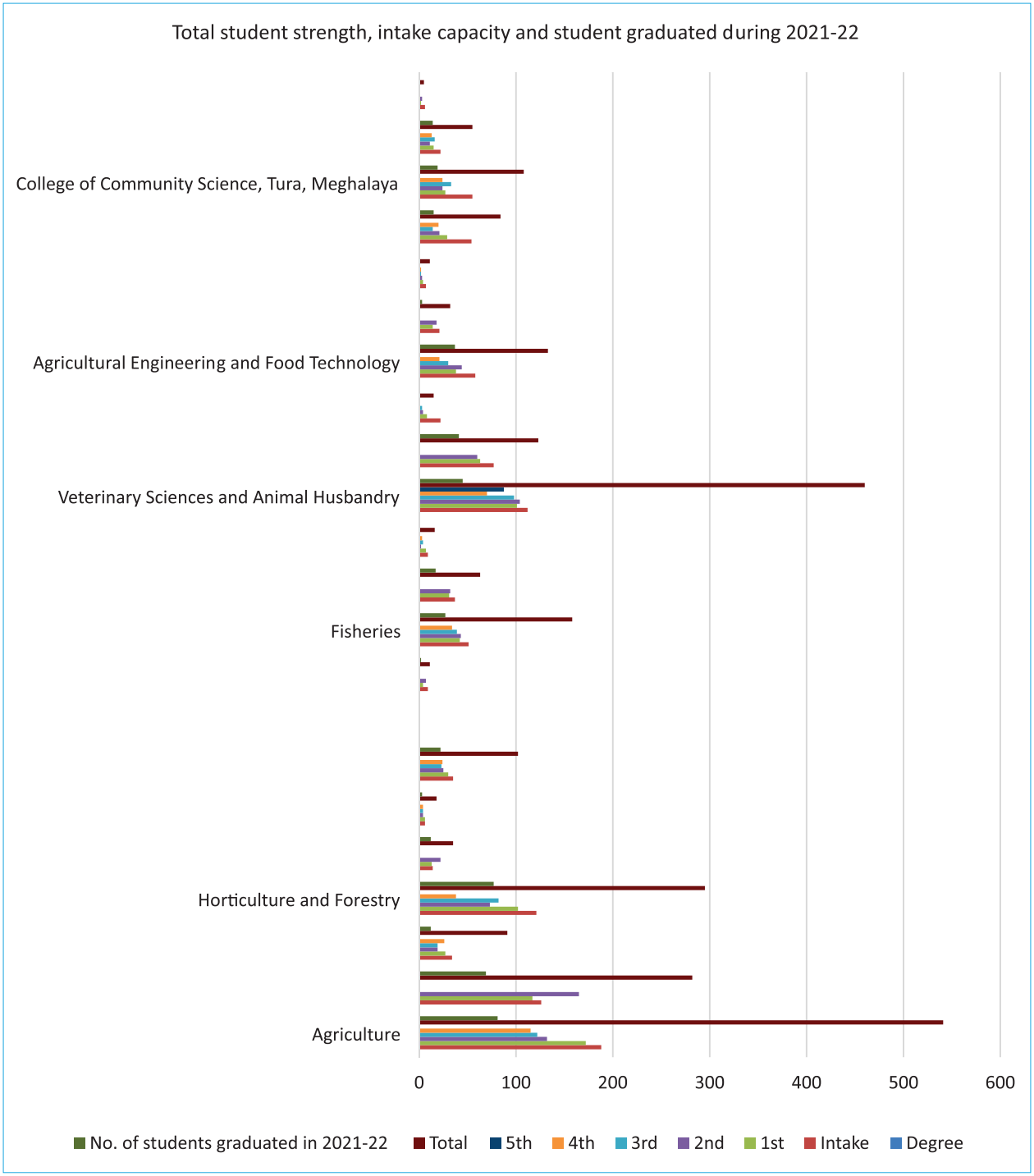
Central Agricultural University (CAU), Imphal was established in the year 1993 under the Central Agricultural University Act, 1992 of the Parliament (Act No. 40 of 1992). The University is a fully residential university having 13 constituent colleges covering 7 North-east Hill states under its jurisdiction except Assam.

Academic Activities

The University offered 9 Undergraduate, 45 Masters and 25 Ph D degree programmes in different subjects/disciplines through its 13 constituent colleges. The University maintains common Academic Calendar for all courses except B V Sc & A H, which is governed by the Minimum

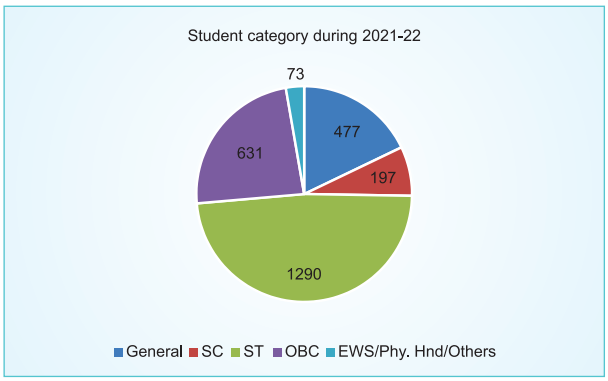
Degree programmes and students strength in constituent colleges (Year 2021-22)

Name of the faculty	Degree programme	Intake capacity	Year wise student's strength						No. of students graduated in 2021-22
			1st	2nd	3rd	4th	5th	Total	
Agriculture	B Sc (Hons) Agri.	188	172	132	122	115		541	81
	M Sc (Agri)	126	117	165				282	72
	MBA (Agri Business Mangement)	5	04	03				07	03
	Ph D (Agri)	34	27	19	19	26		91	12
Horticulture & Forestry	B Sc (Hons) Hort	121	92	78	77	71		318	77
	M Sc (Horti)	14	13	22				35	12
	Ph D (Horti)	06	06	04	04	04		18	03
	B Sc (Hons) Forestry	35	30	25	23	24		102	22
	M Sc (Forestry)	09	04	07				11	02
Fisheries	B F Sc	51	42	43	39	34		158	27
	M F Sc	37	31	32				63	17
	Ph D	09	07	02	04	03		16	
Veterinary Sciences and Animal Husbandry	B V Sc & A H	112	101	104	98	70	87	460	45
	M V Sc	77	63	60				123	41
	Ph D	22	08	04	03			15	
Agricultural Engineering and Food Technology	B Tech (Agril. Engg.)	58	38	44	30	21		133	37
	M Tech (Agril. Engg)	21	14	18				32	03
	Ph D (Agril. Engg)	07	04	03	02	02		11	
	B Tech (Food Tech.)	54	29	21	14	20		84	15
College of Community Science, Tura, Meghalaya	B Sc (Hons) Community Science	55	27	24	33	24		108	19
	B Sc (Hons) Food Nutrition & Dietetics	22	15	11	16	13		55	14
	M Sc (Community Science)	06	2	03				05	
Grand total		**1069**	**846**	**824**	**484**	**427**	**87**	**2668**	**502**



Standards for Veterinary Education (MSVE Regulations of 2008, Veterinary Council of India). The Selection/Nomination of candidates is made through Competitive Entrance Test conducted by the concerned member states located within the jurisdiction of CAU, Imphal for undergraduate programme. Common entrance test was conducted by University for PG and Ph D programmes. On the recommendations of the ICAR Peer Review Team, the National Agricultural Education Accreditation Board, ICAR, New Delhi granted accreditation for various academic programmes (UG/PG/Ph D) to the Central Agricultural University, Imphal (Manipur) and its constituent colleges from 28 March 2016 to 27 March 2021. The accreditation of the University from 28 November 2021 to 27 March 2022 is in process.

A total of 546, 248 and 52 students including 1 foreign student were admitted in various Undergraduate, Masters and Ph D programmes, respectively during the academic year 2021-22. A total of 337 UG and 147 PG students completed their degrees and 15 students were also awarded Ph Ds during this period. Out of the total students'



strength of 2,668 in the University, 477 students belong to the general category, 197 scheduled castes, 1,290 scheduled tribes, 631 other backward class, 73 EWS/Physically handicapped/others. Out of them, 1,144 students were male and 1,524 were female amounting to Male: Female ratio as 1:1.33.

The students of the University showed excellent performance at national level competitive examinations and admissions in national/premier institutes of higher studies. During the period under report, 19 students have secured Junior Research Fellowship (JRF) examination, 2 students ICAR SRF examination and 4 Student GATE examination. The University has an exemplary record of placement in a number of private and public sector organizations, government undertakings. One hundred three students were placed in various capacities in different organizations during the year 2021-22.

Research Activities

The University research aims to develop need-based research projects through sustainable and eco-friendly scientific and technical approaches for developing agricultural technologies/practices/ agricultural machines and equipments which can bring about a far reaching impact on productivity

and profitability of crops, animals and fishes and develop new products for value-addition, enhance income generation and in turn the socio-economic upliftment of the people of North Eastern Hill Region. During the year under report, University carried out 28 Intramural Research Projects (IRPs) where 7 IRPs were newly sanctioned, 13 ongoing and 8 completed under University Funded Research Programmes. Out of the 110 Externally Funded Research Projects, 33 were newly sanctioned, 65 ongoing and 12 were completed.

For strengthening the research activities, the University is implementing 34 AICRPs in agri and allied fields. The University also took up, from time to time, the contingency research projects and station research and trials which are of great concern and need immediate attention in the region. The University was successful in developing location specific recommendations and research findings on agriculture and allied disciplines for the farmers and agri-entrepreneurs of the NEH Region. A number of recommendations have been made that helped in the development of agro-based crop improvement, plant protection, and economically sustainable technologies specific for different agro-climatic conditions of the region. An Australian patent (No. 2020102879) was granted for the technique of diagnostic assay of Porcine Circo Virus 2 Infection in pigs. One cassava variety TCa13-1 (CAU-Umangra 1) has been released and is submitted for publication in gazette. First time in India, the seed production under captivity has been developed and standardized for *Clarias magur*, a delicacy fish of North-east India. A transboundary disease surveillance laboratory in North-east India has been established for the diagnosis and monitoring of potential transboundary diseases of bacterial, viral and fungal origins in livestock, poultry and wild

animals with origin from neighboring North Eastern regions during the reporting year. A National Seminar cum Exhibition on Conservation and Commercialization of Citrus Biodiversity in NEH Region was organized during 18 to 19 February 2021. Altogether, more than 200 scientists, students and researchers from different parts of the country participated in the seminar.

Extension Activities

The Directorate of Extension Education provides extension services to the farmers of seven North-eastern states through various programmes and activities. The programmes implemented during the year include trainings, demonstration, field days, kisan melas, farmer congress, exhibitions, radio talks, TV telecast, film shows, workshop, etc. Transfer of technology activities were planned and coordinated in different districts of the seven states through its 13 constituent colleges, six Krishi Vigyan Kendras and six Multi Technology Testing and Vocational Training Centres.

The Directorate organized Regional Agri Fair (RAF)-2020-21 during 8-10 March 2021 at Central Agricultural University, Central Farm, Lamphelpat, Imphal, Manipur and sponsored by Ministry of Agriculture and Farmers Welfare, Government of India. The theme of the fair was Agriculturally Vibrant and Self-reliant (AVSR: अवसर) NEH Region. Approximately. 3,000 public visited the fair and 1,671 farmer, farm women, and rural youth had registered online. The Directorate also organized 7 on-campus awareness programmes which benefitted 254 beneficiaries. Three trainings were also organized for farm, farm women and rural youth which benefitted 96 beneficiaries. Three training programmes were also held for extension functionaries which benefitted 81 beneficiaries. Two off-campus awareness cum training programmes were also held which benefitted 44 beneficiaries.

During the whole programme, COVID-19 protocol and SOP were maintained as per GOI and GOM. The directorate had also organized a national conference on 'Priorities in Crop Protection for Sustainable Agriculture' during 16-18 March 2021 at COA, CAU, Imphal. In addition, the Directorate organized a number of webinars and workshops for the farmers, unemployed youths and extension functionaries. "Mobile Based Agro-Advisory" project financed by the MeitY, GoI, and implemented by DIC, New Delhi and CAU, Imphal, for farmers of Tripura, Mizoram, Arunachal Pradesh, Manipur, Meghalaya have been implemented. All the KVKs under the extension department along with constituent colleges of the University located in different states of the northeastern region also conducted a number of awareness camps, trainings, FLDs and method/ result demonstrations for the farmers, unemployed youths and extension functionaries. Moreover, under the externally funded programmes sanctioned to the directorate, like RKVY-RAFTAAR Agri-Business Incubator (R-ABI) sponsored by MoA & FW; ICAR-IGFRI, Jhansi, Uttar Pradesh sponsored Project/Programme; Farmers FIRST Programme; ICAR-NIBSM NEH programme etc., a number of webinars, trainings, awareness camps, FLDs, method/result demonstrations, input distribution, scientist-farmers interaction programme etc. were held by following Covid-19 protocol and SOPs of respective State and Central Governments.

Human Resource Development

The University has total staff strength of 1,113 including 13 deans, 25 administrative, 322 teaching and 766 non-teaching positions. At the headquarters, there are 13 executive officers in the administrative positions supported by 35 technical and 109 non-technical staff. In the constituent colleges of the University, there are 322 teaching and 622 non-teaching staff. During the year, 9 staff members were transferred, 22 superannuated, 3 demised and 2 resigned from the service during the year under report. A total of 314 trainings, workshops, conferences, seminars, summer schools, etc were organized at different constituent colleges of the University. Faculty members were deputed for participation in 73 international, 200 national conferences and seminars, 99 workshops and 30 faculty members were deputed for long-term training courses and 167 for short-term training programmes. Ninety eight faculty members delivered lectures at various trainings, workshops and other programmes. Forty five faculty members served as external examiners

at various institutes. Fifty four guest lectures were delivered by reputed scientists from other institutes at different constituent colleges of the University. A total of 56 faculties of the University were also recognized for their excellence in research and developmental works and 13 MOU's were signed with reputed institutes during the period for cooperative relationship through mutual assistance in the areas of education, research and extension activities.

Under IDP-NAHEP sanctioned to the University by ICAR a total of 119 different programmes were conducted at 6 constituent colleges of the University, viz. IDP regional workshop on Start-ups and entrepreneurship (4 nos. with 618 participants); workshop on Gender and entrepreneurship (11 nos. with 1,496 participants); national training on Entrepreneurship development (16 nos. with 1,846 participants); motivational talk (15 nos. with 1,732 participants); interaction with entrepreneurs (5 nos. with 1,732 participants); communication skills and personality development (15 nos. with 2,434 participants); innovation and leadership development (9 nos. with 1,156 participants); training on Networking and negotiation skills (4 nos. with 1,143 participants); value chain development in agri-entrepreneurs (6 nos. with 1,076 participants); business management skills training programme (11 nos. with 1,874 participants); workshop on Start-ups (4 nos. with 712 participants); lecture series (9 nos. with 1,314 participants); webinars on Environmental issues (9 nos. with 1,091 participants) and national workshop on Gender issues and Atma Nirbhar Bharat in agriculture (1 with 150 participants).

Infrastructure Development

Various civil construction works were taken up during the year for meeting the required infrastructural facilities of the University. It included construction works of college buildings, laboratories, hostels, staff quarters, auditorium, information centers, canteen, post office, bank, security barracks, etc. The University is giving special emphasis for speeding up of construction activities of the newly established colleges so that academic classes can be started at the permanent campus of the colleges at the earliest. The following infrastructures are being developed in six constituent colleges of the University under the Institutional Development Project under NAHEP, ICAR: (i) Established 7 numbers of smart virtual classrooms with 70 seat capacity each; (ii) Established 6 numbers of language laboratories with 30 seat capacity; (iii) Established 6 numbers of Incubation Centres; (iv) Laboratory modernization; and (v) Green and disabled friendly campus.

University Publication

During the reporting year, faculties of constituent colleges of the University have published 964 research literatures comprising 450 full length research, 57 seminar proceedings, 114 papers presented in seminars, symposia, 83 popular articles, 47 books, 44 book chapters and 169 bulletins/ manuals/pamphlets, etc.

Visitors

The University witnessed the visits of 50 visitors in different college campuses located in seven states of the north-east hill region of India during the reporting year which is less as compared to previous years due to the pandemic and lockdowns. The visitors included eminent administrators, scientists, faculties, meritorious students and progressive farmers of varied experiences.

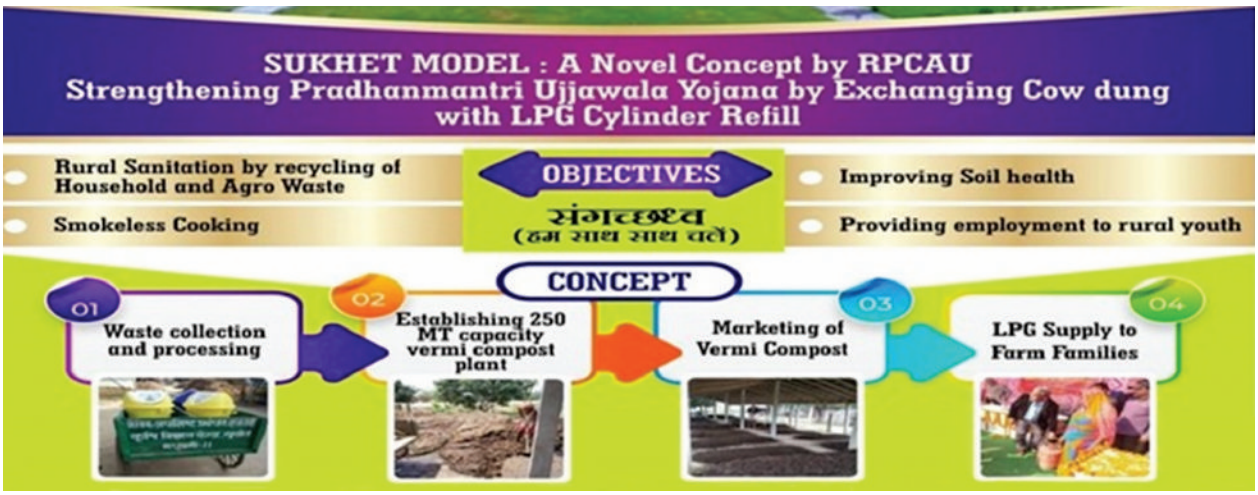
Dr RAJENDRA PRASAD CENTRAL AGRICULTURAL UNIVERSITY, PUSA, BIHAR

Dr Rajendra Prasad Central Agricultural University (DRPCAU), Pusa was established on 7 October 2016. In its archive, the University owes legacy to Rajendra Agricultural University, Pusa, a state agriculture university established in 1970 and earlier to that Agricultural Research Institute and College, Pusa which came into existence in 1905. The University extends its jurisdiction and responsibility in the fields of teaching, research and extension in context of agriculture and allied sciences to the whole country with special reference to the State of Bihar.

During the academic year the University has made an all-round development be it teaching, research, extension and administration. Number of new courses in the form of PG, Ph D, PG Diplomas and Certificate courses have been introduced to produce quality manpower in agriculture and allied sectors.

Proud Moment for DRPCAU

In the 75th year of Independence when our country is celebrating Azadi Ka Amrit Mahotsav DRPCAU has added another feather in its crown and made us proud when Sukhet Model of Madhubani district, conceptualized and operationalized by DRPCAU found a mention in 80th edition of Mann Ki Baat address to nation by Hon'ble Prime Minister Shri Narendra Modi Ji on Sunday 29 September 2021. Highly impressed by the workflow of waste management model of Sukhet, Hon'ble Prime Minister stressed upon need of replicating it at the every Panchayat of the country. He said Sukhet Model is an eco-friendly and pollution-free model enhancing the cleanliness drive in villages, thus augmenting the "*Swachh Bharat Abhiyan*". The management in Sukhet Model addresses the cooking fuel issues of villagers by supplying gas cylinders in lieu of bio-degradable wastes. It promotes not only use of clean energy but also cleanliness of the surroundings. The collected bio-wastes are recycled to vermicompost at waste management units of



KVK and supplied to local farmers at minimal prices which helps to improve the soil health and safe disposal of non-biodegradable wastes. It has therefore become one stop solution for waste and soil fertility management, as well as in cooking fuel and cleanliness management in a very cost-effective way thereby making India "The Aatm Nirbhar Bharat".

Work Flow of Sukhet Model

Waste collection and processing

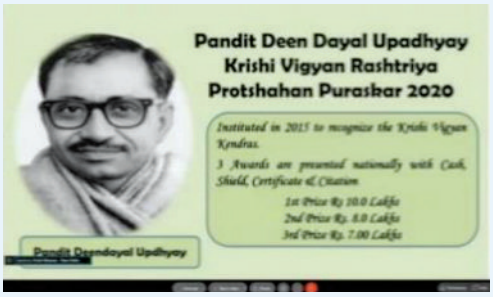
Establishing 250 metric tonnes capacity vermicompost plant

Marketing of vermicompost

LPG supply to farm families

Awards

The 1st prize of Pandit Deen Dayal Upadhyay Krishi Vigyan Rashtriya Protshahan Puraskar-2020 was conferred to Krishi Vigyan Kendra, Piprakothi in the category of "Excellence for Agricultural Institution" on the occasion of 93rd ICAR Foundation Day celebrated on 16 July 2021.



Dr Rajendra Prasad Central Agricultural University has bagged the most prestigious "University of the Year (in existence for more than 30 years) 2020-21" award presented by Federation of Indian Chamber of Commerce and Industry (FICCI) in collaboration with Ministry of Education, Ministry of Commerce and Industry held during 25 to 27 February 2021.

The University has the honour to find a place in best top ten among government universities of the country by India Today-MDRA Survey 2021 for second consecutive year. Hence DRPCAU became first Agricultural University in India which ranked under top ten till date. The University also got 3rd spot in best student-teacher ratio.

Agriculture Today's Agri-Education Awards 2021-Excellent Green Campus Initiative was awarded to Dr Rajendra Prasad Central Agricultural University for exemplary contribution towards agricultural education in India and beyond.	
University Library, DRPCAU has been awarded with this year's prestigious award 'Best Profile Registration Award of J-Gate @CeRA in the Eastern Region' by the ICAR and INFORMATICS India.	

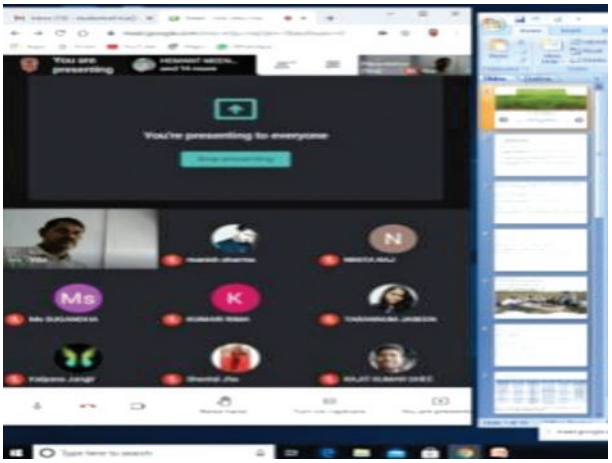
Education

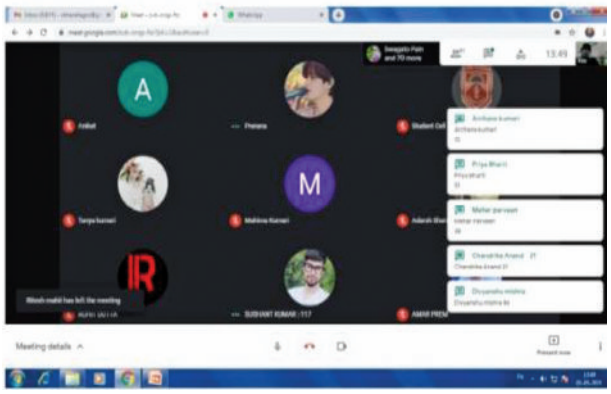
Readiness of DRPCAU for implementing New Education Policy (NEP)

DRPCAU had initiated the process of streamlining the agri-education according to NEP by launching the PG diploma and certificate courses; industry oriented courses; integrated humanities and arts with science; by introducing mandatory foreign language courses; improved industry academic linkage; internationalization of education and MoUs with foreign universities for student and faculty exchange and collaborative research. PG diploma courses have been started to meet the requirement of trained manpower for supervisory level jobs in agri-warehouse management, agricultural journalism and mass communication and agri-tourism. Certificate courses will meet the requirement of skilled human resources for base level jobs such as nursery management, plant-tissue culture, farm mechanization, artificial intelligence, embryo transfer technique and senior citizen assistance. Admission process of PG Diploma Programme and Certificate Courses was successfully completed and a total of 66 students got admitted to different courses. The event was launched under the chairmanship of Dr Trilochan Mahapatra, Secretary, DARE, with gracious presence of DDG (Edn), Dr R C Agarwal, and Dr Pankaj Mittal, Secretary General, AIU.

Best Practices in Pedagogies: Online and ICT Driven Teaching-learning Process

DRPCAU has been continuing all the essentialities of online teaching-learning in education amid the COVID-19 pandemic and by effective utilization of digital platform and e-learning resources for online classes and examinations, viva and presentations, interviews, along with all requisite formalities for PG and Ph D research completion. In relation to online resources accessibility, a week-long college-wise orientation-cum-sensitization programme was conducted and 460 students from eight colleges were





educated with information searching, access and use in digital environment with special reference to authentic academic e-learning resources. Further, a web-based mobile digital library platform has been developed to empower university library users to access e-resources directly from their mobile devices. These initiatives led to completion of academic calendar within stipulated time.

Academic Programmes' Profile 2021-22

The University has launched new academic programme from the session 2021-22 in B Tech (Food Technology), B Sc (Forestry) for Undergraduate, Agroforestry for Postgraduate and Aquaculture for Ph D. Such initiatives resulted in increase in intake capacity from 646 to 716.

Students Diversity

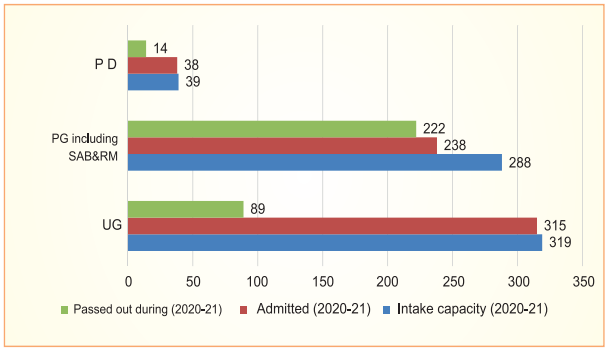
At DRPCAU, Pusa, we aspire and impart high quality agricultural education, research and extension services to agricultural fraternity, students and farmers for their betterment and empowerment in health, education and economic well-being on sustained and continuous basis. Our efforts in these directions resulted in producing many educators, administrators, policy planners, and executives in educational and research organizations, government departments, banks, public sector undertakings, etc. With the results of our continuous efforts, we have students' participation from across 27 states of India which makes us one of the most diverse institution in structured agricultural education and research.

Placement at a Glance

Forty eight students have been placed in 18 different firms with an average annual package of ₹4.79 lakh and the highest package of ₹8.10 lakh. The Placement Cell of the University is making all efforts to groom the student's through soft skill and personality development.

Research

The University is equipped with well qualified scientific human resources devoted for development of crop varieties and technologies to improve the livelihood of farming community with the help of its adequate infrastructure and different research projects including 27 AICRPs, 5-International projects, 10-Government of India funded projects, 4-Government of Bihar funded projects, and 82 University funded projects.



Research achievement

Rajendra Gehun 3 (WB 02)

Year of Recommendation/Notification: 2021
Recommendation/Notification Agency: CVRC
Notification No./ Date/Year: 2021
Pedigree/Parentage: *Triticum dicoccon* CI9309/AE.SQUARROSA (409)/ 3/ MILAN/ S87230// BAV92/4/2* MILAN/S87230//BAV92
Breeding Method: Selection
Released for the Area/State: Bihar
Technology/Product: Developed

Monetization of Agro-waste

The University has taken an initiative to utilize different ago-waste as resource for revenue generation through its Center of Research on Wealth from Waste. During the period under report the following products have been developed by utilizing various agro wastes as mentioned below:

- Fibre extraction from banana pseudostem and its further use in production of various decorative items.
- Incense sticks, artifacts, cutlery, and furniture manufacturing from pigeon pea stalk.
- Essential oil from turmeric leaves and its usage as mosquito repellent.
- Use of litchi seed powder in fish feed.
- Manufacturing packaging material from maize cob stone.

Product Processing for Value-addition

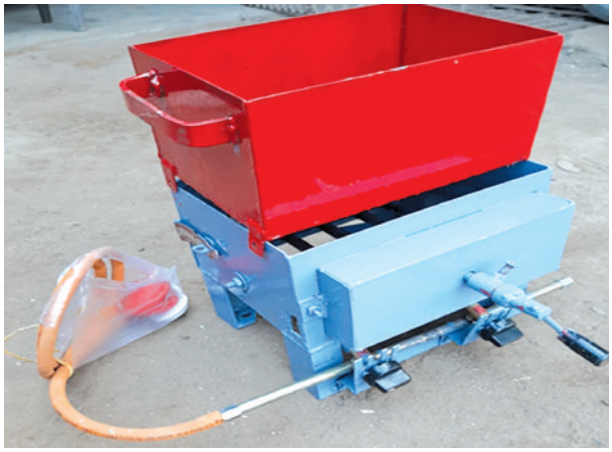
Product development: Dried cauliflower: The University has standardized cauliflower dehydration technology, viz. dehydrated and powdered cauliflower at Food Science and Technology Laboratory. Edible coatings were also prepared using papaya and turmeric leaf as base material for extending shelf-life of fruits.

Dried yam powder and yam papad: Dried yam powder, developed by College of Agricultural Engineering, is used for making yam papad. The major composition of papad is yam powder, chickpea powder and blackgram powder at ratio 3:1:1. Other minor ingredients include mustard oil, salt, asafoetida, sodium bicarbonate and water.

Development of Machinery

Manual cabbage harvester: A manual cabbage harvester has been developed which comprises cutting, conveying and collecting system. The cutting is powered by human through lever, however, conveying is powered by battery. Collection provision is provided in the back which has capacity of 10 cabbages. The developed machine saves about 28% time in cabbage harvesting in comparison with traditional method. The machine also eliminated the bending posture which reduced the human energy demands.

Portable corn roaster-cum-boiler: A gas operated portable corn roaster-cum-boiler has been developed by CAE. The process of corn roasting and boiling can be done in a same single portable unit. The unit can roast up to 5 corns and can also boil 12 corns in one lot simultaneously within 15 minutes. The unit is a low cost, easy to operate and result oriented in better utilization of energy.



Infrastructure Initiative

Installation of cages and floating jetty: The University has installed a cage culture facility with the floating jetty boats under the NFDB sponsored project.

Mechanized herbal gulal making unit inaugurated: A mechanized herbal gulal making laboratory has been established at the Advanced Centre of Research on Wealth from Waste to facilitate large scale herbal gulal production. The unit has the machineries for peeling, chopping, slicing, juice making, ingredients mixing, tray drying, grinding, weighing and brand sealing. Various farm products and farm wastes are being utilized for herbal

gulal preparation. On this occasion, Hon'ble Vice Chancellor reviewed the various ongoing research activities in the centre and appreciated the efforts.

Herbal Vatika established and inaugurated: The Herbal Vatika was inaugurated by the hon'ble Vice Chancellor on the 3 December 2020 wherein more than 50 different medicinal plants were planted.

Golden Jubilee Forage Garden established: On completion of 50 years of All-India Coordinated Research Project on Forage Crops and Utilization, a Golden Jubilee Forage Garden was established at DRPCAU, Pusa and virtually inaugurated by Secretary, DARE and DG, ICAR in presence of Hon'ble Vice chancellor and Deans and Directors of the University.

Commercialization of Technologies

Collaboration for commercialization of technology: The University has made leapfrog progress in transfer and commercialization of different technologies developed by the University by signing MoUs between Centre of Start-up Facilitation-DRPCAU, Pusa and seven entrepreneurs.

- Support Foundation, Muzaffarpur
- Asia Entrepreneurship Skill Association, Uttar Pradesh
- Adventure Organic Farms, Patna
- MGCUB, Motihari
- Sontsa Beverage Food Pvt Ltd, New Delhi
- MMAU Goods Pvt Ltd, Muzaffarpur
- MoU with NAV Ganga Pvt Ltd, for silage

Extension

Salient achievements

- Organized 22 kisan melas - one in campus and rest at different KVKs.
- Delivered 68 Radio/TV talks.
- Conducted 2,097 FLDs; 56,734 FCS and 1,281 farmers training.
- Conducted 90 technology assessment trials.
- More than 10,000 farmers got benefitted by different trainings and kisan melas.
- Strengthened kisan call centers.

A spectacular kisan mela was organized by Dr Rajendra Prasad Central Agriculture University from 07.02.2021 to 09.02.2021 at its premises on the theme Atma Nirbhar Gaon- Swabhimani Kisan. More than 10,000 farmers from almost all over India keenly participated in it and made it immensely successful. Around 160 stalls on hybrid seeds, fertilizers, tractors and unique agro-models were displayed in both public and private partnership mode. Scientists interacted with farmers and received their feedback for further improvement in extension activities of DRPCAU.

RANI LAKSHMI BAI CENTRAL AGRICULTURAL UNIVERSITY, JHANSI

The Rani Lakshmi Bai Central Agricultural University (RLBCAU) is the first Agricultural University in the country, which was established as an institution of national importance by an Act of Parliament by Government of India on 5 March 2014. Within the provision of the University Act, its headquarters and constituent College of Agriculture and College of Horticulture and Forestry are located at Jhansi. Two colleges, namely College of Veterinary and Animal Sciences, and College of Fisheries are being established at Datia, Madhya Pradesh. The University made stupendous growth in all the spheres of its mandated activities in academics, research and extension education including infrastructure development. The University took several initiatives to foster sustained growth and quality outcomes by improving efficiency, infrastructure, instruction materials, laboratories and human resources.

Academics

The on-going three undergraduate programmes for the degree of B Sc (Hons) Agriculture, B Sc (Hons) Horticulture and B Sc (Hons) Forestry continued, besides PG programme in eight subjects (Genetics and Plant Breeding, Agronomy, Plant Pathology, Soil Science, Entomology, Vegetable Science, Fruit Science, Silviculture and Agroforestry). The University along with its College of Agriculture has been accredited by the ICAR- National Agricultural Education Accreditation Board (NAEAB). It enrolled new students for various PG/UG programmes admitted through ICAR-All India Entrance Examination within the statutory framework of the reservation policy of Government of India. Despite the outbreak of COVID-19 global pandemic, best possible efforts were made to continue the academic activities with least disruptions. All final undergraduate and PG students completed their degree requirements within the stipulated timeframe. Six research cum development projects have been sanctioned under Rashtriya Krishi Vikas Yojana (RKVY) - Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (Raftaar) component by UP State Level Sanctioning Committee (SLSC) with an outlay of ₹854.90 lakhs. These projects are mandated to promote bee-keeping, low-cost mushroom production and protected cultivation of high-value cut-flowers in addition to establishment of plant-health clinic and hi-tech nurseries for quality planting material. The faculty and students were also active participants of Swachh Bharat Abhiyan, National Social Service, national festivals, games and sports, Hindi Pakhwara, and extra-curricular activities.

In-situ rainwater management and crop diversification for climate-resilient agriculture

The research was carried out to standardize the agro-techniques for efficient use of irrigation and rain water and crop diversification for climate-resilient agriculture in Bundelkhand. Out of various tillage methods (deep tillage, residue mulching, broadbed and furrow, ridge and furrow, and conventional tillage), ridge and furrow system was found most promising for *in-situ* rainwater harvesting and resulted in generating maximum crop and water productivity. The system productivity in terms of wheat-equivalent yield was maximum in ridge-and furrow-planting system (6,273 kg/ha/yr) with the highest water productivity (1.85 kg grain/m^3 water). Among different cropping systems (groundnut-wheat, maize-mustard and sorghum-chickpea), maize-mustard cropping sequence showed superiority for the highest water productivity (1.73) and net returns (₹ 54,005 per ha), while groundnut-wheat exhibited maximum WEY (6,397 kg/ha/yr).

Crop diversification in Bundelkhand region.

Identification of waterlogging and drought tolerant accessions for development of climate resilient sesame genotypes

Out of 1,027 germplasm accessions phenotyped against waterlogging, 11 accessions, viz. IC 204414, EC 334965, EC 334449, EC 334970, EC 334981, EC 346727, IC 96095, EC 334977, GT 10 and RT 346 exhibited varying degree of tolerance based

on survival, recovery and seed produced. Out of above mentioned genotypes, GT 10 survived even after 72 hours of waterlogging, hence considered as most tolerant one followed by EC 346727 and EC 334449. In general, reduction in plant height and chlorophyll content was observed even in tolerant genotypes. Further, out of 1,538 accessions, 10 accessions EC 346933, IC 0129289, IC 0129550, IC 0129611, IC 0129613, IC 0129724, IC 0129777, IC 0129807, IC 208699 and IC 501107 exhibited waterlogging tolerance.

Waterlogging screening against waterlogging under field and pot conditions.

At the same time from same set of 1,538 accessions, 35 most promising drought tolerant accessions were identified during 2020 and being validated during current season.

Screening of cowpea genotypes for herbicide tolerance

Seeds of 100 varieties and germplasm accessions of cowpea obtained from ICAR-NBPGR, New Delhi; ICAR-IIPR, Kanpur; ICAR-IIVR, Varanasi; ICAR-IGFRI, Jhansi and GBPUA&T, Pantnagar were planted for the screening for post-emergence herbicide tolerance of Imazethapyr in *kharif* 2020. The plants were scored for herbicide tolerance 2 weeks after spray on a 1–5 scale (1=highly tolerance, 5=highly sensitive). Eleven accessions showed tolerance towards Imazethapyr and the accessions namely, EC 390219, EC 390226, EC 390266, EC 390269, GC 6 and GC 5 showed herbicide score of 1. *Mullago* was found to be the major weed followed by *Commelina*. Imazethapyr effectively controlled the weed population from average 4 to 9 weeds per m^2 taken at 10 different locations in the treatment. Weed-control efficiency was maximum at 81.61% with the application of Imazethapyr @ 80 g a.i. ha^{-1}.

Identification of trait specific donors and germplasm characterization in linseed

The 2,612 linseed germplasm accessions were characterized along with 08 checks, viz. T 397, Shekhar, Sheela, Sharda, Kartika, JLS 95, JLS 67 and LSL 93 under irrigated and rainfed conditions. Three accessions of wild species *L. bienne*, EC 993388, EC 993389 and EC 993391 and one of *L. grandiflorum*, IC 633096 were also characterized and maintained. Total 56 trait specific donors were identified for their use in linseed breeding programme.

Genetic enhancement of barley

Seventy six barley genotypes, including released varieties and genetic stocks were evaluated for grain yield, yield attributes and physiological traits, leaf area index, chlorophyll fluorescence and chlorophyll content during *rabi* 2020-21. The genotypes, BH 393, DL 88, Dolma, DWRB 137, DWRB 180, PL 426 and PL 751 were found promising for flag leaf length and breadth parameters. The malt barley genotypes, DWRB 101 (148) and DWRB 123 (151) showed high tillering/m than feed barley genotypes and the variety DWRB 160 showed the highest 1,000 grain wt. (58 g), followed by DWRB 92 (52) and DWRB 91 (51 g). The genotype DWRB 137, DWRB 174 and DWRUB 52 were promising for total chlorophyll content, while the genotypes BHS 400, HBL 391 and BH 946 showed higher leaf area index. The grain yield ranged from 1.6 t/ha (DWRB 192) to 3.9 t/ha (DWRB 137).

Genetic enhancement of wheat

Eighty two wheat genotypes, including released varieties (44), genetic stocks (37) and the land race, Kharchia Local were evaluated for different agro-morphological traits and physiological characters. The genotypes, AKAW 3717, DHTW 60, Halna, HD 2733, PBW 343, PBW 550, PBW 723, Raj 4079, MP 3336, UAS 304, WB 02, WH 542, WH

730 and WH 1124 showed higher chlorophyll content. The genotypes, DBW 17, HD 2733, Hindi 62, IC55 3915, Kharchia Local, PBW 550, PBW 660, WH 730 and WH 1124 were found promising for Fv/Fm ratio. Leaf area index was promising in the genotypes, DBW 16, Hindi 62, HD 2967 and MP 3336. The genotypes, DBW 90, DHTW 60, Hindi 62, GW 366, Raj 3765 and WR 544 were better for flag leaf attributes. The grain yield ranged from 1.2 t/ha (Kharchia Local) to 5.1 t/ha (HD 3086). The phenomenon of hybrid necrosis was observed at seedling stage in the crosses PBW 723/DBW 110, PBW 723/GW 322 and PBW 723/K 1006 with the common parent PBW 723. PBW 723 is improved version of the mega cultivar PBW 343 developed by marker assisted back crossing (MABS) for genes introgression of Yr17/Lr37/Sr38 and Yr70/Lr76 from *Aegilops ventricosa* and *Aegilops umbellulata*, respectively. This phenomenon needs further genetic studies for confirmation of Ne1Ne1 ne2ne2 and ne1ne1 Ne2Ne2 gene combinations in the parents, DBW 110, GW 322, K 1006 and PBW 723. The genotype RLBW 02 was unique for dark brown glumes and highly resistant reactions (0) for stripe rust.

Management of fungal and bacterial leaf spot diseases in mungbean

Research was conducted on mungbean variety SML 668 to minimize fungal and bacterial leaf spot using different fungicides. The two sprays with azoxystrobin 23 EC @ 0.5 ml/l water and two sprays with *Bacillus subtilis* @ 4 g/l water were found most effective in minimizing the *Corynespora* leaf spot disease, whereas copper oxy-chloride 50 WP @ 2 g/l water + streptomycin 100 ppm resulted in minimum disease severity of 30.8 and 14.8 due to bacterial blight. Among various biological, two sprays with *Bacillus subtilis* @ 10 g/l water caused disease severity of 31.7 and 22.1% over control during the two seasons. Treatment with azoxystrobin 23 EC @ 0.5 ml/l water produced the maximum yield of 889 kg/ha followed by *P. fluorescens* (872 kg/ha) and *B. subtilis* (856 kg/ha) and provided maximum protection against both the diseases.

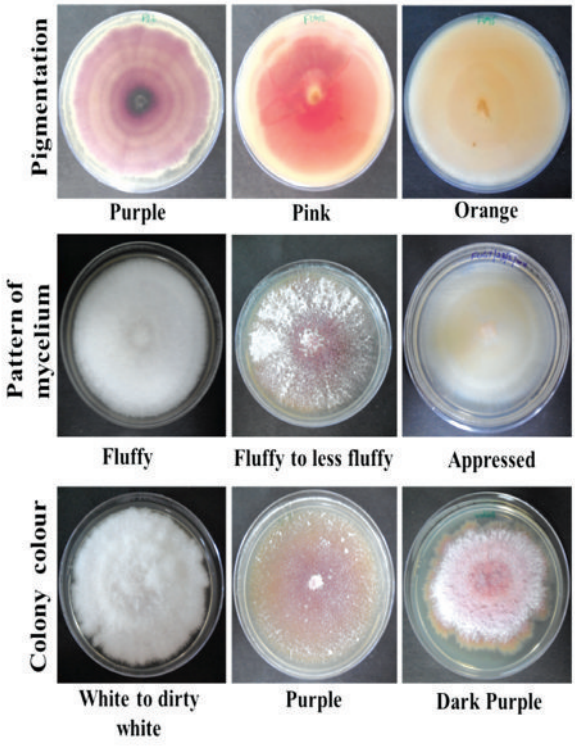
Genetic improvement of Indian mustard

A total of 650 germplasm lines of *Brassica* including indigenous mustard germplasm, exotic lines, genetic stocks, different *Brassica* species and wild relatives were evaluated for different agro-morphological traits. The germplasm lines, viz. RC 1271, NC 37362, IM 108, PCR 9403, EC 766381, EC 766423, EC 766315, EC 766275, EC 766134, EC 766124 and IC 422156 were identified with desirable traits and these germplasm lines will be used in crossing programme to find the desirable segregants for variability for yield and other component traits.

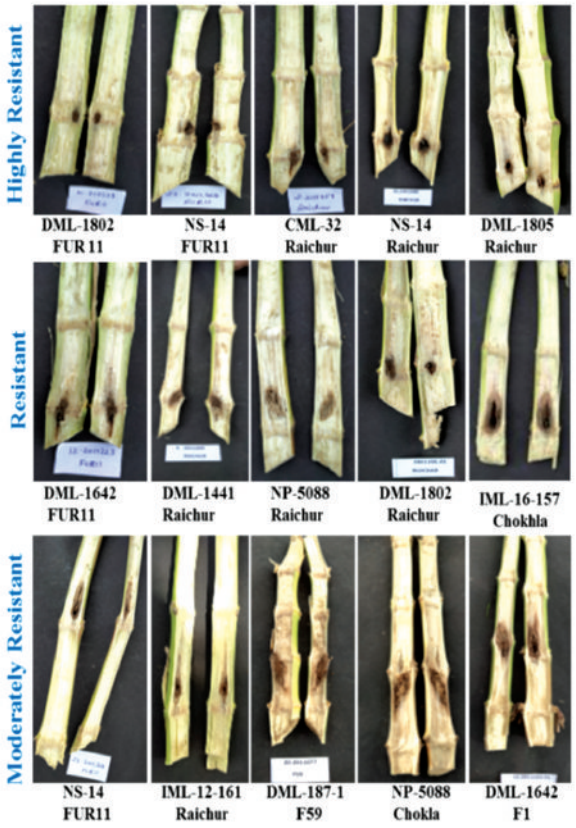
Variability for agro-morphological traits in *Brassica* germplasm accessions.

Morphogenetic variability of *Fusarium* spp. in maize

Morphological characterization of 71 *Fusarium* isolates were performed and a huge variation in mycelial growth, pattern of mycelium, type of mycelium, colony colour, pigmentation, sporulation, branching, shape and size of the microconidia, macroconidia and chlamydospores was obtained in different isolates. Sixty isolates of *Fusarium* isolates were tested against *Fusarium* stalk rot (FSR) susceptible Pusa Composite 4 in field conditions by toothpick inoculation method in *kharif* 2020 and *rabi* 2020-21. After 40 days of inoculation, the stem were split open, brown to pinkish stalk discolouration of xylem vessels was observed as a result of *Fusarium* infection. The lesion length and disease severity were measured for each isolate in both *kharif* and *rabi* season. Among 60 isolates, 12 isolates were highly virulent, 39 isolates moderately virulent and 9 isolates showed least virulence in *kharif* season.



The disease severity varied from 11.11-66.00%, while in *rabi* season, 8 isolates found less virulent, 47 isolates found moderately virulent, 5 isolates were found virulent and disease severity varied from 18.51-66.6%. Five highly virulent isolates of *Fusarium* were tested against in 40 inbred lines of maize for their resistance evaluation against FSR. The inbred lines, viz. IML 16-157, DML 1451, NP 5088, DML 1441, DML 1802, KDM 895 A, CM500 and DML 1642 were found resistant against Chokhla, FUR 11 and Raichur isolates. Whereas inbreds lines, viz. DML 1802, NS 14, CML 32, and DML 1805 were found highly resistant against FUR 11 and Raichur isolates only. None of the inbred lines were found resistant against F59 and F1 isolates. At the same time, the identified species were *Fusarium verticillioides, Fusarium proliferatum, Fusarium oxysporum* and *Fusarium equiseti* among 14 isolates selected by using ITS 1-ITS 4. Phylogenetic tree was constructed by using maximum likelihood method and different clades had been formed.



Pruning of guava under high density planting system

The effect of pruning on guava cv. L 49 under high-density planting system (2 m × 3 m spacing) was ascertained with 0, 25, 50 and 75% shoot pruning in randomized block design in six replications. Results indicated that 25% shoot pruning had significant effect on vegetative growth and yield attributes. Maximum number of new shoots after pruning were recorded with 25% shoot pruning, followed by 50% pruning. Shoot pruning at 25% also increased the number of fruits per plant, fruit weight and total yield. However, maximum TSS (^{0}brix) was recorded with 75% shoot pruning.

Bamboo-based agroforestry for restoration of degraded land

An experiment was conducted with two bamboo species, viz. *Dendrocalamus strictus* and *Bambusa vulgaris* planted at a spacing of 8 m × 6 m. The inter-row spaces were intercropped with jackbean (*Canvalia ensiformis*) sown at a spacing of 1m × 1 m. Bamboo species attained a mean height of 2.93 m (Trimester 1 – August 2020 to October 2020), 3.16 m (Trimester 2 – November 2020 to January 2021) and 3.45 m (Trimester 3 – February 2021 to April 2021), while the number of culms/clump was 12.8, 16.6 and 23.6, respectively. The height of five culms was 1.65, 2.06 and 2.38 under 1st, 2nd and 3rd trimester, respectively. The number of branches and height of jackbean was 8.56 and 100 cm, respectively. Number of pods/plants, length of pod and pod weight was 15.1, 16.3 cm and 14.94 g, respectively in the growing season, while pod yield of 150 kg/ha per month was obtained in the growing season from June 2020 to January 2021.

Research work under various ICAR-AICRPs, viz. on chickpea, and rapeseed-mustard, aside from voluntary trials in the purview of AICRP-maize, barley, pearl millet, MULLaRP and sesame and niger were also undertaken towards enhancing productivity and production of these crops through development of high-yielding, multiple disease resistant varieties for central India.

Quality seed production under seed hub projects

A total of 1,136 q seed was produced for different crops, including millets, oilseeds, pulses and cereals at University farm and in farmers' participatory mode, during 2020-21. Three Seed Hub Projects on pulses, oilseeds and millets have been executed at University to take-up seed production of different crops. Keeping in mind the cropping pattern of Bundelkhand region, the highest seed production was taken-up for pulses (485 q) followed by oilseeds (395 q), cereals (235 q) and millets (21 q).

Extension

Front Line Demonstrations (721) were organized at farmer's field on mustard (100), pea and lentil (10), chickpea (15), wheat (3), groundnut (30), maize (100), *urd* (120), mung bean (5), aerobic rice (15), sesame (45), millets (100), medicinal plant (48), marigold (10), fruits (20), agro forestry (100) at Jhansi, Lalitpur districts of Uttar Pradesh and Datia, Tikamgarh and Niwari districts of Madhya Pradesh. FLDs on rapeseed and mustard (*rabi* 2020-21) displayed 21.44% increase in average yield over the local practices with additional mean monetary benefit of ~ ₹13,030/ha. Chickpea variety RVG 202 exhibited yield of 13.40 q/ha against the local check yield with net return of ₹33,761. Lentil IPL 316 and field pea Aman recorded yield advantage of 29.90 and 41.0% over the local check with higher gross returns of ₹58,212 and ₹12,648/ha, respectively. The farmers (1,858) participated in off-campus training conducted in the districts of Jhansi, Lalitpur, Tikamgarh, Niwari and Datia for scientific farming and propagation of medicinal and aromatic plants, improved field crops, package of practices, nutrient management, plant protection, garden, nursery, etc. In-campus training were also organized to popularize value added and herbal industry oriented cultivation of medicinal plants (160 farmers), scientific production technology of rapeseed and mustard for extension workers (20), climate smart agricultural technologies in Bundelkhand (115); reforms in agricultural marketing (86) and training, exhibition and distribution of medicinal and aromatic plants (80). The faculty members delivered 40 radio talks and participated in TV show on farm related topics for creating awareness about soil health, crop insurance, and other welfare schemes for the welfare of farmers and rural audiences. The University organised exhibition centred at nutri-*ayur* natural health products of medicinal and aromatic plants and participated in technology and machinery demonstration meet-cum-farmers' fair at neighbouring ICAR Institutes. Useful implements (knapsack sprayer, storage bin, fork-shovel and wheel barrow) were distributed among beneficiaries under SCSP programmes. University maintained a regular communication among farmers of Bundelkhand region with the help of print media and ICT based farm advisories (243) as per seasonal requirements. Farmers' day and National Farm Women Day were celebrated with the active on-campus participation of farmers. State governments, NGOs, and FPOs sponsored visits of farmers, villagers, youth and other interested stakeholders (588) to the University campus and research farm to get hands on information, knowledge and learning experience about recent developments in agricultural farming and associated opportunities to enhance farm income.

Infrastructure Development

a. ***Academic block, hostels and residences:*** The construction work related to extension of girls' hostel, faculty residences {T- III (12)/ IV/T-V (12)}, community centre, guest house, farm and external development, etc. at Jhansi and Academic Block (for establishment of Colleges of Veterinary and Animal Sciences and Fisheries), boys and Girls hostel and residences -VI (2) /T-V (4)/T-IV (12)/T-III (12)/ T-II (12) at Datia (MP) are in full swing and likely to be completed by the end of this academic year.

b. ***Check dams and farm ponds:*** Farm development was taken up at the Research Farms of Jhansi and Datia for ensuring 100% rainwater harvesting by constructing check dams and ponds at lowermost points of the farm. One dozen farm ponds and check dams covering 8 ha area have been developed at the University Research Farm at Jhansi and two ponds at its Datia campus in an area of 1 ha. These water bodies have been brought under fisheries production and recreational purposes, besides ensuring round the year water availability for irrigation.

Check dams and farm ponds.

Agricultural Scientists Recruitment Board

Direct recruitment/Lateral entry

Vacancy notification for filling up 72 RMP positions was issued in August 2019. Selection process for 26 RMP positions was completed by September 2020 and 35 more RMP positions (total 61) was completed by February 2021 which included Deputy Directors General, Assistant Directors General, Directors, Project Directors and remaining were Joint Directors of National Institutes. Further recruitment were deferred and revamping of the score card for recruitment of senior scientific posts (both RMPs and non-RMPs) of ICAR was initiated for making it completely objective in order to computerize the screening process at ASRB. World suffered from Covid-19 pandemic and country faced national lockdown from 24 March to 3 May 2020. Course of this pandemic and its fear continued even subsequently during the year and experts were reluctant to come to ASRB for screening of applications and interviews. Compliance of Covid-19 protocols also affected the availability of staff in the office.

These constraints and urgency of recruitment of Research and Management Positions (RMP) and Career Advancement of Senior Scientists to Principal Scientists, ASRB switched to virtual mode and established three Video conferencing facilities with the help of NIC. Also, 51 ICAR institutes were designated as ASRB Remote Centres to provide safe, secure and seamless Video conferencing facility to the experts and candidates in the nearby ICAR institute/own institute. This enabled ASRB to continue recruitment process even during the Covid-19 pandemic.

Further, the requisitions for filling up RMPs and non-RMPs of the ICAR Headquarters and its Research Institutes were also received from the Council. The details of the positions are as follows:

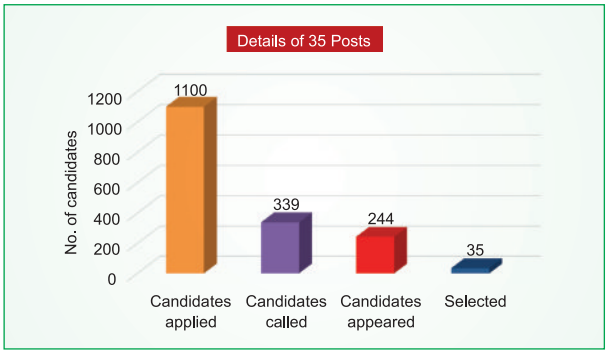
i. DDG/National Directors / Directors / Project Directors/Joint Directors-90
ii. Project Coordinators-17
iii. Head of Divisions-294
iv. Senior Scientist-cum-Head-37

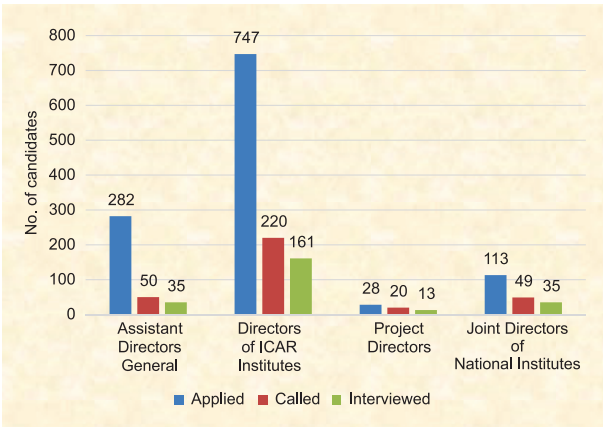
The selection process for filling up these RMPs/ non-RMPs is also based on Score Card system. The revamping of Score Card for RMPs/non-RMPs was initiated in pursuance of the direction from the Hon'ble Minister of Agriculture and Farmers Welfare for making it completely objective in order to computerize screening process at ASRB. The Score Cards for recruitment of RMPs have been finalized by the Council which is undergoing computerization. The revamping of Score Cards for non-RMPs of ICAR is still under process. The selection process for filling up these RMPs/ non-RMPs shall be initiated on the receipt of computerized Score Cards.

Summary of direct recruitment process completed during the period

Category	No. of post(s)	Candidates applied	Candidates called for interviews	Candidates appeared in interviews	Recommended for appointment	NFS
Assistant Directors General	5	282	50	35	5	0
Directors of ICAR Institutes	23	747	220	161	23	0
Project Directors	2	28	20	13	2	0
Joint Directors of National Institutes	5	113	49	35	5	0
Total	35	1170	339	244	35	0
Per post/availability		33.43	9.67	6.97	100	

The Board had screened more than 1,100 applications and had called 339 candidates for interview. However, 244 candidates actually attended the interview. The Board interviews first top ten ranking candidates for each post who scored at least 60% marks in the screening. On an average 6.97 candidates appeared in interview for each position during the period under report.





Recruitment of Assistant Directors General, Directors, Project Directors and Joint Directors of National Institutes.

National Eligibility Test (NET), ARS (Preliminary) – 2021 and Senior Technical Officer (T 6) Examination

During the year, a combined examination for ARS 2021 (preliminary) for 222 vacancies of Scientists in 48 disciplines, Senior Technical Officers for 65 positions and National Eligibility Test in 60 disciplines was conducted in Online mode at 32 centers across the country from 23-27 August 2021. A total of 68,473 candidates had registered for the examination and 47,326 candidates actually appeared in the examination.

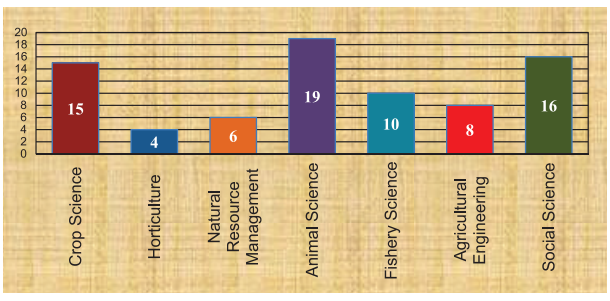
In ARS, candidates who obtain prescribed minimum qualifying marks in the Preliminary Examination will be allowed to appear in the ARS (Mains) examination in the ratio of 1:15 (Category wise) for each post. Main examination is scheduled to be held on 28 November 2021.The candidates who obtain such minimum qualifying marks in the Mains Examination as may be decided by the board as per its discretion shall be called for viva-voice in the ratio of 1:5 (Category wise) for each post.

For Senior Technical Officer Post, candidates who obtain prescribed minimum qualifying marks shall be called for interview in the ratio of 1:5 for each post.

Assessment/Promotion of Senior Scientists under Revised Career Advancement Scheme

View of interview board.

During the year, 78 proposals in 35 disciplines received from different ICAR institutes were assessed for promotion/assessment from Senior Scientist to the grade of Principal Scientist under the revised Career Advancement Scheme (CAS) and the recommendation has been sent to the Council.



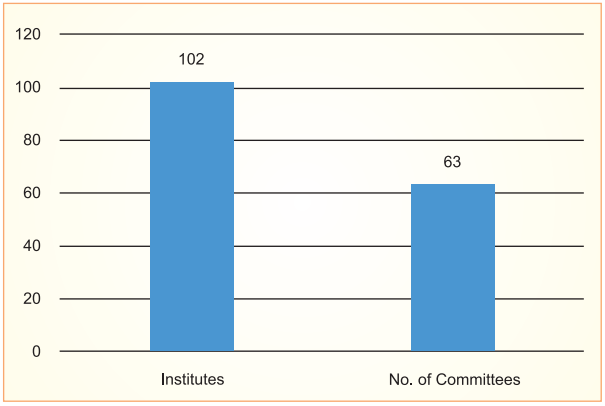
Major discipline-wise details of proposals assessed.

Career Advancement Scheme (CAS) for ARS Scientists (RGP ₹6000 to ₹9000) and Assessment Promotion of Technical Personnel

In accordance with the scheme and rules of Career Advancement Scheme (CAS) for ARS Scientists, the Chairman of the various committees to consider the cases of promotion of scientists in the ICAR institutes are nominated by the Chairman, ASRB. Various nominations were accordingly made for heading the Selection Committees in the institutes by the Chairman, ASRB. Besides this, nominations were also made by the Chairman, ASRB for constitution of Assessment Committees for considering cases of technical cadre staff working in ICAR HQ and its institutes across India.

Assessment Promotion of Technical Personnel

The Board finalized nominations of experts for 102 institutes including ICAR headquarters for Assessment Committees for various categories of technical personnel.



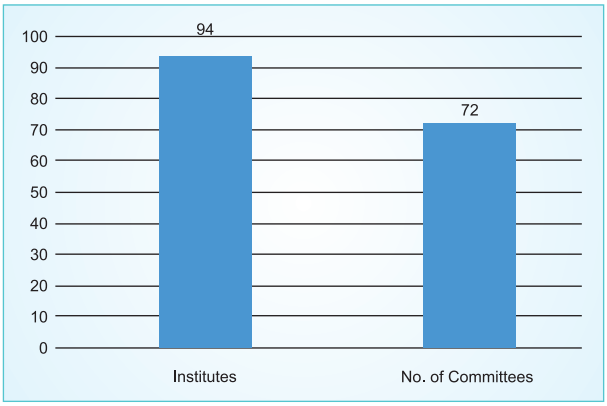
Details of Assessment Committees for Technical Personnel.

Assessment Promotion of Scientists

The Board finalized and notified nomination of experts for 94 institutes for constitution of Departmental Promotion Committees (DPCs) for assessment of scientists from RGP ₹6,000 to ₹7,000, RGP ₹7,000 to ₹8,000 and from RGP ₹8,000 to ₹9,000.

Advice to Council on Tenure Renewal and Departmental Promotion

During the year, Board regularly participated in all the Tenure Renewal Committee meetings of the Deputy Directors General (DDG)/ Assistant Directors General (ADG) and Directors and Departmental Promotion Committee meetings for the promotion of officials of ICAR.



Details of Assessment Committees for Scientists.

Reforms

1. **Digitization:** For easy retrieval of the NET certificates which were earlier issued in printed form, Board has initiated digitization of NET certificates of NET Examination-2018 (I & II) onwards. Now, NET certificate from the exam NET 2018 onwards, can be downloaded through DIGILOCKER app of MeitY, Government of India.
2. **Online examinations:** ASRB has gradually shifted from conventional pen and paper examination to on-line computer based tests. During the year, Board has conducted a combined examination for ARS 2021 (Preliminary), Senior Technical Officer and National Eligibility Test. A total of 68,473 candidates had registered for the examination.
3. **Creation of video conferencing (VC) facility for screening of applications and interviews:** A network of video conferencing facility was created for screening applications and interviewing candidates during Covid-19 pandemic to keep the pace of recruitment of RMP in national interest. The VC facility was established at three locations in ASRB and 51 centers at ICAR institutes with the help of NIC to provide safe-secure and seamless communication with experts and candidates. This helped the Board in a great way in complying with the Covid 19 pandemic protocol during screening of applications and conducting interviews.

Agrinnovate India Limited

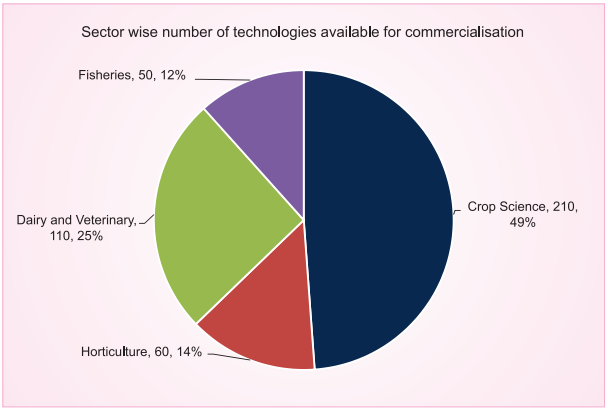
Agrinnovate India Limited (AgIn), a Government of India enterprise, is steadily moving towards meeting its objective of stimulating and fostering innovations in agriculture and building 'A world of Innovative Partnerships'. As an effective interface between Indian Council of Agricultural Research (ICAR-an autonomous organization under DARE) on one side and the Stakeholders of agricultural sector, viz. Farmers, Public and Private Sector firms, R&D organizations on the other, AgIn strives to secure promote sustainable technologies from across National Agriculture Research and Education System (NARES) for commercial scale production to ensure overall development of agribusiness sector.

The Guidelines for commercialization of technologies developed under ICAR and Institutions under the National Agricultural Research System (NARS) have been harmonized with AgIn thereby widening the scope for commercialization cutting across disciplines/sectors. Agrinnovate India Limited is now in a position to take advantage of the new opportunities for enhancing and catalysing innovation and capacity driven agricultural development through partnerships.

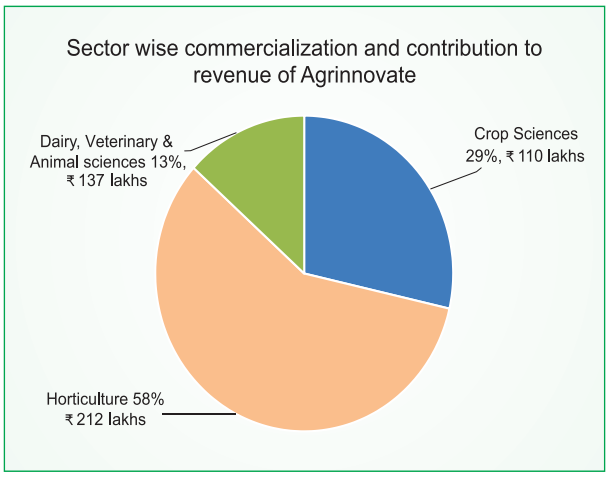
The Company has successfully been able to attain a turnaround in the recent past and has efficiently handled partnerships with several ICAR institutes and private companies. The company's revenue from operations touched ₹3,90,57,458 for the first time since the inception of the Company and the revenue rose to ₹97 lacs in the financial year 2020-21.

Business Development Activities

Constant and continuous efforts by CEO, AgIn and team resulted in widely expanding the business opportunities for the Company and nearly 440 technologies from different sectors have been added to the list of technologies ready for commercialization through Agrinnovate.



During the year 2020-21, AgIn handled several ICAR institutions and helped transfer a total of around 105 technologies earning a gross revenue of ₹4.60 crores. These technologies emerged form crop science (29%), dairy and veterinary sciences (13%) and horticulture (58%).



Sector-wise distribution of revenue through technology transfer at Agrinnovate.

Promotional Activities

AgIn undertook several initiatives as part of the Business Development Program to promote its services to various stakeholders and also several bodies invited AgIn as an expert for policy deliberations and capacity building activities. Significant among these include,

- Expert evaluator for Investment and Disinvestment policy Committee for NRDC, Investment Meet;
- Invited as an Expert evaluator for Cisco Challenge for agriculture;
- Invited as an expert by National Biodiversity Authority (NBA), Chennai on highlighting impediments in main streaming biodiversity, the role of Technology commercialization;
- CEO, AgIn was also invited as Guest of Honour by ICAR-IISR and ICAR-Indian Soybean Research Institute, Indore for women leadership and entrepreneurship;
- AgIn, co-sponsored, CII, Hive, with CII for 'Advanced Technologies Reshaping Indian Agriculture';
- Organized one day Aquapreneurship Program "Institute Industry Interface through virtual mode" on 19.02.2021, especially for the fisheries sector;
- Participated and presented the activities of AgIn in a Webinar organized by Economic Times on Technology transfers for Start-ups;
- Addressed a class of Incubatees of the RKVY RAFTAAR under NIVEDI, Bengaluru on Technology commercialization and Incubation;
- Delivered lecture and created awareness on Technology Commercialization through AgIn, for students, startups and faculty through National Institute of Agri Marketing (NIAM), Jaipur;
- National Agricultural Higher Education Project (NAHEP), Lecture series (13), wherein the AgIn activities and how to go about technology commercialization was briefed for the participants during this series;
- Created awareness through participation in the GKVK, Bengaluru, Web series on Patenting and commercialization, do's and dont's and provided a detailed account of IPR protection and technology commercialization to university staff and students;
- Deliberated in a one-day IPR sensitization workshop on Technology commercialization, role of Agrinnovate, Dr Y S R Horticulture University, Andhra Pradesh, an interactive session for over 1,200 participants was conducted online giving details about AgIn and technology commercialization;
- Special lecture series was organized for FPOs registered through NAFED and IFFCO on Technologies that could benefit FPOs.

Future Strategy

Having established itself as a 'One stop shop' for all agricultural technologies, market ready for commercial businesses, AgIn is looking towards diversifying its activities into enhancing revenue generation through AgIn enterprise scale-up and equity-based partnership with startups.

Indian Council of Agricultural Research (ICAR)

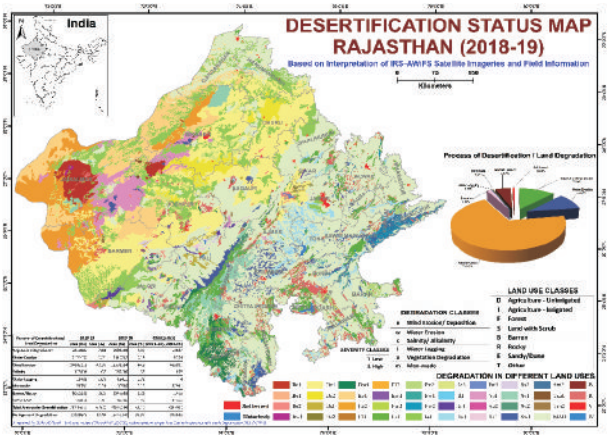
The ICAR's accomplishments and progress towards achieving the Strategic Objectives, Key Performance Indicators (KPIs) and out-put outcome framework articulated during the year are presented here. ICAR ensures that groundbreaking discoveries and technologies to reach our farmers, producers and consumers. We at ICAR are working towards self-reliant agriculture, most customer-focused activities and achieve ICAR's strategic goals to ensure agricultural and rural prosperity. ICAR solves societal challenges through collaboration with our other partners, including academic and science organizations; small business and industry; agencies from all levels of government; and non-governmental, public, and private organizations. ICAR continued strong collaboration with other agencies to help Indian agriculture to become more efficient and competitive, to sustain natural resources and the environment, to enhance the safety of our nation's food supply and improve nutrition.

Indian agriculture and rural life have undergone tremendous transformation since independence. Agricultural development is an integral part of overall economic growth and was the main source of national income and occupation at the time of Independence. It contributed about 50 per cent to India's national income, and around 72 per cent of total working population was engaged in agriculture at that time. Although the contribution of agriculture to national GDP is decreasing over the years, it is important that the growth of other sectors and overall economy depends on the performance of agriculture to a considerable extent. Because of these reasons agriculture continues to be a dominant sector in the Indian Economy. The post-Independence journey of Indian agriculture has been quite impressive despite several limiting factors such as uncertainties of weather, declining soil health, increasing atmospheric temperature and emergence of more virulent pests and pathogens. Technological advancements in agriculture have been influential in driving changes in the farm sector. Although the amount of land and labour used in farming declined, the total farm output increased more than 5 times between 1950-51 and 2020. Similarly, the yield (kg/ha) has increased about four times during the same period.

ICAR has focused on different aspects of Agricultural Research such as food security and supply; food, nutrition and human health promotion and next-generation food system; climate and energy needs; sustainable use of natural resources; food safety; small business innovation and product development; and agricultural education and workforce development. ICAR has played a major role in promoting excellence in higher education in agriculture and coordinating education in all state agricultural universities and central agricultural universities. ICAR vigorously pursued the deployment of digital platforms in agriculture and the application of ICT for farmers' empowerment.

The digital revolution has opened new windows for Indian farmers. Technologies like precision agriculture, e-extension, drone-led operations, smart warehousing and transport optimization, real-time yield estimation and price information, credit and insurance management and e-marketing have proven their applicability in making agriculture predictable and profitable.

Soil and water management for sustainable yield: The digital soil mapping framework has been developed using AVIRIS-NG Hyper spectral data, STRM data (30 m), and Sentinel-2 data, and prepared Geo-referenced desertification map of Rajasthan (1 : 500,000 scale) using Indian remote sensing satellite images (IRS-AWiFs), mapping of groundwater potential zones and identification of recharge structures in hard rock areas. Granular minerals fertilizer was developed as an alternative



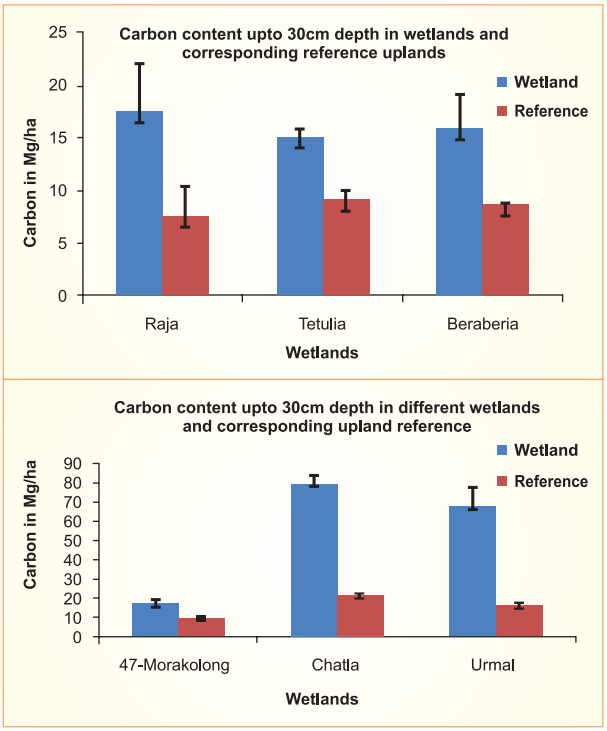
Desertification/land degradation map of Rajasthan

Cut-soiler working under field condition and pearl millet crop

to conventional P and K fertilizer, mechanized technique for seed coating of biofertilizer and a soil biological health kit. Besides, a mini pan evaporimeter for on-farm irrigation scheduling, cut-soiler technology for reclamation of saline soils and a bio-consortia for enhancing the productivity of agri-horticultural crops standardized.

CSR GROW-SURE, a unique bio-stimulant comprising highly efficient salt tolerant bacteria was developed. The formulation was tested for growth and yield parameters in tomato, and banana cultivated in sodic soils of pH 9.14-9.30 and partially reclaimed sodic soils of pH 9.2, respectively and found more effective than CSR-Bio. Plastic mulching in oil palm was effective in enhancing water-use efficiency as it recorded almost comparable yields with micro jet irrigation. Plastic mulching was effective in saving 25% water in drought conditions. Thematic maps were developed for soil suitability for grape growing in Maharashtra, Madhya Pradesh and West Bengal. These maps will be useful for the identification of regions suitable for growing grapes in non-traditional areas and for round the year availability. Tomato cultivars Kashi Aman and Kashi Adarsh tolerated moderate salinity when grafted over brinjal rootstocks.

Climate change and resilient agriculture: Carbon sequestration potential of the floodplain wetlands was assessed in Assam and West Bengal. In Assam wetlands, C deposit up to 30cm depth of soil was higher (1.7 to 4.2 times) than in the reference upland sites. The estimated C in wetlands of West Bengal revealed higher accumulation (1.67 to 2.3 times) than corresponding upland sites. The carbon footprint was assessed in different rice production systems (zero-till, aerobic and shallow lowland) through total life cycle analysis. The study revealed that aerobic rice emitted lowest total GHG-C-eq tonne^{-1} followed by ZTR and SLR, respectively. For production of one tonne of rice, the GHG emissions were 0.73, 0.76 and 0.87 C-eq tonne^{-1} in ZTR, AR and SLR, respectively.



Carbon accumulation in wetlands and corresponding reference sites of West Bengal (*top*) and Assam (*bottom*)

A multiple-stress tolerant rice variety Swarna Samriddhi Dhan was notified and released for cultivation in lowland ecosystem of Bihar. Swarna Samriddhi Dhan is a medium duration, high-yielding, multiple-stress (drought, submergence, disease and insect pests) tolerant, with desirable cooking quality traits and has long slender grains. A drought-tolerant rice variety Swarna Sukha Dhan was released for cultivation in drought-prone upland ecology of Uttar Pradesh. Swarna Sukha Dhan is a short duration, high-yielding and multiple-stress (drought, diseases and insect pests) tolerant with acceptable cooking quality traits. The impact of adoption of Low Tunnel Technologies (LTT) for cultivation of vegetables during off season (winter) in Bikaner, Rajasthan was assessed. LTT for vegetable production has spread over 1,200 ha and farmers earn ₹ 2-3 lakh net profit from one ha per season depending on type of vegetable, seed quality, climatic conditions and marketing demand. The resilience to heat stress in different indigenous goat breeds (Salem Black, Malabari, Osmanabadi, Kanni Aadu and Kodi Aadu) was assessed.

Genetic resources: About 25 explorations were carried out and 1,409 accessions (comprising 772 cultivated and 637 wild) were collected from Assam, Arunachal Pradesh, Bihar, Haryana,

Grain variability in bush type rajmah from Hailakandi (Assam)

Himachal Pradesh, Jammu and Kashmir, Jharkhand, Chhattisgarh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttarakhand and Uttar Pradesh. Germplasm accessions were found in 45% in wild species/CWR. Germplasm included to the National Genebank for long-term storage comprised 8,622 accessions of orthodox seed species and till date the base collection of National Genebank has a total of 4,56,568 accessions. In the cryogenebank, 237 accessions of seeds and pollen genomic resources of different crop species were successfully cryopreserved, making overall collection of 12,076 accessions. A total of 41,490 samples of trait specific accessions were imported from 36 countries. Screening against biotic and abiotic stresses in different crops was carried out in 8,500 and 9,215 accessions, respectively. Biochemical evaluation of 6,580 accessions was undertaken in different crops for oil content, protein, sugar, amino acids, antioxidants and active principles. About 1,22,736 imported samples were processed for quarantine clearance. The total collection in National Genomic Resource Repository (NGRR) is 9,094 from 46 species. The whole genome sequence of cardamom variety Njallani Green Gold has been assembled at a N50 of ~ 151 kb with 72% BUSCO completeness.

On fruits, germplasm such as banana (18), citrus (5), guava (3), mango (30), jamun (1), rose apple (5), jackfruit (40), pine apple (7), avocado (53) and one each in acid lime, ber, custard apple, guava, wood apple were collected. In plantation crops, a total of three new germplasm accessions of arecanut were collected. In vegetable, germplasm in various crops such as chilli (24), brinjal (3), watermelon (3), muskmelon (5), okra (27), Dolichos bean (17), onion (3), radish (10), bitter gourd (6), ridge gourd (3), cucumber (60), cluster bean (2), bottle gourd (8), bell pepper (16), drumstick (77), curry leaf (17), summer squash (33), amaranth (9) were collected. In flowers, germplasm in various crops such as tuberose (1), gladiolus (12), gerbera (16), dahlia (30); and in medicinal plants germplasm in crops such as gudmar (*Gymnema sylvestre*) (31), brahmi (*Bacopa monnieri*) (71), bhringaraj (*Eclipta alba*) (53) and mushroom (2) were collected.

In livestock, registered breeds of Dharwadi and Manda buffalo; and Rajapalayam, Chippiparia and Mudhol Hound dog were gazette notified by the Government of India. Monyul cattle of Tawang and West Kameng districts of Arunachal Pradesh was characterized. Monyul cattle are reared for milk, manure and draught. Multivariate analysis was conducted for different biometric traits of 3,282 cattle of 21 native cattle breeds/ populations of the country.

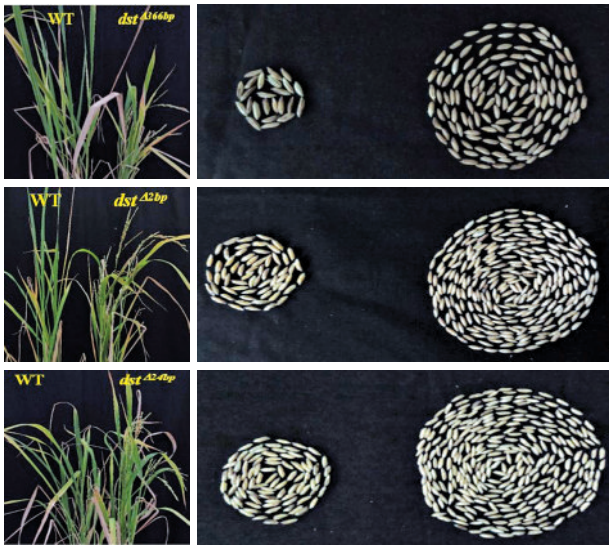
Germplasm repository at National Gene Bank, ICAR-NBAGR, Karnal is being strengthened by preserving diversified form of germplasm (semen, somatic cells and DNA). Total 10,030 semen doses of native breeds (Sahiwal cattle, Nili Ravi buffalo, Marwari, Manipuri, Zanskari horses and Halari donkey) and 970 somatic cell doses of native breeds (Tharparkar cattle, Sirohi and Rohikhandi goat, Mewari, Jalori and Marwari camel and Ghurrah pig) were added during the period for cryopreservation.

The new fish species, viz. snake eel, *Xyrias anjaalai* sp. nov. obtained from deep sea off Kollam, Kerala and *Badis kaladanensis*, a new percoid fish from Mizoram were recorded and described.

(a) *Badis kaladanensis*, holotype, ZSI FF 5404, 48.6 mm SL; (b) Paratype, PUCMF 15002, 45.2 mm SL.

Crop improvement: During 2020-21, a total of 254 varieties/hybrids including 35 special traits varieties of crops were notified and released for commercial cultivation. These varieties comprised: cereals such as rice 39, wheat19, maize 19, pearl millet 3, finger millet 4, barley 1, sorghum 1, little millet 1 and kodo millet 1; Oilseeds such as soybean 25, rapeseed-mustard 7, groundnut 4, linseed 6, sesame 2, safflower 1, castor 1; Pulses–chickpea 13, pigeonpea 8, lentil 4, field pea 3, faba bean 2, mungbean 1, and clusterbean 1; Commercial crops–cotton 62, sugarcane 6, jute 2, mesta 1; Forage and other crops–oat 6, amaranth 4, forage sorghum 2, pearl millet 2, berseem1, kalingda 1 and dhaincha 1.

Cajanus platycarpus, a non-crossable wild relative of pigeonpea, possesses resistance to polyphagus insect pest *Helicoverpa armigera*. The putative insect resistance genes have been cloned from *C. platycarpus* and are being validated in *Nicotiana tabacum*. The intra-specific genetic linkage maps of chickpea was utilized to 15 quantitative trait loci (QTL) associated with drought traits (membrane stability index, relative



Genome edited *Drought and Salt Tolerance* (*DST*) gene knock out mutant of MTU1010 exhibit enhance tolerance to salinity stress. Salt stress (200 mM) was imposed after panicle initiation for 15 days, and then recovered; WT, MTU1010; $dst^{\Delta 366\ bp}$ $dst^{\Delta 2bp}$ and $dst^{\Delta 24bp}$ are mutants of MTU1010 with 366, 2 and 24 bp deletions, respectively.

water content, seed weight and yield under stress) accounting for phenotypic variations ranging from 11.8% to 27.1%. CRISPR-Cas9 genome editing was used to develop mutants of *drought and salt tolerance* gene encoding a zinc finger transcription factor for improving salt and drought tolerance in rice. Three homozygous transgene free mutants were developed which were more tolerant to salt stress and produced more grains as compared with wild type MTU 1010. Using PacBio and Illumina Mate-pair reads, first ever reported chloroplast and mitochondrial genome of Indian tea were successfully assembled and analyzed. Chloroplast genome comprised 126 genes while mitochondrial genome has 66 genes. Twenty eight diverse tropical maize genotypes were evaluated for their embryogenic callus induction potential using mature seed derived two different explants under two different callusing media, out of 28 genotypes, better callus induction was achieved in four genotypes from nodal explants.

During the year, total production of quality seed including all classes was 3,03,130.2 q against the target of 3,32,055.3 q. Production comprised 79,373.3 q of foundation seed, 1,18,487.0 q of certified seeds, 77,376.4 q of truthfully labeled seed and 27,893.5 q of planting material of field crops. A total of 98 varieties of horticultural crops were identified and Notified by the Central Sub-Committee on Crop Standards, Notification and Release of varieties for Horticultural Crops in its 28th Meeting. These include 15 in fruit crops (sweet orange-1, acid lime-2, grapes-2, mango-5,

banana-5), 29 in vegetable crops (brinjal-5, chilli and capsicum-5, one each in radish, cauliflower, bottle gourd, cucumber, ridge gourd, spine gourd, French bean, long melon; pea and beans-5; tomato-6); three in bulbous crops (garlic-2, onion-1), 23 in potato and tropical tuber crops (potato-8, cassava-5, yams-7, Colocassia/arvi including Sakhen Bunda-3), eight in plantation crops (coconut-6, arecanut-1 and oil palm-1), nine in spices (three each in turmeric and coriander and one each in celery, fenugreek and ajwain) and eleven in flowers (aster-1 and five each in marigold and chrysanthemum).

In apple, a total of five hybrids were developed namely Anmol for early maturity, Ambrit with typical ambri flavour, Priame, Pride and Pritor with scab resistance. In coconut, Kalpa Ratna suitable for tender nut, copra and inflorescence sap production, and Kalpa Raja a promising tall variety for the root (wilt) disease prevalent tract have been developed. The productivity is 133 nuts/palm/year, in Kalpa Ratna, whereas 158 nuts/palm in Kalpa Raja. The dwarf varieties of cashew, such as Nethra Vaaman (<2m height, yield 1-2 kg/plant) and KAU Nihara (yield 2 kg/plant) were identified. Arka Shyama watermelon variety, with dark red, crispy, sweet pulp, 3-4 kg weight, early harvest (65-70 days) and yield potential 62.8 tonnes/ha was developed. Arka Neelachal Pushti Indian bean (Sem), a high-yielding, pole type, round padded variety which is rich in protein and micronutrients and is ideal for cultivation in eastern India. The average yield was 24 tonnes/ha in 120 days. Resistant varieties of vegetables developed were: Kalinga Brinjal 131 (BB 67) and Arka Avinash brinjal (resistant to bacterial wilt); MS/11-664 potato (resistant to late blight); T Ca 14-5 and 8S 501-2 cassava (resistant to cassava mosaic disease); TGy 14-6 greater yam (resistant to anthracnose); Gujarat Navsari Mango Ginger 2 ginger (resistant to rhizome rot and leaf blight); CG Raigarh Haldi 3 turmeric (moderately resistant to *Colletotrichum* leaf spot and *Taphrina* leaf blotch); Karan Sounf 1 fennel (resistant to *Rumularia* blight); CG Raigarh Dhaniya 3 and Ajmer Green Coriander 1 coriander (resistant to powdery mildew and aphids); Hisar Methi 273 (resistant to downy mildew and tolerant to powdery mildew) fenugreek; Ajmer Ajwain 73 ajwain (tolerant to root rot); and Ajmer Nigella 1 nigella (tolerant to root rot). In button mushroom varieties NBS 5-1084 and NBS 5-773, paddy straw mushroom DMRO 1072 and DMRO 995, oyster mushroom strain H3 and shiitake mushroom strain DMRO 327 were recommended for release for commercial cultivation.

Livestock improvement: A total of 25,323 Artificial inseminations in Frieswal were carried out from which 4,140 female progenies were born and 1,209 daughters reached the age of first calving. In Avishaan flock of sheep, ewe productivity efficiency (EPE) was 4.22 and 22.90 kg at birth and 3 month of age, respectively. A total of 535 male and 192

Muzzafarnagari flock

Barbari male

Ammol
Early maturity

Ambrit
Ambri flavour

Priame
Scab resistant

Pride
Scab resistant

Pritor
Scab resistant

female sheep of different breeds were supplied for genetic improvement of farmer's flock. Improved Jamunapari, Barbari and Jakhrana goats were supplied for genetic improvement programme in farmer's flock. The overall mean milk yield in 90 days and 140 days was 75.38±1.84 and 111.46±2.99 litre, respectively; and lactation length was 161.04±3.24 days. In Barbari goat, overall mean for 90 days and 140 days milk yield was 60.75±0.85 and 82.55±1.29 litre, respectively; and lactation length was 134.87±1.82 days.

At Anand centre of AICRP on Poultry Breeding, the 40 weeks egg production of Ankleshwar (S-2) was 76.38 eggs, while 72 weeks egg production in IWH and IWP strains (S-1) was 307.2 and 317.5 eggs, respectively. Egg production of IWD and IWK strains (S-8) up to 64 weeks was 226.5 and 218.1 eggs, respectively. A total of 4,19,477 improved chicken germplasm was distributed by different centres in their respective regions/states. CARI- Gracy and CARl-Nirsafed were developed to address issues of climate change for backyard poultry. The dual type hardy birds are efficient egg producers even in intense summer, and also good meat producers. This will help increasing farmers' income by maximizing production throughout the year.

In fisheries, picnic seabream or black seabream (*Acanthopugrus berda*) has high economic and recreational values, excellent meat quality and ability to tolerate wide variations in environmental conditions. Its breeding and seed production were achieved by induced breeding using salmon-GnRH-analogue hormone. Grey mullet (*Mugil cephalus*) a high-valued commercial brackishwater fish, was successfully bred under controlled captive conditions for the first time in the country. Technology on carp sperm cryopreservation was field-tested and successfully upscaled for use in improving hatchery seed quality and genetic exchange through field demonstrations. During the year 800 ml of milt from riverine stocks of Indian major carp was cryopreserved and stored in cryobank. In view of the emerging importance of seaweed mariculture, an all-India preliminary site selection survey suitable for seaweed farming was conducted. A total of 1,677 differentially expressed genes were identified in *Catla catla* through transcriptome analysis. Fourteen differentially expressed regulatory hub genes for growth were also identified. The fish-derived bioactive peptides can prove to be a natural and less toxic therapeutic source.

Picnic seabream or black seabream, *Acanthopagrus berda*

Crop management: Pusa Decomposer is a microbial consortium of fungi developed for accelerated degradation of paddy straw into manure in 20-25 days. This technology is an effective eco-friendly solution for agri-residue management, alternative to burning thereby decreasing air pollution and improving soil health. An endospores-based liquid formulation CRIJAF SONA was developed for jute retting which can be completed within 12 days and the resulting jute fiber has a better strength. Rainfed monocropping systems have low yield and lead to low income. Therefore, an Integrated Farming System (IFS) model was developed for rainfed cotton-based system for central India. Overall, one-ha IFS model produced 70.2 q/ha cotton-equivalent yield with a benefit: cost ratio of 1.95. The biopolymers can be used as a seed coating material and carrier matrix for entrapment of agri inputs. These polymers were utilized for entrapment of beneficial microbes like *Trichoderma* which enhances productivity between 20-30%.

Two promising *Trichoderma* isolates were identified with the potential to enhance sugarcane yield by 17-24.5% under low inorganic fertilizer usage. For the first time leaf spot *(Curcularia*

Pusa Decomposer

Spraying

Mixing and incorporation

Irrigation

Germination of wheat

geniculata) has been observed on maize in India. A study was conducted to isolate and identify efficient bacterial endophytes for wheat to enhance further the genetic potential of low accumulating genotypes for update and translocation of iron and zinc in grains and plant parts. The isolates DS-178 *(Bacillus subtilis)* and DS-179 *(Arthrobacter* sp.) were more for zinc acquisition, whereas DS-68 *(Arthrobacter sulfonivorans)* and DS-163 *(Enterococcus hirae)* were efficient for iron acquisition in grains. Topramezone, promising herbicides is found to be effective to control broadleaved weeds and some of the narrow leaved weeds. Adult weevils of bioagent *Cyrtobagous saliviniae,* were released in aquatic weed (*Salvinia molesta*) in Madhya Pradesh. Complete control of the weed was achieved within six months and there was no regeneration of weed thereafter.

In horticulture, clay-polymer composites using starch, guar-gum, chitosan as polymer and clay, sugarcane bagasse and grape pomace as filler were synthesized. Clay-polymer composites and nano particles as fertilizer carrier will help in increasing micronutrient use efficiency especially in case of Fe and Zn having low availability in calcareous soils. A Litchi maturity kit that provides an easy and handy option to accurately judge acidity of litchi fruit was developed. The attainment of 18-20 BTSS and acidity of less than 0.5% is a reliable indicator of optimum fruit maturity. Two formulations of nutrient mixture, viz. Kalpa Poshak and Kalpa Vardhini were developed for enhancement of growth of juvenile palms and improving the productivity of adult palms, respectively. About 37% increase in nut yield was observed in the palms. The liquid nutrient formulation Akra Sasya Poshak Ras, a unique balanced blend of the macro and micronutrients was developed. This formulation is suitable for commonly grown vegetables.

Integrated management schedule for stem-borer *(Dervishiya cadambas)* in grapes was standardized which comprised removal of loose bark from main trunk and cordons during July-August and washing (2 ml/l water) them with *Metarhizium brunneum* (5×10^8 spores/ml) @ 1.5 to 2 litre formulation/ plant. The resistance in different *I pomoea* sp. (*I. palmata, I. triloba, I. mauritiana*, and *I. obscura*) against sweet potato weevil was studied by choice assay test.

The Arka Viral Kit is based on Loop-mediated Isothermal Amplification (LAMP) to diagnose Tomato Leaf curl Bangalore virus (ToLCBV). It is user friendly, as the testing can be done in a water bath or dry bath, and cost-effective compared to other PCR based diagnostic kits.

Livestock management: Feeding of maize sprouts with straw bedding to crossbred dairy cows during early to mid-lactation in addition to the existing feeding practice increased milk yield and milk fat and SNF. The body weight gain and feed efficiency improved, and stress indices reduced in broiler chicken with supplementation of methyl donors like betaine, B_{12}, folic acid or biotin having no supplemental methinonine. Different bajra cultivars could totally replace maize in the diet of broiler chicken.

Embryo transfer technology (ETT) was initiated in Kankrej cattle for faster multiplication of superior germplasm. Out of seven embryos retrieved from two cows, five good-quality embryos were transferred into four recipients, Established one OPU-IVF pregnancy of Sahiwal cow. Multiplication of elite buffaloes by cloning and ovum pick up technique was achieved, five pregnancies from embryos in buffalo; six calves born through AI using semen of cloned bulls and seven pregnancies through AI from semen of cloned bulls are ongoing. Buffalo pregnancy diagnosis kit Preg-D was developed. The Preg-D kit is the prototype of a urine based novel technique for pregnancy diagnosis in dairy animals. Buffalo Saliva Scope, an estrus identification kit was developed. An alternative package of practices of mithun rearing under a semi-intensive rearing was developed. Under this system, the mithuns can be monitored by the owner regularly for growth, reproduction, health care, and breeding. Nine units of this system were established benefitting 334 mithun farmers.

Mithun rearing units—Mai village, Lower Subansiri district, Arunachal Pradesh

The National Animal Disease Referall Expert System v2 (NADRESv2), a dynamic geographic information and remote sensing-enabled expert system, developed and maintained by ICAR-NIVEDI was updated with 3,262 district wise livestock disease outbreaks data from November 2020 to September 2021. The prediction results, risk maps, bulletins, and post-prediction maps were updated on NADRESv2 and automated messages were sent to National Animal Disease Epidemiology Net work centres and further disseminated through forecasting bulletin to all the state Animal Husbandry Departments and Department of Animal Husbandry and Dairying, Government of India, for initiating preventive action for disease. A marker vaccine candidate for Peste des petits ruminants (PPR) was developed through reverse genetics. The backbone of the PPR vaccine virus, PPRV/Sungri/96 was used, as this attenuated virus is being successfully used for PPR control in India for over two decades. ICAR-NIHSAD developed the Lateral Flow Rapid Test Kit for Pen-side detection of avian influenza H5 virus antigen in suspected chicken flocks. The test is simple to perform at low cost, and provides rapid diagnosis within 20 min. An SYBR green-based FMDV-3D specific ane-step real-time RT-PCR (rRT-PCR)test was developed for pan-serotype identification of FMD virus. This test is 10 times more sensitive than the traditional agarose gel electrophoresis-based RT-multiplex PCR (RT-mPCR). Complete genome sequence of 4H5H/highly pathogenic avian influenza (HPAI) viruses and 7H5N8 HPAI viruses isolated from chicken, ducks, crows, crows, wild birds and bar-headed goose was determined.

In fisheries, a starter microbial consortium named CIBAFLOC was developed which facilitates *in-situ* bioremediation, cleaning of nitrogenous wastes in the rearing water and get converted into nutrient-rich microbial biomass. Goldfish hematopoietic necrosis viral disease (GHNVD) has led to worldwide economic losses in goldfish aquaculture. Virus was inactivated with formalin and the vaccine for cyprinid herpes virus (CyHV-2) was developed by using fantail goldfish fin (FtGF) cell line for its propagation. The results have proven that the formalin-inactivated vaccines were efficient and it resulted in triggering the immune gene expression in goldfish. Viral nervous necrosis (VNN) is an acute viral disease affecting more than 120 species of marine, brackishwater and freshwater fish causing up to 100% mortality in larval and juvenile fishes. A recombinant vaccine, CIBA-Nodavac-R against VNM was developed. It can effectively prevent VNN caused by RGNNV (red-spotted grouper nervous necrosis virus) in fingerlings and prevent vertical transmission in brooders. The vaccine is safe and efficacious.

Mechanization and energy management: A tractor-operated variable width raised bed drip lateral-cum-plastic mulch laying machine was developed. This machine is able to form bed of 0.6 to 1.0 m in width and 0.15 m in height. A tractor-operated 19-row garlic weeder was developed. Average weeding efficiency and plant damage by garlic weeder are 69.6% and 0.1%, respectively. A tractor front mounted hydraulically operated two-row pigeon pea harvester was developed. It saved 40% cost and 96% labour when compared with manual method of harvesting.

Hill farming needs versatile agricultural machinery, which should be light in weight for transportation in hilly areas and portable. So a light-weight multi-crop thresher was developed for threshing wheat, paddy, minor millets, and amaranth crops commonly grown in Uttarakhand hills. The multi-crop thresher would benefit hill farmers by saving time and labour and reducing the drudgery involved in the traditional/ manual threshing operations. A tractor-operated drainage trencher for laying sub-surface pipes was developed and evaluated. The developed trencher can make the trench up to the depth of 1.0-1.1 m with width of 150-160 mm. The cost of the trencher was ₹ 3,00,000 and cost of operation is about ₹ 1,300/h. The climate smart machinery such as roto-till-drill, broad-bed and furrow planters, laser land leveller, ridge and furrow planter and mole drainage technology were identified to overcome the adverse effect of climate change and degrading natural resources. The total input energy in wheat production after adopting roto-till drill (21.1 GJ/ha) is about 39% lower as compared to conventional practices (34.9 GJ/ha).

The carbon emission in roto-till drill is 1,670 kg of equivalent C/ha which is 9% less as compared to conventional practice (1,834 kg of equivalent C/ha). A tractor-operated multi-row paper-tape vegetable transplanter was developed to save on labour, time and cost of vegetable production. It is a 6-row transplanting machine mounted on 3-point linkage of tractor. The field capacity of the transplanter was 0.25 ha/h and fuel consumption of 2.8 l/h. A battery-operated pruner for horticultural crops was developed. The device was tested on ber, guava, wax apple and mango. The cost of machine is ₹ 2,625 and operation cost is ₹ 39.48/h. A pollinator for greenhouse was designed on the principle of a pulsating air jet for pollination. The highest pollination efficiency (83.66%) was achieved at 1.99 m^3/min airflow rate, 23.50 Hz pulsation frequency and exposure time 19.40 sec. The yield was higher with developed pollinator compared to pollination by a blower (36.6%) and controlled plot (95.7%). The bullock powered, rotary mode driven feed type sunflower thresher has been developed. The average output of the thresher was 65 kg/h with efficiency of threshing as 99% and cleaning 85%. Solar-assisted e-prime mover was developed for weeding and spraying in soybean crop. A three-cylinder tractor diesel engine was modified to run using 100% compressed natural gas (CNG). The engine was successfully operated using 100% CNG under no load condition. Pusa- Farm Sun Fridge for storage of perishables, can be built by farmers from locally available materials and does not need electrical supply or batteries for cooling. The structure of size 3×3×3 m and 2 tonnes capacity uses 12 solar panels @ 415 W each. Pusa-FSF could achieve daytime temperatures as low as approximately 4-6°C when the daily ambient maximum temperature reaches about 45°C.

Post-harvest management and value-addition: IoT-based smart storage structure for pulses was developed for one-tonne storage bin, based on the developed protocol. It includes three sensor modules, and each module has a carbon dioxide sensor, temperature and RH sensor, and a display unit. One module has an oxygen sensor also. Maize cobs are harvested at around 35% moisture content while shelling operation is performed at around 17% moisture content. Therefore a hot air maize cob dryer was developed with 150 kg capacity. The drying is carried out at 60°C, and it takes 24-27 h to reach the final moisture content of 17-18% at the atmospheric temperature (36.86°C) at RH (51.37%). Certain fungi that are found in agricultural crops such as maize, peanuts, cotton seed, chillies etc. produce aflatoxins. These are carcinogenic and impose qualitative and quantitative losses to the agricultural produce. The lateral flow immuno assay (LFIA) device was developed for detection of toxins in the agricultural crops. A natural ventilator based modular onion storage system of one tonne capacity was developed. The storage study of the onions indicated 18% physiological weight loss, 5.5% rotting and 0.2% sprouting losses of stored onions. A power operated baby corm dehusker was developed to reduce the drudgery in dehusking of baby corn. It has capacity of 25 kg/h. Slitting efficiency, dehusking efficiency and desilking efficiency of this machine are 100, 92 and 100%, respectively. Composite yarns prepared by wrapping conductive carbon filaments with cotton fibres through friction spinning were used to develop flexible heat generating pads for multiple applications. These include heating shoe pads, thermal garments, warming seat covers, heating gloves etc. which can be operated by 5V, 2A DC power supply.

Nutri-cereals such as bajra and maize are highly nutritious and are even superior to rice and wheat in various nutritional constituents. In spite of all these benefits, bajra and maize occupy a lower position in human food chain in comparison to staple food grains and are not popular among consumers due to lack of good dough making quality, which limits their application in routine bakery products and in chapatti making. To address this problem, vital wheat gluten (VWG) protein added for reconstitution of bajra and maize flour and products such as Hallur: Soft Bajra Atta and Makai: Soft Makka Atta were developed. These products were as good as wheat for superior dough quality. The VWG was extracted from wheat flour. Superior nutritional composition of Hallur: Soft Bajra Atta and Makkai: Soft Makka Atta will boost their consumption, and also enable farmers to have incentive to grow more nutri cereals.

Agricultural human resource development: ICAR ensures quality assurance of AUs through accreditation and ranking process. Connectivity and availability of e- resources across libraries, connectivity of libraries on a single platform through uniform solutions, along with emphasis on capacity building of the students and faculties through various training programmes under the scheme as well as NAHEP and NAARM has raised the standard of PG research as evident by increased number of publications in high impact journals. AUs were also supported for encouraging holistic development of students, through creation of placement cells, support for sports facilities.

Various programmes/activities also facilitated promotion of higher agricultural education and also helped reduce academic inbreeding, infuse merit and promote national integration in AUs. These include centralized admissions in UG/PG and Ph.D.; award and distribution of fellowships to attract and retain the talent and promote merit, admission of foreign students for globalization of agricultural education, National Professorial Chairs and National Fellow Scheme for promotion of excellence in research, Emeritus Scientist / Emeritus Professor Schemes as a structural method of utilizing skill bank of the outstanding superannuated professionals in various disciplines to address faculty shortage.

Globalization of Agricultural Education

Learning and Assessment Centre (LAC)

The key components of NAHEP, viz. Centres for Advanced Agricultural Sciences and Technology (CAAST), Institutional development Plan (IDP), and Innovation Grants improved performance of AUs through entrepreneurship opportunities, non accredited AUs attaining accreditation and helped accelerate institutional reforms. NAARM contributes immensely on wide range of issues of national and global importance apart from various courses on capacity building. The Academy has also been promoting online and digital education, start ups for agripreneurship.

Social science: Income scenario of agricultural households in India along with variations in various income components were examined across different rounds of the Situation Assessment Survey of Agricultural Households (SAS-AH). Agricultural households usually derived income from farm and non-farm sources. Agricultural sustainability report of 24 Indian states, studied using 51 indicators across four dimensions (soil, water, environmental and socio-economic), revealed that a moderate level of agricultural sustainability in India with the Composite Index of Agricultural Sustainability (CIAS 0.41-0.57). The inter-state variations in CIAS are quite pronounced. An android-based application-eLISS data collection app was developed to capture data from the field for major livestock products. The KISAAN 2:0 (Krishi Integrated Solution for Agri Apps Navigation) App, was envisaged to help e-agriculture and to drive smart phone based agriculture in India. This app integrates more than 300 Agricultural related apps developed by ICAR Institutes. KISAAN 2.0 app provides a single interface in multiple Indian languages for Indian farmers to access agricultural knowledge about crops, horticulture, livestock, fisheries, natural resource management, agricultural engineering, agricultural education and agricultural extension. Black Pepper Drought Transcriptome Database (BPDRTDb) consists of characterizations of black pepper genotype and its web resource will serve as valuable resources for new genes discovery as well as developing SSR maskers in endeavour of higher crop production.

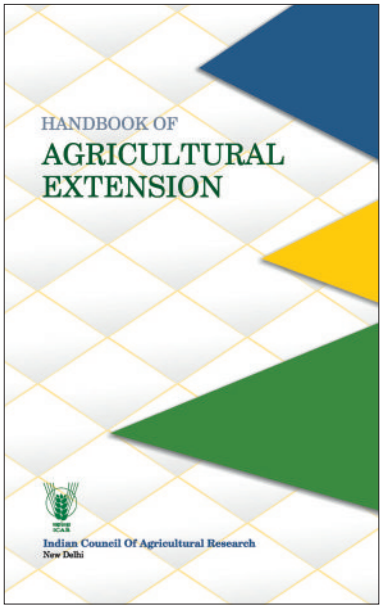
ICAR carried out research activities focusing on farm women nutritional security, livelihood enhancement, technological empowerment, drudgery reduction and entrepreneurship development. Under the ICAR-CIWA-IRRI collaborative project a Women Farmer Producer Company named "Chitri Dora" was formed with the help of guarantee partner PRAGATI at Koraput involving 1,031 tribal women farmers, covering 30 producer groups, for collective marketing of

Learning and Assessment Centre (LAC)

Disc type ridger for farm women

aromatic rice. For farm women a manual disc ridger was also developed and tested for operational parameters to form ridges and channel with proper work rest cycle. The output capacity is 427 m^2/h, which is more than 5 times the traditional method of using spade.

Information, communication and publicity services: The ICAR-DKMA publishes periodicals, books, handbooks, Annual Reports, newsletters, bulletins, monographs, e-books, media columns, social media contents and advisories. The knowledge banks are available in open access as well as in closed access models to the stakeholders in agriculture. ICAR-DKMA has already taken steps to disseminate knowledge by using up-to-date most popular ICT tools for benefitting the national as well as international agricultural world. *The Indian Journal of Agricultural Sciences* and *The Indian Journal of Animal Sciences*, the monthly research journals of international repute are in the open access mode (http://epubs.icar.org.in/ejournal). The journals have a wide clientele and received a total of 1865 (Animal Sciences) and 2794 (Agricultural Sciences) submissions, respectively during the reporting period. The user base of the journals is expanding and 2125 and 3273 new users have associated making the total tally to

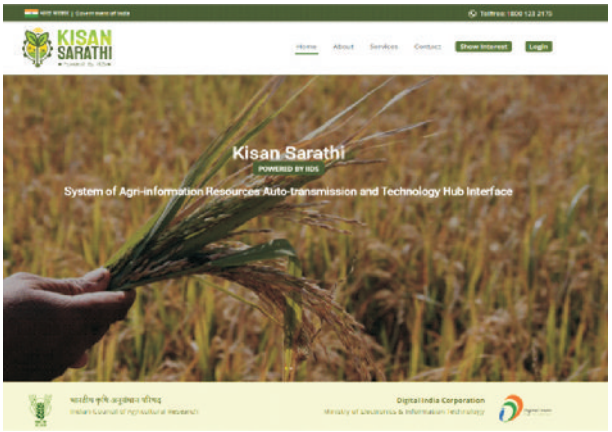


21,154 (Animal Sciences) and 40,926 (Agricultural Sciences) users. The journal website was visited nearly 45000 times with audience belonging to 143 countries. The journals have considerable metrics, viz. impact factor and H index are 0.22 and 26 for Agriculture and 0.21 and 22 for Animal sciences given the fact that these are multi-disciplinary in nature. Popular periodicals like *Indian Farming* and *Indian Horticulture,* and *Kheti* and *Phal Phool* were brought out on topical issues for outreach to the masses.

To disseminate information in real-time, the ICAR website is updated on a regular basis and in total 4,589 pages were updated and a total of 45,77,864 page views from more than 200 countries were recorded. The top five countries visiting the Website include India, United States of America, United Kingdom, United Arab Emirates and Nepal. On ICAR Facebook, a total of 430 posts were published during the year 2021 and it has 2,20,379 Followers. ICAR Twitter handle has more

than 1,60,132 Followers. On an average, 3 Tweets are Posted every day and a total of 1,013 Tweets were posted during the year. The YouTube Channel of ICAR has Video Films, Animations, Lectures/ Interviews by dignitaries and Eminent Scientists, Proceedings of National and International Events, etc. It has 63,300 Subscribers.

ICAR DARPAN Dashboard (https://icar.dashboard.nic.in/login.aspx) provides centralized, easy-to-access platform for display and access of data from multiple sources. To increase the penetration of agricultural technologies and two way effective communication with farmers, multi-media based multilingual ICT based communication system "Kisan Sarathi: An interface solution with farmers" was launched on 93rd foundation day of Indian Council Agricultural Research. The Agricultural Research Management System (ICAR-ARMS) has been developed for evaluation, monitoring and management of scientific output for policy planning of the Council. E-HRMS (Human Resource Management System) is a work flow based online solution which consists of creation of e-service book and all processes/information impacting service book from joining to retirement of an employee. Land Record Management Information System (https://lrms.icar.gov.in) is an online solution for Land Record Management of ICAR institutes was developed by IT Unit of IASRI in collaboration with ICT Unit of ICAR Headquarters and Director (Works).



Kisan Sarathi

Technology assessment, demonstration and capacity development: Technology assessment is carried out by KVKs, in different locations under various agro-ecological situations. About 5,222 technologies of various crops were assessed at 12,015 locations by conducting 25,843 trials at farmers' field. The different thematic areas were: cropping systems, drudgery reduction, farm machineries, integrated crop management, integrated disease management, integrated nutrient management, integrated pest management, integrated weed management, processing and value-addition, resource conservation, storage techniques, and varietal assessment of cereals, pulses, oilseeds, fruits, vegetable and commercial crops. A total of 873 technological interventions relating to different livestock were assessed by KVKs at 3,204 locations through 6,646 trials covering thematic areas such as animal disease management, evaluation of breeds, feed and fodder management, nutrition management, livestock production management, and processing and value-addition. About 364 technologies at 1,222 locations through 2,247 trials under other enterprises including mechanization; processing and value-addition; drudgery reduction; small-scale income generation; nursery raising, fish production and management; and household food security.

CFLD on chickpea (NBeG 49) KVK, Gadag

CFLD on blackgram (Shekhar-2) KVK Kaushambi

A detailed programme was planned, prepared and executed on Cluster Frontline Demonstrations (CFLDs) with an aim to demonstrate the production potential of major pulse and oilseed crops in the country. A total of 1,67,026 Frontline Demonstrations (FLDs) on crops, farm machineries, livestock and fisheries, other enterprises and gender-

Training programme on Integrated Farming System (IFS)

VL QPM Hybrid 59

specific technologies for women empowerment were organised. About 45,469 training courses for farmers and farm women targeting productivity enhancement and cost reduction of field crops, horticultural crops, plant protection, empowerment of rural women, livestock production and management, soil health and fertility management, capacity building for group actions, agricultural engineering, production of inputs, fisheries, and agro-forestry.

Capacity development of 1.41 lakh extension personnel was conducted through 4,620 courses in the country. The extension, functionaries engaged both in government and non-government organizations for the development of agricultural sector in the country were included in these trainings. Soil, water, plant and manure samples of farmers' fields were analysed at KVKs, and suitable advisories based on analysis were provided to them. A total of 52 Directorates of Extension Education (DEEs) of the SAUs/CAUs have played a crucial role in technological backstopping to KVKs in India. The DEEs facilitated technological backstopping for KVKs by conducting training programmes, field days, farmer-scientist interactions, soil health camps, kisan melas, kisan goshthies and technology week celebrations.

Research for tribal and hill regions: The varieties released for cultivation were: biofertified maize VLQPM Hybrid 59; grain amaranth VL Chua 110; finger millet VL Mandua 378 and VL Safed Mandua 382; wheat VL Gehun 2015; rice UL Dhan 88, VL Dhan 159 and VL Sikkim Dhan; and Vegetable VL Sabji Matar 14 and VL Cherry Tomato 1. About 187.0 q breeder seed of 47 released varieties of 17 crops were produced. The 9.93 q truthfully labelled seed of 20 varieties of 13 crops was produced. A total of 15.4725 q TL seed was supplied to different stakeholders. An integrated organic farming system (IOFS) model (0.43 ha area) was developed at Umiam, Meghalaya to meet the diverse requirement of the farm household while preserving the resource base and maintaining the ecology. The model has diversified farming components like field crops (cereals, pulses, oilseeds), horticultural crops (vegetables, fruits), livestock (one cow + calf), duckery (20 ducks) along with perennial fodder crops, composting units and central water harvesting pond for composite

IOFS model at ICAR Research Complex for NEH Region, Umiam

Vertical cropping over Jalkund in IOFS model

fish culture and as a source for irrigation during lean season. The IOFS model generated an average net return of ₹ 82,450/year with B: C ratio of 2.43 which are much higher than the common farming practices.

Patent and copyright: During the period under report 70 new patent applications were filed in different sectors of agriculture at Indian Patent Office (IPO). Further, ICAR's cumulative number of granted patents has risen to 408 with grant of 52 patents by IPO from 26 ICAR institute Plant Varieties and Farmers' Rights Authority (PPV&FRA) granted registration certificates for 58 varieties (55 extant and 3 new) during this period. The cumulative figure of registered varieties is 1360s. Research outcomes including software, books, research reports and other creative activities were protected under copyright act by filing 59 applications. A total of 301 copyrights have been registered from different ICAR institutes. Sixteen applications for designs were filed by ICAR-CIFT, Cochin, ICAR-CMFRI, Cochin, NINFET, Kolkata, and ICAR-NRC on Mithun, Nagaland. These included: (i) Fish freshness sensor; (ii) Fish smoking kiln; (iii) Hot air assisted continuous infrared dryer; (iv) Meat and shell separating machine for clams; and (v) Banana pseudo-stem fiber extractor. A total of 73 filed design applications have been registered. Twenty two Trademark applications were filed in different products and brand names, viz. *CAFRI Krishivaniki, CAMMiN, CIFRI ARGCURE, DCFR Aqua FSD fish anaesthetic, Fish Tanavhari, Brahmavarta, KaMilk, NINFET Power, Preg-D, Spiisry, Shining Barb, Srinidhi, Vanashree etc.* Total of 189 trademark applications have been filed by 27 ICAR institutes. Thirty-five ICAR institutions in different Subject Matter Divisions have entered into 417 agreements for consultancy/contract research and services with 240 public and/or private organizations.

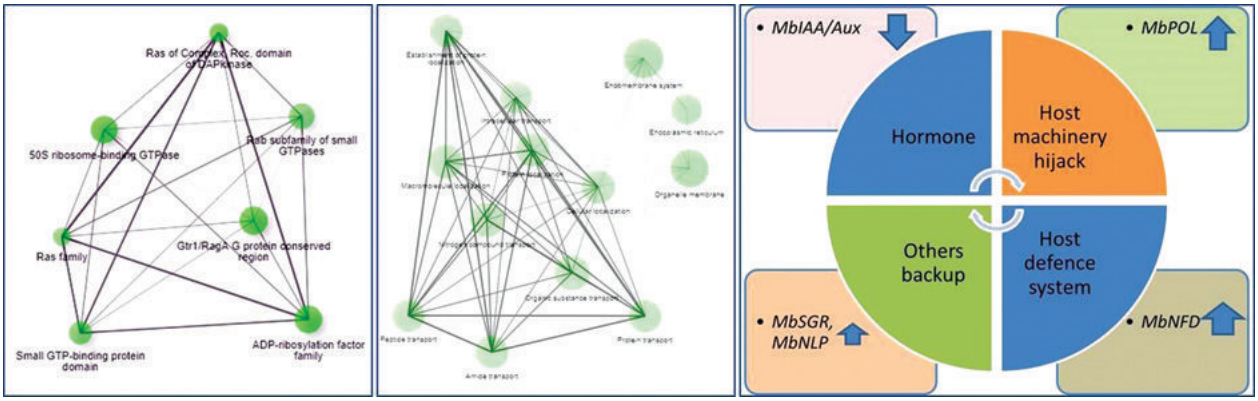
Organization and management: Various useful programs for the farmers were organized by the institutes of the Council in Hindi and Regional Languages. All activities related to KVK's located in Hindi Speaking area and agriculture extension activities are also being performed in Hindi and Regional Languages. Various publications on various subjects like agriculture science, animal and fishery science and horticulture science are being brought out in Hindi and Regional Languages by the Council and its Institutes. In-house journal of ICAR Headquarters *Rajbhasha Aalok* is being published regularly. This magazine includes articles on scientific subjects and governments schemes in simple Hindi besides reports of various programmes being organized by the Council and its institutes from time to time.

Meetings of the ICAR Regional Committees No. VI, VII and VIII were held through Video Conferencing. The Regional Committee Meetings held once every two years, provide an ideal platform for reviewing the status of agricultural research, education and extension in the mandated states and union territories. The Indian Council of Agricultural Research has been recognizing and rewarding the institutions, scientists, teachers, farmers and agricultural journalists every year. To commemorate 93rd Foundation Day of ICAR, the Award ceremony was organized at Krishi Bhawan, New Delhi, through video conferencing on 16 July 2021. The awards were given in 17 different categories to 63 awardees; these comprised 39 scientists (including 08 women) and 9 farmers (including 2 women farmers). It is heartening to note that of the 39 scientists 8 are women.

Administration: During the year, the following posts were filled up under the promotion quota: fourteen Director/Joint Director cum Registrar, two Director (F)/Comptroller, five Deputy Director (F)/Chief Finance & Accounts Officer, eleven Deputy-Secretary & nine Chief Administrative Officer, twenty-one Senior Finance & Accounts Officer, twenty-one Under-Secretaries, thirty Senior Administrative Officer, twelve Principle Private Secretary, thirty-four Administrative Officer, twenty-four Finance & Accounts Officer, twenty-three Section Officers, twelve Private Secretary, two Assistant, and three LDC at ICAR Hqrs.

During the year, 61 eligible officers and staff of ICAR (Hqrs.) were granted the benefits of financial up-gradation under the Modified Assured Career Progression scheme in accordance with the Government of India (Department of Personnel and Trainings) instructions in this regard.

Finance: The Revised Estimates in respect of DARE/ICAR for 2020-21 was ₹ 7762.38 crore. An internal resources of ₹ 273.40 crore (including interest on Loans & Advances, income from Revolving Fund Schemes and interest on Short Term Deposits) was generated during the year 2020-21. The total allocation Budget Estimates for 2021-22 was ₹ 8513.62 crores.



Two significant hubs identified using network enrichment analysis and model of delayed BSMYV infection

Supporting basic and strategic research: The National Agricultural Science Fund supports basic and strategic research in agriculture aimed at fostering research and a research culture and science popularization. At present 78 projects are in operation and out of which 73 are multi institutional in nature. A total of 10 new projects approved, 55 research articles published in reputed journals; two patents granted and nine technologies were developed. Population diversity of banana streak viruses (BSV) and the mechanisms of resistance to BSV in diploid seedy banana of North-east India were deciphered. Whole genome sequencing of *Bacillus thuringiensis* isolate, Bt 62 genome, revealed the presence of *cry8Sal* and *cry8Ib* genes. Bt 62 isolate was found toxic to white grub (*Holotrichia serrata*). The bioassay results indicated that cry8Sal toxin exhibited higher insect mortality of up to 90% as compared to 60% mortality with cry8Ib toxin. Using potential microbial consortia 'Excel Decomposer' was developed for decomposition of different bio-waste. In addition, a drum type composting unit and shredder machine namely 'Excel Composter' and 'Excel Shredr' were also customized and fabricated for enhanced decomposition of organic residues. The 'Excel Decomposer' is also being used for *in-situ* decomposition of rice and wheat residue in farmers' field of Bhopal. Process for biodiesel production from microalgal slurry was standardized. Biodiesel up to 45% of dry weight was obtained from *Chlorella minutissima* biomass.

Ekcel decomposer

Training and capacity building: Council organized an online workshop on Training Management Information System (TMIS) to acquaint the participants about the proper functioning of TMIS and its implementation in the institutes/HQs, to submit online Annual Training Plans (ATPs), Training Applications, Training Feedback and Impact Assessment of the Training Programme attended. ICAR-Institutes organized Training Programmes for Finance staff dealing with Accrual Accounting, e-Office Implementation, PME Cell Incharges and Vigilance Officers. Fifteen ICAR-Institutes organized online Training Programme on "Effective Health Management for Enhancing Work Efficiency of ICAR Employees" covering physical, mental, spiritual health along with stress management and positive thinking in which about 1200 employees attended the programme. During the reporting period, 1519, 955, 615 and 678 scientists, technical, administrative including finance, and SSS were trained, respectively with overall, 3,767 employees were trained even during the Covid-19 Pandemic situation, mostly through virtual mode. Compared to 2013-14, there was considerable improvement in number of employees undergone trainings particularly in case of Scientists, Technical, Administrative and Skilled

Support Staff, where improvement was 9.0, 158.1, 1.5 and 1595.0%, respectively along with overall improvement of 56.4% in all the categories of employees during 2020-21. Compared to 2013-14, ICAR-Institutes/HQs organized 13.4 and 1140.0% more training programmes for technical and skilled support staff, respectively during 2020-21. Though there was decline in number of trainings due to Covid-19 pandemic but the participation per training increased considerably.

The ICAR and the SAUs system are making a concerted effort to better target research and to improve coordination of programmes across the various institutes. The concerted endeavours are also being made to foster partnership with the farmers and other stakeholders, so as to accelerate the transfer of technology. These achievements of the Council will help the policy planners, researchers and all stakeholders, in future research and innovations for the improvement of Indian agriculture.

03

DARE INTERNATIONAL COOPERATION ACTIVITIES

The Department of Agricultural Research and Education (DARE) was established under Ministry of Agriculture in December 1973. DARE is the nodal agency for International Cooperation in the areas of agricultural research and education in India. The Department liaises with foreign governments, UN, CGIAR and other multilateral agencies for cooperation in various areas of agricultural research and education.

As provided in the Government of India's Allocation of Business Rules, 1961, made under Article 77(3) of the Constitution of India, which inter-alia allocates the following to the Department of Agricultural Research and Education (DARE):

"International cooperation and assistance in the field of agricultural research and education including relations with the foreign and international agricultural research and education institutions and organisations".

International Cooperation in DARE has been operating through the Memorandum of Understanding (MoUs)/Work Plans signed with various Countries/International Organisations/ Foreign Universities and Institutes with DARE as the nodal Department.

The areas of cooperation as agreed in the MoU are implemented through development of Work Plans which describe specifically the activities to be carried out under this Cooperative Programme and which set forth the intended contributions of each party. These Work Plans shall originate from either party but will require the full approval of both the Parties for implementation.

Many activities are carried out under the approved Work Plans which also include exchange of Scientists/Experts of each country for study tour/ training programme on mutual consent.

CG Section

Consultative Group on International Agricultural Research (CGIAR) is a global partnership that unites international organizations engaged in research for a food-secured future. CGIAR research is dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring sustainable management of natural resources. Out of the 15 Centres, ICAR/DARE has strong collaboration in the field of agricultural research, education and capacity building with IRRI, IFPRI, CIMMYT, ICARDA, ICRAF, IWMI, ILRI, ICRISAT, WFC, CIP, Bioversity International and CIAT alliance.

India is a donor member country to CGIAR from decades and also a voting member in CGIAR System Council, representing South Asia Constituency of the Council along with two alternate partner countries, viz. Bangladesh and Sri Lanka. India has assumed important role in CGIAR System as a permanent voting member.

Now, the CGIAR is going through a transition/ change process and research will now be grouped in different Initiatives under the One CGIAR (effective January 2022, after the termination of the CGIAR Research Programmes by 31 December 2021). The new Initiatives will work on identified areas, bringing together relevant CG Centers and the global demand, innovation and scaling partners.

CG Section processes all work relating to CG Centres including processing of MoU, Work Plan and foreign visits of scientists/officials of ICAR/ DARE, payment of annual contribution to CGIAR and collaborative projects between ICAR and CGIAR Centres.

Major activities undertaken

- Annual Review Meeting with the Consultative Group on International Agricultural Research Centers (CGIARs) held virtually on 3-4 February 2021 to discuss their ongoing activities with India focus as well as their future plans.
- Secretary, DARE and DG, ICAR chaired a virtual meeting on 12 March 2021 with representatives of IRRI, ICARDA, ICRISAT, CIP, ICRAF, CIMMYT and AVRDC to discuss on rice-fallow cropping system optimization, diversification and intensification in Chhattisgarh, Jharkhand and Odisha.
- Work Plan signed on 31 May 2021 for the period 2021-25 between Indian Council of Agricultural Research (ICAR) and World Agro-forestry (ICRAF), Kenya developed in accordance with the MoU signed between ICAR and ICRAF in 1985.
- A new project entitled Accelerating Genetic Gain in Rice (AGGRi) Alliance included in the existing ICAR-IRRI Work Plan.

Collaborative research projects

- Revalidated the project entitled Management and mitigation of the spread of Tropical Race 4 of *Fusarium* wilt on banana – Mapping of the TR 4 affected area of banana in India.

- Collaborative research project entitled Genetic Bio-fortification of Wheat for Grain Zinc approved in collaboration with IFPRI.
- Revalidation the project entitled Genetics of insecticide and Bt toxin resistance in *Helicoverpa armigera*.
- Collaborative research project entitled Sealing out Climate Smart Agriculture for Resilient Farming in India approved in collaboration with IWMI.
- Collaborative research project entitled Improvement of Banana for Small Holder Farmers in Great Salt Lake Region of Africa [Indian Component-Breeding for improved banana with Fusarium wilt (*Fusarium oxysorum* f. sp. *cubense*) resistance] - Phase-II approved in collaboration with Bioversity.
- Collaborative research project entitled Accelerating the Mainstreaming of Elevated Zinc in Global Wheat Breeding: A 'Fluoride in the Water' Approach to Nutrition (DFID DF) approved in collaboration with CIMMYT.
- Collaborative project proposal entitled Accelerating Genetic Gains in Maize and Wheat for Improved Livelihood (AGG) approved in collaboration with CIMMYT.

IC - I Section

Major activities undertaken

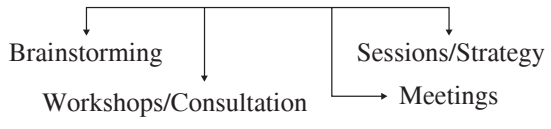
- A total of 04 cases of foreign deputation including short term and long term deputations were approved during 2020-2021.
- A total of 13 cases for grant of approval/ NOC to various organizations for organizing International Conferences/Workshops, etc. in India were approved during 2020-2021.
- Approval for 03 cases of international consultancy projects at various ICAR Institutes was granted during 2020-21.
- A number of cases related to grant of permission to foreign nationals for undergoing research work under various Post-doctoral and Doctoral Fellowships were processed and approved.
- Grant-in-Aid to the tune of ₹1.40 crore was released to National Academy of Agricultural Sciences, New Delhi for financial year 2020-21.
- Arrear of Grant-in-Aid to the tune of ₹20.00 lakh for financial year 2019-20 was released to Indian Agricultural Universities Association, New Delhi in financial year 2020-21.
- A total amount of ₹3,51,86,674 received from MEA was released to various SAUs/ICAR Institutes as fellowship under IAFS-III during 2020-21.
- A total amount of ₹6,28,44,900 received from MEA was released to various SAUs/ICAR Institutes as fellowship under India Afghanistan Fellowship Programme during 2020-21 including contingent expenditure.
- Applications of 05 Nepalese candidates have been received from MEA for admission under India-Nepal Fund Scheme and process for their admission in various SAUs is under progress through Agricultural Education Division, ICAR.

National Academy of Agricultural Sciences (NAAS)

The National Academy of Agricultural Sciences (NAAS), a national think-tank and platform for science-policy interface, leads in promoting excellence and convergence of agricultural research (science), education and extension for the growth of national economy with a vibrant farm sector. In pursuance of this mission, the Academy has been organizing congresses, conferences, brainstorming sessions, consultations, lectures and dialogues on important research, innovation, development and policy issues, and communicating their outcomes to the concerned stakeholders towards promoting ecologically sustainable, economically vibrant and socially equitable agriculture. The Academy has played a significant role in providing vital and timely inputs to many critical policy issues under active consideration of the Government.

During the period, the Academy held 14 Brainstormings, Strategy workshops, Experts' meet and Expert Consultations Meetings in virtual or hybrid mode, besides organising a number of lectures at national level on contemporary issues of Indian agriculture. Publications were brought out based on the recommendations from these events with action points for the Policy makers, Government, institutions of higher learning, farmers and other stakeholders.

In pursuance of its mandate, the NAAS carried out following activities during the period 2020-21:



Brainstorming sessions/strategy workshops/ consultation meetings

- Brainstorming on "Food, Agriculture and Income Policy for the Five Trillion Economy" (Convener: Dr Suresh Pal) on 14 October 2020 to discuss the potential of agriculture and the needed policy reforms to achieve the target by 2024-25.
- Brainstorming on "Transforming Higher Agricultural Education in India" (Convener: Prof. R B Singh) on 20 October 2020, highlighted the reforms needed to align agricultural education with the goals of NEP, 2020.
- Brainstorming on "Innovations in Potato Seed Production and Its Adoption" (Convener: Dr S K Chakrabarty) on 27 October 2020, highlighted the challenges associated with potato seed production, and called upon the stakeholders to build a technologically superior and cost-effective system.
- Brainstorming on "Wastewater Utilisation in Urban and Peri-Urban Agriculture" (Convener: Dr J C Dagar) on 17 November 2020 emphasized on resource management to meet the ever-increasing demand for water, food and other essential commodities, which may accentuate further in the wake of continued migration to urban areas for livelihood and better life expectations.
- Brainstorming on the "Need for Breeding Tomatoes Suitable for Processing in India" (Convener: Dr A T Sadashiva) on 24 November 2020 highlighted the need for crop improvement programme to address the market demand and called for public private partnership.
- Brainstorming on "Recent Agricultural Market Reforms" was organized jointly with ICAR-National Institute of Agricultural Economics and Policy Research on 18 December 2020, which highlighted the initiatives taken by the Government of India to boost agricultural sector in the post Covid-19 pandemic situation.
- Considering that the transboundary and emerging diseases are becoming the greatest economic threat to animals worldwide, Brainstorming on "Emergency Preparedness for Prevention of Transboundary Infectious Diseases in Indian Livestock and Poultry" (Convener: Dr Parimal Roy) was organized on 19 December 2020.
- The enactment of Farmers' Empowerment and Protection Agreement on Price Assurance and Farm Services Act, 2020, along with other two interrelated farm bills, is expected to accelerate adoption of contract farming. Against this backdrop, the Academy organized a one-day brainstorming session on "Contract Farming for Transforming Agriculture: Challenges and Way Forward" (Dr Anjani Kumar) on 10 March 2021. A number of strategies for increasing farmers' linkage with markets for better price realization and improvement in farmers' economic condition.
- A strategy workshop on the "Potential of Transgenic Poultry for Biopharming" (Convener: Dr Tarun Kumar Bhattacharya) was held on 15 March 2021. The main emphasis was on the need for collaboration among institutions to develop high-end biotech products, including transgenic animals for producing biopharmaceuticals.
- A Policy Dialogue on "Biofortification to Address Hidden Hunger and Nutritional Security: Present Status and Way Forward" (Convener: Dr U S Singh) was organized by the Academy on 26 March 2021, which deliberated on the present status of biofortified crops and the way forward. The crops covered were sweet potato, potato, rice, wheat, millets, pulses and quinoa. A special presentation was made on the scope of biofortification of animal products. It also discussed solving the hidden hunger problem and addressing the nutritional security in terms of strategies needed for out-scaling biofortified products and policies required for achieving these.
- A Brainstorming Session was organized on "Gender and Nutrition Based Extension in Agriculture" on 28 June 2021 under the Convenership of Dr Ashok K Singh, FNAAS to explore the prospects of integration of nutrition rich technological options with government schemes and gender-neutral extensions to improve nutritional security.
- A strategy workshop on "Drudgery Free Agriculture: Challenges and Way Forward" was organized on 15 September 2021 under the Convenership of Dr K P Singh, FNAAS. The emphasis was given to develop entrepreneurs for the establishment of farm machinery custom hiring centres for proper utilization of tractor power and agricultural machines in the country.

- A strategy workshop on "Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Diversification" under the Convenership of Dr V K Baranwal, FNAAS was organized on 20 September 2021. The workshop presented the national and international status of the programmes related to the certification of quality planting material. The need to establish a robust system for the certification of planting material of fruit crops in the country and development of a national database of the centres producing the planting material was emphasized during the Workshop.
- A Brainstorming Session on "Strategies and Approaches for Promotion of Sustainable Bivoltine Sericulture in India" under the Convenership of Dr Shailaja Hittalmani, FNAAS and Co-convenership of Dr S B Dandin, Former Director, Central Silk Board, Bengaluru and Dr Rajendra Prasad, VC, UAS, Bengaluru was organized by NAAS on 22 September 2021 to address the issues confronting the sericulture industry with special reference to production of quality bivoltine silk as a substitute imported silk especially from China.

Foundation day programme/Annual General Body meeting

On the occasion of its Foundation Day on 5 June 2021, the Academy organized a virtual Lecture delivered by Dr Shakuntala Haraksingh Thilsted, the 2021 World Food Laureate and Global Lead for Nutrition and Public Health at the WorldFish of the Consultative Group of International Agricultural Research. Dr Thilsted described that aquatic foods have huge potential to be processed as nutritious, safe and accessible food products. These can be a ready-to-use supplement (RUFS)/ ready-to-use therapeutic food (RUTF). The new products, which are developed by WorldFish and its partners in different parts of the world are accessible in smaller quantities, have a long shelf-life, are easy to transport, and their consumption is extended during lean production periods. For example, one tablespoon of fish chutney (60 g of raw fish) can effectively nourish pregnant and lactating mothers. Its composition includes dried small fish (37%), oil (15%), onion (37%), garlic (7%) and red chillies (4%). Similarly, fish powder as a superfood can complement family foods. She suggested that aquatic superfoods can be included in the food-based social safety net programmes and those programmes adhering to the 'right-to-food' to nourish the poor and vulnerable, especially mothers, children, and school feeding. There is a need for national, and state-level comprehensive policies and investments for aquatic foods to nourish India and incorporate diverse aquatic foods in national and state food-based dietary guidelines. Insufficient and unreliable data is constraining in formulating effective policies and institutions to promote the production and consumption of aquatic food.

AGB Meeting was held on 9 August 2021 in virtual mode. Besides usual AGB business session, following science-based activities were organized:

- Scientific presentations by newly elected Fellows.
- The Presidential Address was delivered on 'Startup Culture in Agriculture' by Dr T Mohapatra, President, NAAS in 28th AGM.

NAAS Regional Chapters' activities

Twelve Regional Chapters of the Academy are functioning at Barapani, Bengaluru, Bhopal, Coimbatore, Cuttack, Hyderabad, Karnal, Kolkata, Lucknow, Ludhiana, Pune and Varanasi.

The regional chapters of the Academy organized several events to highlight major trends, issues and challenges of the region and create awareness about various activities of the Academy. Translation of a number of Academy publications in regional languages was also taken up by these chapters.

Publications: The crystallized views of the scientists emerging from the interactive sessions organized by the Academy are published as Policy/ Status/Strategy Papers and Policy Briefs, which provide useful inputs to the policy makers, planners, educationists and decision-makers. Following policy documents were published for the period:

Policy/Status/Strategy papers

- Policy Paper 96: Livestock Improvement through Artificial Insemination
- Policy Paper 97: Potential of Non-bovine Milk
- Policy Paper 98: Agriculture and Food Policy for the Five Trillion Dollar Economy

Policy briefs

- Policy Brief 9: Direct Benefit Transfer of Fertilizer Subsidy: Policy Perspectives
- Policy Brief 10: Harmonization of Seed Regulations for Sustainable Food Security in India
- Policy Brief 11: Towards Revision of Biological Diversity Act 2002

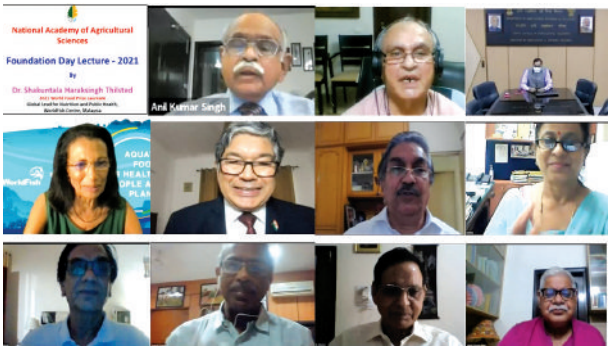
Periodicals and other publications

- NAAS News (quarterly), a document covering the events and happenings in the Academy, besides views of Fellows and articles on contemporary issues; Vol. 20, No. 4 and Vol. 21, No. 1 to 3.
- Abstracts of Presentation by Fellows elected (2021)
- NAAS Year Book and Year Planner 2021
- Agricultural Research, the official science journal of NAAS (published by Springer India Pvt Ltd), Vol 9, No. 2 to 4 and Vol 10, No. 1 (quarterly).

Recognizing and promoting excellence of individual scientists in the field of agriculture

Fellowship/Associateship: The Fellowship of the Academy embodies a wide spectrum of national and international scientists. Fellows including Pravasi and Foreign fellows are elected annually in recognition of their distinguished achievements in the field of agriculture and allied sciences. During the year, 33 fellows including 2 Pravasi fellows and 2 Foreign fellows were elected to Fellowship of the Academy. The Academy also has a scheme of NAAS Associates for encouraging promising young scientists below the age of 40 years, to be associated with the Academy activities. During this period, 11 young scientists were selected as Associates of the Academy based on their academic excellence and scientific contributions as reflected by publications, and products, processes and technologies developed, etc.

Release of NAAS Publications (1 Jan 2021).



Foundation Day Celebrations (5 June 2021).

NAAS Policy documents brought out during 2020-21.

Indian Agricultural Universities Association

Indian Agricultural Universities Association (IAUA) was established on 10 November 1967 (Registration no. 3498). There were only nine (9) founder member agricultural universities, PAU, Chandigarh (now Ludhiana); APAU (now ANGRAU), Guntur; JNKVV, Jabalpur; UPAU (now GBPUAT), Pantnagar; UAS, Bengaluru; KU, Kalyani (now BCKV, Mohanpur); OUAT, Bhubaneswar; UU (now MPUAT), Udaipur; and IARI, New Delhi. Presently, the IAUA has 70 member universities.

The main objective of the Association is to promote agricultural research, education and extension in the universities and the states, and thereby rural development in the country. It also acts as a bureau of information to facilitate communication, coordination and mutual consultation among agricultural universities. The Association also acts as a liaison between member universities and concerning government departments to facilitate communication and expedite the needed action in matters of importance.

A quarterly newsletter is being published by the Association since 2000, giving important news, events and achievements by member universities for the information of all the members and others interested stakeholders. An Annual report is also

published documenting all the activities of the year.

The information on events and proceedings are published through the host universities and the recommendations are also uploaded on IAUA website (www.iauaindia.org) and circulated to all the Vice Chancellors of member universities and other main stakeholders.

Other than grant from ICAR/DARE, the main source of revenue of the Association is the annual subscription from member universities.

Important events/activities organized at IAUA-member universities

University addressing Covid pandemic: Centre for Zoonoses with state-of-the-art facilities was established at Department of Veterinary Public Health and Epidemiology, Nagpur Veterinary College under Maharashtra Animal and Fishery Science University (MAFSU), Nagpur with the financial support from Indian Council of Agricultural Research (ICAR), New Delhi. The infrastructure/ facilities at the Centre along with the expertise has been dedicated for the real time diagnosis of COVID-19 infection since 8 April 2020 by initiating testing of human samples (oral and nasal swabs) after it received formal recognition from the ICMR, New Delhi. The team of academicians at every stage of its processing; work with precision for serving the society and the nation with social and moral responsibility. Working with full dedication the team of veterinarians had screened 24,072 human samples for COVID-19 till 15 January 2021. The Centre is truly contributing 'One Health' through its activities and stands as the first team of veterinarians in India addressing the COVID-19 pandemic.

Team of academicians working in COVID Lab.

International wildlife conference: In view of on-going COVID-19 pandemic, the International Conference WILDCON 2020 was organized through online mode from 18 to 20 December 2020 with the theme “Insights into wildlife conflicts, rescue and rehabilitation: Challenges and opportunities for conservation” by Maharashtra Animal and Fishery Sciences University (MAFSU), Nagpur .

Release of Compendium and Batch of WRTC by the dignitaries.

International webinar on dairy microbiology: Dairy Microbiology Department, SMC College of Dairy Science, Anand Agricultural University, Anand organized an International Webinar on ‘Functional Fermented Foods–Current Status and Future Prospects’ in association with its Alumni Association, Gujarat State Biotechnology Mission (GSBTM) and SASNET-Fermented Foods on 15 December 2020. The programme aimed at knowledge exchange and knowledge dissemination in the area of Functional Fermented Foods for the benefit of all stakeholders. Out of 680 delegates registered for the webinar 65% were students, 30% from academia, 3% from industry, and 2% consultants. Expert speakers in the webinar were Dr N P Shah, Professor of Food Science, University of Hong Kong; Dr Suja Senan, Associate Principal Scientist, Nutrition Division of Pepsico, Chicago; Dr Anand Bhadalkar, Joint Director, Business Development, Gujarat State Biotechnology Mission; and Mr Pravin Singh, Key Account Manager DSM, Food Specialties Ltd, New Delhi.

Participants attending the webinar.

UK-India Agri Innovation virtual tour: The UK-India Agri Innovation Virtual Tour was attended by policy makers in India and UK, Agricultural Production Commissioners of Tamil Nadu, Telangana and Maharashtra and Vice-Chancellors of TNAU, PJTSAU and SAUs from Maharashtra. Dr Renu Swarup, Secretary, Department of Biotechnology; Dr Robert Bradburne, Deputy Chief Scientific Advisor, UK Department of Environment, Food and Rural Affairs (DEFRA); and Dr Tom Child, Deputy Director, Global Research and Innovation, UK Department of Business, Energy and Industrial Strategy (BEIS) set the stage by providing snapshot of UK Innovation Landscape and Policy besides flagging of challenges and opportunities opened up for India-UK research and educational collaborations. The event was organized by Foreign, Commonwealth and Development Office and moderated by Ms Sara Fallon, Regional Director, Science and Innovation, British High Commission, New Delhi during 1-4 December 2020 on virtual mode. On the opening day, Shri Gagandeep Singh Bedi, IAS Agricultural Production Commissioner and Principal Agricultural Secretary to the Government of Tamil Nadu, highlighted the potentials and constraints in the State Agriculture. Dr N Kumar, Vice-Chancellor, TNAU elucidated facilities available in TNAU and flagged off some of the emerging areas of interest.

Participation of TNAU in the UK-India Agri Innovation Virtual Tour.

Visit of High Commissioner of Uganda: Ms Grace Akello, High Commissioner, Uganda along with Ms Sophie Birungi, First Secretary and Ms Jane Francisca Emiru, Administrative Attache (New Delhi Embassy) visited Anand Agricultural University (AAU) on 22 October 2020.

The delegation had an interactive meeting with the Vice-Chancellor Dr R V Vyas and Associate Director of Research, Dr M K Jhala. Dr Vyas highlighted the main activities of AAU in Agricultural Education, Research and Extension. Activities under Biofertilizer project, Pesticide residue laboratory, Plant tissue culture, Vidya dairy, Animal genetics and biotechnology were discussed in details. Ms Grace explained the scenario of Uganda in context of need for upgrading their local cattle breeds for more production, improvement in veterinary and dairy education, utilization of unused land for agricultural production, and especially showed interest in organic farming. Possible areas of future cooperation were also discussed.

Vice Chancellor with delegates.

MOUs signed by IAUA-Member universities

i. Chaudhary Sarwan Kumar H P Krishi Vishwavidyalaya, Palampur

- MoU signed with M/s R K Seeds Farm, Solan and M/s ACSEN Hy Veg Private Limited, Rajpura, Punjab in January 2021. Under CAAST project for students training
- MoU signed with M/s Nutranta Seeds Private Limited, Hyderabad in January 2021 for Seed production and marketing of garden pea variety Him Palam Matar 2.

- MoU signed with NBPGR, New Delhi in February 2021 for DUS Testing Centre (Buckwheat) at Sangla.
- MoU signed with Brooks Hospital, Delhi in March 2021 for Skill Upgradation of Veterinarians and Para professionals.

ii Dr Y S R Horticultural University, Tadepalligudem

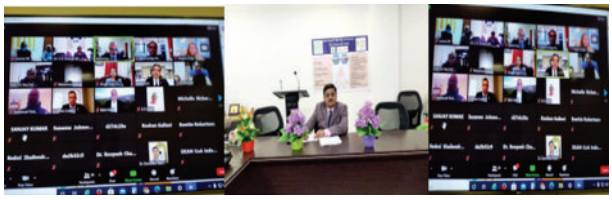
- Signed Memorandum of Understanding (MoU) with the ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI), Thiruvananthapuram, Kerala on 30.12.2020.
- Signed Memorandum of Understanding (MoU) with the ICAR-Central Plantation Crops Research Institute (ICAR-CPCRI), Kasaragod, Kerala through webinar on 05.01.2021.
- Signed Memorandum of Understanding (MoU) with the M/s Jain Irrigation Systems Limited (JISL), Jalgaon, Maharashtra on 06.01.2021.
- Signed Memorandum of Agreement (MoA) with Protection of Plant Varieties & Farmers' Rights Authority (PPV & FRA), Government of India, New Delhi for establishing of Second new DUS (Distinctness, Uniformity and Stability) Centre at HRS, Anantharajupeta on 02.02.2021.
- Signed Memorandum of Understanding (MoU) with Echocare Biosolutions Private Limited, Heber Road, Beema Nagar, Trichy, Tamil Nadu on Commercialization of technology of *Mallada* sp.= *Dichochrysa astur* nucleus culture on 05.03.2021.
- Signed Memorandum of Understanding (MoU) with ICAR-Central Soil Salinity Research Institute (ICAR-CSSRI), Karnal, Haryana on 08.03.2021.
- Signed Memorandum of Understanding (MoU) with ICAR-Central Research Institute for Dryland Agriculture (ICAR-CRIDA), Hyderabad on 12.03.2021.

iii GADVASU pacts with BCL industries for livestock feed

- GADVASU, Ludhiana and BCL Industries Limited, Bathinda, Punjab, signed a Memorandum of Understanding (MoU) to study the Utilisation of Dried Distillery Grains with Solubles (DDGS) as livestock feed.

iv Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

- Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior has signed MoU on 17 November 2020 with Dalhousie University, Canada for Dual Degree Programme and Faculty Development Programme (FDP) under NAHEP.



Online MoU signing ceremony between RVSKVV and Dalhousie University, Canada.

v Sher-e-Kashmir University of Agricultural and Sciences Technology, Jammu

- MoU signed with NABARD for acting as Cluster based Business Organization (CBBO) for formation and promotion of Farmer Producer Organization in Jammu region.
- MoU signed with National Cooperative Development Corporation (NCDC), New Delhi for acting as Cluster based Business Organization (CBBO) for formation and promotion of Farmer Producer organization in Jammu region.

vi Tamil Nadu Agricultural University, Coimbatore

- TNAU, Coimbatore signed an MoU with Vyazhan Technologies Pvt Ltd, Coimbatore on 06 November 2020 at TNAU. The development of Artificial Intelligence (AI) and deep learning based android mobile application to tackle the field level problems of farmers in Tamil Nadu.

MoU signed for development of AI based Mobile App.

- A MoA was signed on 23 November 2020 between TNAU, Coimbatore and M/s. Hi-Fi Biotech India Private Limited, Salem for large multiplication of banana varieties/hybrids scale.

MoA signed for mass multiplication of banana hybrids.

- TNAU and CSIR-National Botanical Research Institute, Lucknow signed an MoU on 11.01.2021 to establish research collaborations in the sphere of pest management in flower crops, crop improvement in cotton and multilocation trials in south India.

MOU with NBRI signed by TNAU.

- An MoU was signed on 26.01.2021 between TNAU, Coimbatore and International Institute of Tropical Agriculture (IITA), Ibadan, Nigeriaon virtual mode for collaborative research in banana and plantain specifically but without limitation to other crops. TNAU, Coimbatore is the pioneer institute in banana breeding in India and since its formation in 1971, is actively pursuing banana improvement programmes. The IITA is a non-profit institution that is working with various partners through the CGIAR research programs for ensuring food security in Africa.

MOU between TNAU and IITA being signed.

- Agricultural Engineering College and Research Institute, TNAU, Coimbatore signed Memorandum of Agreement with M/s. Envigreen Biotech India Private Limited, Bengaluru on 27.01.2021 for development of 100% biodegradable films. M/s. Envigreen Biotech India Private Limited produces biodegradable substitute to plastics which are made from natural starch, vegetable oil derivatives and vegetable waste. A pilot plant will be setup at TNAU, Coimbatore with the technical support of M/s Envigreen Biotech India Private Limited, Bengaluru to augment research.

TNAU and Envigreen Biotech signed MOU.

UAS, Dharwad enters into Memorandum of Agreements with agripreneurs of Krishik

University of Agricultural Sciences, Dharwad has signed Memorandum of Agreements (MOAs) with 15 Agri start-ups on 04.01.2021 who are being incubated at KRISHIK Agribusiness Incubator, UAS, Dharwad under the Innovation and Agri-

Entrepreneurship program of RKVY-RAFTAAR scheme, Department of Agriculture Co-operation & Farmers Welfare (DAC&FW), MoA, GoI. Under the scheme, ₹189.92 lakhs has been sanctioned as grant-in-aid to 15 agri start-ups, out of which 7 are seed stage startups with a funding of ₹150 lakhs and 8 are pre-seed stage start-ups with a funding of ₹39.92 lakhs. These start-ups are related to Information Technology, Internet of Thing and Artificial Intelligence in agriculture, farm mechanization, food processing and value-addition, organic farming, value chain, dairy and veterinary, agricultural extension, etc.

UAS, Dharwad enters into MOA (Memorandum of Agreements) with Agripreneurs of KRISHIK Agri startups.

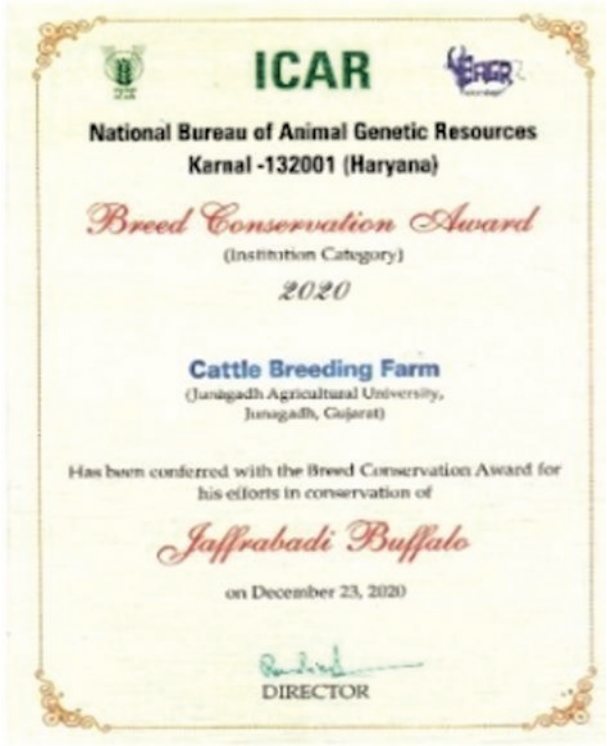
Patents

Patent for protein-based crop growth booster –TNAU, Coimbatore: Seed Centre, Tamil Nadu Agricultural University, Coimbatore conducted research to standardize the seed treatment and foliar spray with 'Protein Extract' to increase crop growth and productivity. The foliar spraying of Protein extract @ 1-1.5% during pre-flowering and flowering stages increased the crop yield by over 15%, across the crop spectrum. The products were launched as commercial natural growth boosters as 'NutriGold' and 'SeedAid'. Patent was granted for the "Technology for Protein Extraction for Seed Treatment and Foliar Spray Application".

US patent for reducing menopausal symptoms– UAS, Bengaluru: US Patent (US 9,855,308 B2) is granted for 'Composition for amelioration of peri- and post-menopausal symptoms and a US Patent for reducing Menopausal Symptoms process for producing the same' with Inventors, viz. Dr S Shamshad Begum, Assistant Professor, Department of Food Science and Nutrition; Dr K Geetha, Professor and Scheme Head, AICRP (F&N); Dr M Vasundhara, former Professor of Horticulture; and Dr S V Suresha, Coordinator, Bakery Training Unit and Comptroller from UAS, Bengaluru (along with the members of Akay Flavours and Aromatics and Jayadeva Institute of Cardiovascular Sciences and Research) under the project entitled 'Dietary intervention to manage menopausal symptoms - A nutritional and clinical study'. The project was sponsored by Akay Flavours and Aromatics, Kerala to UAS, Bengaluru.

Awards

Breed conservation award-2020 (ICAR)– JAU, Junagadh : ICAR-National Bureau of Animal Genetic Resources, Karnal, Haryana awarded the "Breed Conservation Award-2020" for Jaffrabadi breed of Buffalo in Institution Category to Cattle Breeding Farm of Junagadh Agricultural University through virtual ceremony on 23 December 2020.



ICAR

National Bureau of Animal Genetic Resources
Karnal -132001 (Haryana)

Breed Conservation Award

(Institution Category)

2020

Cattle Breeding Farm

(Junagadh Agricultural University, Junagadh, Gujarat)

Has been conferred with the Breed Conservation Award for his efforts in conservation of

Jaffrabadi Buffalo

on December 23, 2020

DIRECTOR

IC – II Section

Major activities

BRICS Summit

BRICS is to associate five major emerging economies: Brazil, Russia, India, China, and South Africa. The BRICS members are known for their significant influence on regional affairs. Since 2009, the governments of the BRICS states have met annually at formal summits. India hosted the most recent 13th BRICS summit on 9 September 2021 virtually. A virtual Meeting of BRICS-Agriculture Experts was held on 26-27 July 2021 in Sushma Swaraj Bhawan, New Delhi, India under the Chairmanship of Secretary, DARE and Director General, ICAR. BRICS Action Plan 2021-24 was formulated.

Foreign Deputation Cases

i. Processing of applications for various training programmes abroad under various foreign governments, announced by DBT/DST etc. GoI against open advertisements, UN/International organizations, International agencies in various fields of agricultural research and education.

ii. Processing of applications for various fellowships/scholarships announced by ICAR, HRD, foreign governments, etc for higher studies/research/Ph D/Post Doctoral Research abroad.

iii. Processing of applications of the Scientists for foreign assignments in foreign governments and International organizations.

iv. Circulation of vacancies notified by CGIAR organizations, other International organizations/agencies such as ADB, Work Bank, Commonwealth Secretariat, UN, etc.

v. Permission was granted by this department for various fellowships/training at foreign organizations/institutes to 15 scientists**.**

vi. Permission was granted to 2 scientists for extension of fellowship/ training in international organizations.

vii. NOC was granted to 2 ICAR scientists to apply in different training/fellowship in international organizations.

List of ICAR Scientists who were granted permission for Foreign visits/NOC for applying for fellowships/training in international organizations during 1 October 2020 to 31 September 2021

- Foreign visit of Mr Vikas Chandra Tyagi, Scientist, ICAR-Indian Grassland and Fodder Research Institute, Jhansi for Netaji Subhash ICAR International Fellowship 2019-20 at Texas A&M University College Station, TX 77843, USA from 5/1/2021 to 4/1/2024 (excluding journey time).
- Foreign visit of Mr Indore Navnath Sakharam, Scientist, ICAR-Central Institute on Post Harvest Engineering and Technology, Ludhiana for Netaji Subhash ICAR International Fellowship 2019-20 at University of Manitoba, Winnipeg, MB, Canada from 1/1/2021 to 31/12/2023 (excluding journey time).
- Foreign Visit of Bholuram Gurjar, Scientist, ICAR-Indian Grassland and Fodder Research Institute, Jhansi for Netaji Subhash ICAR International Fellowship (NS-ICAR-IF) 2019-20 Texas A&M University College Station, TX 77843, USA from 15/01/2021 to 14/01/2024.
- Foreign visit of Ms Veda Krishnan, Scientist, ICAR-Indian Agricultural Research Institute, New Delhi for attending Full bright Nehru Postdoctoral Fellowship at Whistler Centre for Carbohydrate Research, Department of Food Science, Purdue University, USA from 20/02/2021 to 19/2/2022.
- Foreign visit of Mr Dar Jaffar Yousuf, Scientist, ICAR-Central Soil Salinity Research Institute, Karnal for attending Netaji Subhash ICAR International Fellowship (NS-ICAR-IF) 2019-20 at Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Germany from 21/04/2021 to 20/04/2024.
- Foreign visit of Mr Satya Prakash, Scientist, ICAR-CIFE, Rohtak centre, Haryana for attending Netaji Subhash ICAR International Fellowship (NS-ICAR-IF) 2019-20 at Aquaculture and Fisheries Group, Wageningen University, AH, Wageningen, The Netherlands from 01/04/2021 to 31/03/2024.
- Foreign visit of Mr Natarajan M V, Scientist, ICAR-Directorate of Groundnut Research (DGR), Junagadh (Gujarat) for completion of his Ph D under Netaji Subhash ICAR International Fellowship from USA from 19/04/2021 to 18/10/2021.
- Foreign visit of Mr Shankar M, Scientist, ICAR-Central Marine Fisheries Research Institute, Cochin for attending Netaji Subhash ICAR International Fellowship (NS-ICAR-IF) 2019-20 at Institute of Marine Research (IMR),

University of Bergen (UIB), Nordnes, Bergen, Norway from 21/04/2021 to 20/03/2021.

- Foreign visit of Mr Anand Kumar Gupta, Scientist, ICAR-IISWC, Dehradun for attending Netaji Subhash ICAR International Fellowship (NS-ICAR-IF) 2019-20 at North Dakota State University, Fargo, USA from 30/06/2021 to 29/06/2022.
- Foreign visit of Ms Konsam Sarika, Scientist, ICAR-ICAR Research Complex for NEH Region, Umiam, Meghalaya for attending Full Bright Nehru Postdoctoral Fellowship at Prof. Luca Comai, Comai Lab, Department of Plant Biology and Genome centre, University of California, USA from 01/07/2021 to 30/06/2022.
- Foreign visit of Mr Subhash S P, Scientist, National Institute of Agricultural Economics and Policy Research (NCAE & PR), New Delhi for Pursuing Ph D at University of Goettingen, Germany from 28/06/2021 to 27/06/2024.
- Foreign visit of Dr R Asokan, Principal Scientist, ICAR-Indian Institute of Horticultural Research, Bengaluru for attending Full Bright Nehru Postdoctoral Fellowship at North Carolina State University, USA from 01/07/2021 to 31/10/2021.
- Foreign visit of Mr Aditya K S, Scientist, ICAR-Indian Agricultural Research Institute, New Delhi for attending Netaji Subhash ICAR International Fellowship (NS-ICAR-IF) 2019-20 at Humboldt Universität zu, Berlin, Germany from 15/09/2021 to 14/09/2022.
- Foreign visit of Mr Gaurav Kumar Deshwal, Scientist, ICAR-National Dairy Research Institute, Karnal for pursuing Ph D at Teagasc, Food Research Centre, Moorepark Ireland, Wageningen University from 02/08/2021 to 02/08/2023.
- Grant of NOC to Dr Dibakar Mahanta, Scientist, ICAR-Indian Agricultural Research Institute, New Delhi for applying for Full Bright Nehru Fellowship at CFAES Rattan Lal Carbon Management and Sequestration Centre, The Ohio State University, Columbus, USA from 01/08/2022 to 30/04/2023.
- Extension of Fellowship for a period of six months beyond 30/04/2021 to Dr Soumnendu Chakravarti, Scientist, ICAR-Indian Veterinary Research Institute, Izatnagar for ICAR International Fellowship at Pirbright Institute, United Kingdom and the Royal Veterinary College, United Kingdom.
- Grant of NOC to Dr N K Lenka, Principal Scientist, ICAR-Indian Institute of Soil Sciences for applying for Full Bright Nehru Fellowship at USA for the period 01/09/2021 to 31/01/2022.
- Extension of deputation to Shri Mukesh Kumar, Scientist, ICAR-IVRI, Izatnagar for completing formalities at University of Copenhagen, Denmark while pursuing Ph D under Netaji Subhash ICAR International Fellowship from 01/09/2021 to 15/09/2021.
- Rescheduling the foreign visit of Dr Konsam Sarika, Scientist, ICAR-Research Complex for NEH Region, Umiam, Meghalaya for attending Full Bright Nehru Postdoctoral Fellowship at Luca Comai Lab, Department of Plant Biology and Genome Centre, University of California, USA for the period 28/08/2021 to 27/08/2022.
- Foreign visit of M Senthil Kumar, Principal Scientist, ICAR-Indian Institute of Pulses Research, Kanpur for attending Full Bright Nehru Fellowship 21-22, University of California, United States from 01/09/2021 to 31/05/2022.

Germplasm Exchange

i. The cases of export of germplasm are processed in IC-Division as per the provisions/guidelines of the Biological Diversity Act, 2002 and the Biological Diversity Rules, 2004 also subject to guidelines/notifications issued by Ministry of Environment and Forests, from time to time.

   The six Bureaus/Institutes under ICAR system have been designated by Ministry of Environment and Forests to act as repositories under the BD Act, 2002 for different categories of biological resources:

   - NBPGR- for exchange of plant germplasm.
   - NBAGR- for exchange of animal germplasm.
   - NBFGR- for exchange of fish germplasm
   - NBAIR- for exchange of germplasm of agriculturally important insects
   - NBAIM- for exchange of germplasm of agriculturally important micro-organisms
   - IARI- for exchange of germplasm of algae and fungi.

ii. Cases of germplasm exchange are processed in DARE for approval of the competent authority

in consultation with the Bureaus/Institute/ Subject matter division.

iii. In the area of exchange of genetic resources, cases from concerned scientists of ICAR through authorized national bureaus on the basis of signed/agreed collaborative research projects involving ICAR, were processed in accordance with the provisions of Biodiversity Act and further guidelines notified in this regard.

iv. Approval of competent authority was conveyed to ICAR-NBPGR, New Delhi for supply of 700 samples of released varieties and advance lines of wheat, i.e. 350 (2 sets) through CIMMYT, India to Bangladesh and Bolivia for screening against wheat, blast in hot spot areas under ICAR-CIMMYT Collaborative Project No. 4 'wheat blast research and training'.

Annual Membership Contribution

i. Annual membership contribution to Centre for Sustainable Agricultural Mechanization, CSAM (Regional Institution of UN ESCAP) Beijing, China amounting to US $ 15,000 (₹1,109,905) was released for the year 2020-21 on 14 October 2020.

ii. Annual contribution to International Seed Testing Laboratory (ISTA), Switzerland on behalf of Seed Testing Laboratory, IARI, New Delhi amounting to 5214 CHF (Swiss Franc) ₹4,25,000 was released on 18 February 2021 for the year.

iii. Annual contribution to CABI, UK amounting to 56000 GBP (₹ 56,81,635) was released on 30 March 2021.

Memorandum of Understanding (MoU) between State Agricultural Universities and Foreign Institutes

Approval of this department was conveyed to 10 MoUs between State Agriculture Universities in India and Foreign Institutes as detailed below:

- MoU between TANUVAS, Chennai and Forestry University, AFU, Rampur, Chitwan, Nepal F.No 5-68 /2018 IC-III on 15 January 2021.
- MoU between TANUVAS, Chennai and Bangladesh Agricultural University, BAU Mymensingh, Bangladesh approved on 11 December 2020.
- MoU between CCS University, Hisar and College of Agricultural and Environmental Sciences, University of California, Davis, USA approved on 12 January 2021.
- MoU between ANGRAU, Guntur and Malaysian Kelantan (UMK), Malaysia on 14 December 2020.
- MoU between Tamil Nadu Agricultural University (TANU), Coimbatore and collaboration for Shitake Mushroom cultivation Yates, Japan through JICA on 01 April 2021.
- MoU between Chaudhary Charan Singh University, Haryana and The James Hutton Institute Dundee, Scotland, UK on 01 March 2021.
- MoU between Nanaji Deshmukh Veterinary Science University, Jabalpur and Cornell University,USA on 20 October 2020.
- MoU between PAU, Punjab and Agricultural Research Organization, Volcani center, Israel on 12 July 2021.
- MoU between ANGRAU, Guntur and Mississippi State University, Starkville, MS, USA for cooperation in Agricultural Research and Education on 12 July 2021.
- MoU between MPUAT, Udaipur and PNG University of Technology, Independent State of Papua New Guinea on 12 July 2021.

IC – III Section

i. Memorandum of Understandings (MoUs) signed by Department of Agricultural Research and Education (DARE) and Indian Council of Agricultural Research (ICAR) with foreign Governments, foreign Institutions and foreign Universities for collaboration in the field of Agricultural Research and Education through
   - Exchange of scientists and technologists;
   - Exchange of germplasm and breeding material;
   - Exchange of scientific literature, information and methodology;
   - Exchange of scientific equipment as available and required in programme of common interest as may be mutually agreed upon, etc.

ii. The MoUs are implemented through jointly developed Work Plans which describe specifically the activities to be carried out under the MoU.

iii. The following MoUs signed in the recent past with the foreign organizations/Universities for collaboration in Agricultural Research and Education are under process in consultation with ICAR for implementation:

- MoU between Indian Council of Agricultural Research, New Delhi and Hawassa University, Ethiopia
- MoU between Indian Council of Agricultural Research, New Delhi and Heinrich Heine University (HHU), Dusseldorf, Germany
- MoU between Indian Council of Agricultural Research, New Delhi and the Donald Danforth Plant Science Centre (DDPSC), Saint Louis, USA
- MoU between Indian Council of Agricultural Research, New Delhi and Asia Pacific Association of Agricultural Research Institutions (APAARI), Bangkok, Thailand
- MoU between Indian Council of Agricultural Research, New Delhi and the Faculty and Graduate School of Agriculture, Kyoto University, Kyoto, Japan

India Africa Forum Summit

Department of Agricultural Research and Education (DARE) has been designated as the Nodal Department for setting up of various projects under the India Africa Forum Summit. ICAR-Indian Institute of Soil Sciences (IISS), Bhopal is the nodal institute designated for setting up of a Soil, Water and Tissue Testing Laboratory (SWTTL) in Tunisia under the India Africa Forum Summit. The establishment of Soil Water Tissue Testing Laboratory under Indian expertise will facilitate the conservation of soil resources and ensure balanced fertilizer applications to crops grown in Tunisia. The proposal is being finalized in consultation with Ministry of External Affairs, Government of India.

India's Annual Contribution to APAARI and NACA

APAARI: Asia-Pacific Association of Agricultural Research Institutions (APAARI), Bangkok, Thailand is a Food and Agricultural Organization (FAO) led initiative and is an apolitical, neutral, non-profit forum of National Agricultural Research System (NARS) and Agricultural Research institutions in the Asia-Pacific Region, in the pursuit of common objectives. The mission of APAARI is to promote and develop National Agricultural Research Systems (NARS) in the Asia-Pacific Region through facilitation of intra-regional, inter-institutional and international cooperation/ partnership. The overall objective of the association is to foster agricultural research for development in the Asia-Pacific Region so as to help address the concerns of hunger, poverty, environmental degradation and sustainability of agricultural production.

Indian Council of Agricultural research (ICAR) is a founder member of APAARI since its establishment in 1990 at Bangkok, Thailand under the auspices of FAO. DARE/ICAR is being benefitted tremendously by joining APAARI as a regular member through increased participation in the workshops, conferences, expert consultations, policy dialogues and meetings organized by APAARI.

India's Annual Contribution of US $ 10,000 is being paid to Asia-Pacific Association of Agricultural Research Institutions (APAARI), Bangkok, Thailand.

NACA: The Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok, Thailand is an inter-governmental organisation formed in 1988, has been greatly involved in aquaculture development in the Asia-Pacific region. The current member governments of NACA are: Australia, Bangladesh, Cambodia, China, Hong Kong SAR (China), India, Indonesia, Iran, Korea (DPR), Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam.

The objectives of NACA are to promote development of aquaculture through increase in fish production as a food security, poverty alleviation by improving rural income, employment and socio-economic conditions of fish farmers, diversify farm production and the environment and resource management.

The core activities of NACA are: Capacity building through education and training, collaborative research and development through networking among centres; development of information and communication networks; policy guidelines and support to policies and institutional capacities; aquatic animal health and disease management and genetics and biodiversity.

NACA has been playing a leadership role in the overall aquaculture development in the region through the active participation of its member countries. The programmes operated by NACA

have been able to connect the countries, and the lessons learned by one country is easily transferred to others through the network. Besides, aquaculture development, its role in aquatic animal health and disease management, and genetics and biodiversity studies has been found substantial.

During the last several years, the support received by India, especially in developing programmes on fish disease surveillance, its execution through the expertise of NACA has been acclaimed and acknowledged.

NACA has been providing all possible support through the participation of its experts in different programmes organised in the country and the platform of NACA has been providing scope to highlight the intellectual capacity of India and work programmes of ICAR institutes, before the member countries, thereby building a huge image of DARE /ICAR and the country. Besides, the support received on the human resource development of our researchers from time to time in different subject areas is also quite substantial. The recognition of ICAR-CIFA as one of the four NACA lead centres and the scope of presenting the work of the institute before the Network members itself has also elevated the image of the country.

India's Annual Contribution of US $ 60,000 per annum is being paid to Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok, Thailand.

IC-IV Section

Major Virtual Seminars/Meetings during 2021-22

- The cases of virtual online seminars/ conferences of scientists of ICAR are processed in online Foreign Visit Management System (FVMS) of ICAR and a total number of 20 cases were processed by this Section during 1 October 2020 to 30 September 2021.

Indo-BIMSTEC Collaboration

- India hosted the 8th Meeting of Agriculture Experts of Bay of Bengal Initiative for Multi-sectoral Technical and Economic Cooperation (BIMSTEC) countries virtually. Dr Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education and Director General, ICAR chaired the daylong meeting, which was co-chaired by Dr Thanda Kyi, Deputy Director General, Department of Planning, Ministry of Agriculture, Livestock and Irrigation, Republic of the Union of Myanmar. Experts of Agricultural Ministries from Bangladesh, Bhutan, India, Nepal, Sri Lanka, Myanmar and Thailand participated in the meeting.
- The Chairman highlighted the UN Food System Summit 2021 and the transformations that are happening in the agriculture and food systems globally. He exhorted to enhance the engagement and deepen the cooperation in agriculture and allied sectors amongst the BIMSTEC Member States by encouraging the exchange of knowledge, germplasm, students and experts. He also emphasized addressing biosafety and biosecurity concerns and promoting digital agriculture along with the trade of technologies for developing resilient agriculture, food systems and value chains.
- The BIMSTEC Member States appreciated the greater engagement of India offering six slots of scholarships each for Master and Ph D programmes in agriculture and its other initiatives for capacity development and training including the development of seed sectors. The cooperation in the areas of high impact transboundary diseases of livestock and poultry; aquatic animal diseases and bio-security in aquaculture and digitalization to promote precision farming was also discussed in the meeting.
- The BIMSTEC provides a unique link between South and South-East Asia with 5 countries – Bangladesh, Bhutan, India, Nepal and Sri Lanka from South Asia and two countries – Myanmar and Thailand from South-East Asia coming together on one platform for cooperation in 14 key economic and social sectors of the economy.
- The Senior Officers of DARE and ICAR including the Additional Secretary, DARE and Director, DARE; Deputy Director Generals and Assistant Director Generals of ICAR, Director, IARI, and representatives of Ministry of External Affairs joined the above virtual meeting at Krishi Bhawan, New Delhi.

8th Meeting of Agriculture Experts of Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Countries

Indo-Afghanistan Research Collaboration

The ICAR-Indian Agricultural Research Institute (ICAR-IARI) and Indian Veterinary Research Institute (ICAR-IVRI) have continued to play an important role in developing trained human resource for agricultural research in Afghanistan through the establishment of Afghan National Agricultural Sciences and Technology University (ANASTU) at Kandahar in Afghanistan, with the support of the Ministry of External Affairs (MEA), Government of India under the bilateral cooperation programme between Afghanistan and India. The ICAR and ANASTU have also signed an MoU for long-term cooperation in agricultural research and teaching. ANASTU was formally inaugurated by the President Hamid Karzai on 15 February 2014 at Kandahar in the presence of Hon'ble Minister of External Affairs, Government of India and Professor M S Swaminathan. A long-term plan has been developed for ANASTU so that it becomes a self-sustaining First Agricultural University of Afghanistan by 2028.

Indo-SAARC Collaboration

India has been collaborating in promoting Agricultural Sectoral Research and Developmental activities in the SAARC region. The participation of DARE/ICAR was confirmed in various SAARC

programmes. A number of training proposals have been received from SAARC Secretariat/SAARC Agriculture Centre (SAC) and the same have been conducted successfully by obtaining necessary clearances and coordinating between SAARC Secretariat, ICAR Institutes and other organizations. Institutional Charges have been waived off for the SAARC Programmes held at ICAR Institutes.

Recently, Dr J P Mishra, ADG (IR) has been nominated as SAARC Governing Board Member for the SAARC Agriculture Centre (SAC) from India by this Department.

Advance Centre for Agricultural Research and Education (ACARE)

- A Memorandum of Agreement for setting up of an "Advanced Centre for Agricultural Research and Education" (ACARE) at Yezin, Myanmar to assist Government of Myanmar's efforts in capacity building of Myanmar's scientific and technical staff with support of equipment, training, research and participatory knowledge management, was signed between the Ministry of External Affairs (MEA), Government of India and Department of Agricultural Research and Education (DARE), Government of India on 21 September 2015.
- The total financial outlay of the project funded by the Ministry of External Affairs, Government of India is US $83,15,822, which was equivalent to ₹50,84,29,357 (calculated @ 1 US$ = 61.14 at the time of approval in the financial year 2014 - 2015).
- Extension of ACARE Project has been approved till 31 March 2022 without any additional financial grant.

International Collaborative Projects

During 1 October 2020 to 30 September 2021, following Seven International Collaborative projects have been sanctioned by this Department, which are being implemented in various ICAR Institutes in Collaboration with Foreign Partners:

- Collaborative Research Project entitled "Development of Antigen Detection Rapid Diagnostics for Equine Piroplasmosis".
- Collaborative Research Project entitled "Do Agricultural Micro Plastics Undermine Food Security and Sustainable Development in Less Economically Developed Countries".
- Collaborative Research Project entitled "Future Refrigeration India: INDEE+".
- Collaborative Research Project entitled "Augmentation of Plant Genetic Resources and Capacity Building of Researchers in India and Uzbekistan".
- Multinational Collaborative Research Project entitled "FMD Vaccine Quality Testing and Enhancing India's Animal Vaccine Testing Capabilities".
- Collaborative Research Project on "*In -Vitro* Differentiation and Characterization of Fish Muscle and Optimization on Plant-based Scaffolding Towards Whole Cut Seafood Production".
- Collaborative Research Project entitled "Impact of Fertilization on Grain Nutritional Quality for Human Health: Fertilizer Research and Responsible Implementation (FERARI)".

04

PROGRESSIVE USE OF HINDI

Progressive Use of Hindi

During financial year 2021-22 up to 30 September 2021, DARE has ensured compliance of the provisions of the Official Language Act, 1963, Official Language Rules, resolution, general orders, notification, administrative or other reports, or press communiques, issued or made by the Central Government or by a Ministry, Department or office thereof or company, company owned or controlled by the Central Government or by any office of such corporation and various orders/instructions issued by Department of Official Language from time to time on progressive use of Hindi for official purposes in the Department and autonomous bodies coming under its purview. Efforts are being made for progressive use of Hindi in DARE as well as its attached offices.

Targets and achievements, in brief, accomplished by Hindi Section of DARE with regard to progress of Official Language and implementation of Official Language Policy are detailed below:

Policy Implementation: The Official Language Division of the Department, manned by an officer of the level of Assistant Director (OL) and one supportive staff have made continuous efforts towards implementation of the instructions issued by the Department of Official Language in this Department and autonomous Bodies under its purview. In this regard, effective check points have been prepared for compliance of the implementation of the Official Language Policy and circulated to all officers to ensure more and more use of Hindi while disposing off their official work. Emphasis has also been given to achieve the targets of correspondence in Hindi with offices located in "A", B" and "C" Regions.

Notification of Institutions/Offices under Rule 10(4) of the Official Rules 1976: Institutes/Offices of ICAR where 80% of staff have acquired working knowledge/proficiency in Hindi are notified under Rule 10(4) of the Official Language Rules, 1976. Overall 144 offices and attached stations with regional offices of ICAR have been notified till date.

Meetings of OLIC: Quarterly meetings of joint Official Language Implementation Committee (OLIC) of DARE and ICAR have been conducted under the chairmanship of Additional Secretary (DARE) and Secretary, ICAR, who is the nodal officer for implementation of the Official Language Policy in DARE. Four meetings have been organized up to 30 September 2021 and follow up action has been taken in compliance with the decisions taken in these meetings.

Reports related to Official Language Policy: Annual Assessment Report and Quarterly Progress Reports regarding use of Rajbhasha in the Department have been sent to the Department of Official Language, MHA.

Inspections w.r.t. Official Language Policy: During the year, up to 30 September 2021, four sections of DARE and an Organisation namely Dr Rajendra Prasad Central Agricultural University, Samastipur (Bihar) have been inspected to review the progressive use of Hindi and suggestions have been given to solve practical problems being faced by the employees of these sections while working in Hindi.

Translation Work: Translation of documents falling under section 3(3) of Official Language Act, 1963 has been done by Official Language wing of this Department. Documents like Cabinet notes, Resolutions, Notifications, MoU/Agreements/ Work-Plans in the field of Agriculture with other Institutes have been translated in Hindi within the stipulated time-frame based on their priority.

Hindi Fortnight (Pakhwada): Hindi Pakhawada has been observed form 14 September 2021 to 29 September 2021 in the Department in association with ICAR. On the occasion of "Hindi Diwas", a message of Additional Secretary (DARE) and Secretary (ICAR) regarding progressive use of Hindi was circulated. In addition, various Hindi competitions were also organized during Hindi Fortnight.

Special Achievement: Department has the honour to receive the 2nd Rajbhasha Kirti Puraskaar for the year 2020-21 by Rajbhasha Vibhaag, Grih Mantralaya on the occasion of Hindi Diwas.

Promotion of Hindi (Rajbhasha) by ASRB

ASRB is committed to promote progressive use of Hindi in its office to fulfil targets fixed in the annual official language programme 2021-22 as per the official language policy of Department

of Official Language, Ministry of Home Affairs, Government of India. The Board fully ensures that bilingual requirement of the circulars, reports, question papers and other documents, as per the provisions of the Act and Rules, are meticulously complied with.

Quarterly meetings of Official Language Implementation: During the period, Board has organized four quarterly Official Language Implementation Committee meetings in, December, March, June and September 2021. Various issues pertaining to Official Language Implementation were discussed and decisions taken in this meeting.

Celebration of Hindi Pakhwada: During the year ASRB has organized "Rajbhasha-Hindi Pakhwada" from 10 September 2021 to 27 September 2021.

During the Hindi Pakhwada, five competitions were held on different aspects of use of Hindi, viz. Essay writing, Noting and Drafting, Poem recitation, Short story writing and Hindi typing in Unicode where in a total of 107 (Regular and Contractual) employees participated in the competition.

05

DEPARTMENTAL ACCOUNTING ORGANISATION

Accounting Organization of Department of Agricultural Research and Education

The Secretary as Chief Accounting Authority in the Department of Agricultural Research and Education discharges his functions with the assistance of Financial Adviser and Chief Controller of Accounts.

2. As per Rule 70 of GFR 2017, the Secretary of a Ministry/Department as Chief Accounting Authority of the Ministry/Department shall: -

i) Be responsible and accountable for financial management of his Ministry or Department;

ii) Ensure that the public funds appropriated to the Ministry or Department are used for the purpose for which they were meant;

iii) Be responsible for the effective, efficient, economical and transparent use of the resources of the Ministry or Department in achieving the stated project objectives of that Ministry or Department, whilst complying with performance standards;

iv) Appear before the Committee on Public Accounts and any other Parliamentary Committee for examination;

v) Review and monitor regularly the performance of the programmes and projects assigned to his Ministry to determine whether stated objectives are achieved;

vi) Be responsible for preparation of expenditure and other statements relating to his Ministry or Department as required by regulations, guidelines or directives issued by Ministry of Finance;

vii) Ensure that his Ministry or Department maintains full and proper records of financial transactions and adopts systems and procedures that shall at all time afford internal controls;

viii) Ensure that his Ministry or Department follows the Government procurement procedure for execution of works, as well as for procurement of services and supplies, and implements it in a fair, equitable, transparent, competitive and cost-effective manner;

ix) Take effective and appropriate steps to ensure his Ministry or Department:-

(a) Collects all moneys due to the Government and

(b) avoids unauthorized, irregular and wasteful expenditure.

3. As per Para 1.3 of Civil Accounts Manual, the Chief Controller of Accounts for and on behalf of the Chief Accounting Authority is responsible for :-

(a) Arranging all payments through the Pay and Accounts Offices/Principal Accounts Office except where the Drawing and Disbursing Officers are authorized to make certain types of payments.

(b) Compilation and consolidation of accounts of the Ministry/ Department and their submission in the form prescribed, to the Controller General of Accounts; preparation of Annual Appropriation Accounts for the Demands for Grants of his Ministry/ Department, getting them duly audited and submitting them to the CGA, duly signed by the Chief Accounting Authority.

(c) Arranging internal inspection of payment and accounts records maintained by the various subordinate formations and Pay and Accounts Offices of the Department and inspection of records pertaining to transaction of Government Ministries / Departments, maintained in Public Sector Banks.

4. The Chief Controller of Accounts, Ministry of Agriculture and Farmers Welfare performs his duties with the assistance of Controller/ Assistant Controller of Accounts, three Pr. Accounts Officers at HQ and 10 Pay and Accounts Offices. Four Pay and Accounts Offices are located in Delhi/NCR, two in Mumbai, One each in Chennai, Cochin, Kolkata and Nagpur. All payments pertaining to the Department / Ministry are made through PAOs/CDDOs attached with respective PAOs. DDOs present their claims /bills to the designated PAOs/ CDDOs, who issue cheques/releases e-payment after exercising the necessary scrutiny as per provisions contained in Civil Accounts Manual, Receipt and Payment Rules and other order issued by Government from time to time.

5. As per Para 1.2.3 of Civil Accounts Manual, Principal Accounts Office at HQ functions under a Principal Accounts Officer who is responsible for : -

a. Consolidation of the accounts of the Ministry/

Department in the manner prescribed by CGA;

b. Preparation of Annual Appropriation Accounts of the Demands for Grants controlled by Ministry/Department, submission of Statement of Central Transactions and material for the Finance Account of the Union Government(Civil) to the Controller General of Accounts;

c. Payment of loans and grants to State Government through Reserve Bank of India and wherever this office has a drawing account, payment therefrom to Union Territory Government/ Administrations;

d. Preparation of manuals keeping in view the objective of management accounting system if any, and for rendition of technical advice to Pay and Accounts Offices, maintaining necessary liaison with CGA's Office and to effect overall coordination and control in accounting matters;

e. Maintaining Appropriation Audit Registers for the Ministry/ Department as a whole to watch the progress of expenditure under the various Grants operated on by the Ministry/Department;

Principal Accounts Office/Officer also performs all administrative and coordinating function of the accounting organization and renders necessary financial, technical, accounting advice to department as well as to local Pay & Accounts offices and Out Station Pay & Accounts offices.

6. As per provisions contained in Civil Accounts Manual, Pay & Accounts offices make payments pertaining to respective Ministries/ Departments and in certain cases payments will be made by the departmental Drawing and Disbursing Officers (DDOs) authorized to draw funds, by means of cheques drawn on the offices/branches of accredited bank for handling the receipts and payments of the Ministry/ Department. These payments will be accounted for in separate scrolls to be rendered to the Pay and Accounts Offices of Ministry/Department concerned. Each Pay and Accounts Office or Drawing and Disbursing Officer authorized to make payments by cheques/e-payments, will draw only on the particular branch/branches of the accredited bank with which the Pay and Accounts Office or the Drawing and Disbursing Officer as the case may be, is placed in account. All receipts of the Ministry/Department are also be finally accounted for in the books of the Pay and Accounts Office. The Pay and Accounts office is the basic Unit of Departmentalized Accounting Organization. Its main function include:-

a. Pre-check and payment of all bills, including those of loans and grants-in-aid, submitted by Non-Cheque Drawing DDOs.

b. Accurate and timely payments in conformity with prescribed rules and regulations.

c. Timely realization of receipts.

d. Issue of quarterly letter of credit to Cheque Drawing DDOs and post check of their Vouchers/bills.

e. Compilation of monthly accounts of receipts and expenditures made by them incorporating there with the accounts of the cheque Drawing DDOs.

f. Maintenance of GPF accounts other than merged DDO and authorization of retirement benefits.

g. Maintenance of all DDR Heads.

h. Efficient service delivery to the Ministry/ Department through banking arrangement by way of e-payment.

i. Adherence to the prescribed Accounting Standards, rules and principles.

j. Timely, accurate, comprehensive, relevant and useful financial reporting.

7. The overall responsibilities of Departmental Accounting Organization in respect of Ministry of Agriculture and Farmers Welfare are:-

a. Consolidation of monthly accounts of Ministry and its submission to the CGA.

b. Annual Appropriation Accounts.

c. Statement of Central Transactions.

d. Preparation of "Accounts at a Glance".

e. Union Finance accounts which are submitted to the CGA, Ministry of Finance and Principal Director of Audit.

f. Payments of grants-in-aid to Grantee Institutions / Autonomous Bodies etc.

g. Rendering technical advice to all PAOs and Ministry; if necessary in consultation with other organizations like DoPT, Ministry of Finance and CGA etc.

h. Preparation of Receipt Budget.

i. Preparation of Pension Budget.

j. Procuring and supplying of cheque books for and on behalf of PAOs/Cheque Drawing DDOs.

k. To maintain necessary liaison with Controller

General of Accounts office and to effect overall co-ordination and control in accounting matters and accredited Bank.

l. To verify and reconcile all receipts and payments made on behalf of Ministry of Agriculture and Farmers Welfare through the accredited Bank i.e. State Bank of India.

m. To maintain accounts with Reserve Bank of India relating to Ministry of Agriculture and Farmers Welfare and to reconcile the cash balances.

n. To ensure prompt payments.

o. Speedy settlement of Pension/Provident fund and other retirement benefits.

p. Internal Audit of the Ministry, subordinate and attached offices under Ministry of Agriculture and Farmers Welfare and its Grantee institutions, Autonomous Bodies etc.

q. To make available accounting information to all concerned Authorities/Divisions.

r. Budget co-ordination works of Ministry of Agriculture and Farmers Welfare.

s. Monitoring of New Pension Scheme and revision of pension cases from time to time.

t. Computerization of Accounts and e-payment.

u. Administrative and co-ordination function of the accounting organization.

v. Roll out of PFMS under Central Sector Schemes in Grantee Institutions/Autonomous Bodies.

w. Non-Tax Receipt Portal (NTRP) in Ministry of Agriculture and Farmers Welfare.

8. Accounting information and data are also provided to the Financial Advisor and Chief Accounting Authority to facilitate effective budgetary and financial control. Monthly and progressive expenditure figures under various sub-heads/object-heads of the grant of the Ministry of Agriculture and Farmers Welfare are furnished to Budget Section of the Ministry including Senior officiers. Progress of expenditure against budget provisions are also submitted weekly to the Secretary and Addl. Secretary & Financial Adviser as well as Heads of Divisions of the Ministry, controlling the grant for purposes of better monitoring of expenditure in last quarter of the financial year.

9. The Accounting organization also maintains accounts of long-term advances such as House Building Advance, Motor Car Advance and GPF accounts of employees of the Ministry.

The verification and authorization of pensionary entitlement of officers and staff members is done by the Pay & Accounts Offices on the basis of service particulars and pension papers furnished by Heads of Offices. All retirement benefits and payments like gratuity, cash equivalent to leave salary as well as payments under Central Government Employees Group Insurance Scheme; General Provident Fund etc. are released by Pay & Accounts Offices on receipt of relevant information / bills from DDOs.

Internal Audit Wing

a) The Internal Audit Wing carries out audit of accounts of various offices of the Ministry to ensure that rules, regulations and procedures prescribed by the government are adhered to by these offices in their day to day functioning. Internal Auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It basically aims at helping the organization to accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes. It is also an effective tool for providing objective assurance and advice that adds values, influence change that enhances governance, assist risk management, control processes and improve accountability for results. It also provides valuable information to rectify the procedural mistakes/deficiencies and thus, acts as an aid to the management. The periodicity of audit of a unit is regulated by its nature, volume of work and quantum of funds.

b) The Internal Audit Wing working under the overall guidance of Chief Accounting Authority and Financial Advisor has focused on strengthening governance structures, capacity building and leveraging technology in appropriate manner to ensure an efficient and effective Internal Audit practice.

c) In pursuance of O/o Controller General of Accounts, Department of Expenditure, Ministry of Finance, OM no. G.25014/33/2015-16/ MF.CGA/IAD/306-53 dated 15.05.17 and as per provisions contained in Generic Internal Audit Manual (Version 1.0) issued by O/o CGA, Audit Committee has been constituted in this Ministry under the Chairmanship of AS & FA (Agriculture & Farmers Welfare)

with the approval of Secretary (Agriculture and Farmers Welfare) and terms of reference of Internal Audit Committee has been defined in O/o CCA OM No. Agri/IAW/Audit Committee(DAC)/2020-21/158-195 dated 08.09.2020.

d) During the financial year 2021-22, the focus of Audit was to detect errors in fixation of Pay paid in excess as well as in short.

Status of Outstanding Internal Audit paras in the Department of Agricultural Research and Education (DARE) as on 31.12.2021 are given below:-

Department	Outstanding Paras up to 31.03.2021	Paras Raised from 01.04.2021 to 30.06.2021	Paras Dropped from 01.04.2021 to 30.06.2021	Total Outstanding Paras as on 30.06.2021
DARE	12	NIL	NIL	12
TOTAL	12	NIL	NIL	12

Department	Outstanding Paras up to 30.06.2021	Paras Raised from 01.07.2021 to 30.09.2021	Paras Dropped from 01.07.2021 to 30.09.2021	Total Outstanding Paras as on 30.09.2021
DARE	12	NIL	NIL	12
TOTAL	12	NIL	NIL	12

Department	Outstanding Paras up to 30.09.2021	Paras Raised from 01.10.2021 to 31.12.2021	Paras Dropped from 01.10.2021 to 31.12.2021	Total Outstanding Paras as on 31.12.2021
DARE	12	NIL	12	NIL
TOTAL	12	NIL	12	NIL

Banking Arrangements

State Bank of India is the accredited bank for PAOs and its field offices in the Ministry of Agriculture & farmers Welfare. e-payments processed by the PAOs/CDDOs are settled through CMP, SBI, Hyderabad in favor of the bank account of vendors/beneficiaries. In some cases, Cheques issued by the PAOs/CDDOs are presented to the nominated branch of the accredited bank for payment. The receipts are also remitted to the accredited banks by the respective PAOs/CDDOs apart from Non-Tax-Receipt Portal (NTRP). Any change in accredited bank requires specific approval of Controller General of Accounts, Department of Expenditure, Ministry of Finance.

Principal Accounts Office has 10 (Ten) Pay & Accounts Offices. Four PAOs are located in Delhi/NCR, two in Mumbai, One each in Chennai, Cochin, Kolkata and Nagpur. All payments pertaining to the Department/Ministry are made through PAOs/CDDOs attached with respective PAOs. Drawing and Disbursing Officers present their claims/bills to the designated PAOs/CDDOs, who issue releases e-payment after exercising the necessary scrutiny as per provisions contained in Civil Accounts Manual, Receipt and Payment Rules and other orders issued by Govt. from time to time.

Initiatives on e-payment

The e-payment system in all Pay & Accounts Offices of Ministry of Agriculture & Farmers Welfare had been successfully implemented from 2011 onwards.

e- Payment System

Since, the IT Act, 2000 recognizes the digitally signed documents or electronic records digitally authenticated by means of an electronic method or procedure in accordance with the provisions of section 3 of the Act, the Controller General of Accounts had developed a facility in COMPACT for electronic payment (e-payment) through digitally signed electronic advices. This had replaced the existing system of payment through cheque while leveraging the COMPACT application running in all Pay & Accounts Offices in all Ministries/Departments of Central Government.

The e-payment system developed was a fully secured web based system of electronic payment services which introduces transparency in government payment system. Payment of dues from the government under this system were made by credit of money directly into the bank account of payee through a digitally signed e-advices generated from COMPACT through

the 'Government e-payment Gateway (GePG)' on a secured communication channel. Necessary functional and security certification were obtained from STQC Directorate for its roll out. The system was implemented in all Central Government Civil Ministries/ Departments in a phased manner.

GePG has further been upgraded to PFMS system, which is an integrated Financial Management System of Controller General of Accounts, for sanction preparation, bill processing, payment, receipt management, Direct Benefit Transfer, fund flow management and financial reporting

PUBLIC FINANCIAL MANAGEMENT SYSTEM (PFMS)

Public Financial Management System (PFMS) initially started as a Plan Scheme named CPSMS of the erstwhile Planning Commission in 2008-09 as a pilot in four states of Madhya Pradesh, Bihar, Punjab and Mizoram for four Flagship schemes e.g MGNREGS, NRHM, SSA and PMGSY. After the initials phase of establishing a network across Ministries / Departments, It has been decided to undertake National roll-out of CPSMS (PFMS) to link the financial networks of Central, State Governments and the agencies of State Governments. The scheme was included in 12th Plan initiatives of erstwhile Planning Commission and Ministry of Finance. Presently PFMS is the scheme of Department of Expenditure, Ministry of Finance and being implemented by O/o Controller General of Accounts across the country.

2. As per MoF, DoE, OM No.66 (29) PF-II/2016 dated 15/07/2016, Hon'ble Prime Minister has emphasized the need for improved financial management in implementation of Central Plan Schemes so as to facilitate Just-in-Time releases and monitor the usage of funds including information on its ultimate utilization. The Public Financial Management System (PFMS) is administered by the O/o controller General of Accounts in the Department of Expenditure which is an end-to-end solution for processing payments, tracking, monitoring, accounting, reconciliation and reporting. It provides the scheme managers a unified platform for tracking releases and monitoring their last mile utilization.
3. In order to abide by the directions to implement Just-in-time releases and monitor the end usage of funds, it has been decided by Ministry of Finance to universalise the use of PFMS to cover all transactions/payments under the Central Sector Schemes. The complete monitoring of these schemes require mandatory registration of all Implementing Agencies (IAs) on PFMS and mandatory use of Expenditure, Advances & Transfer (EAT) module of the PFMS by all IAs. The Implementation Plan covers the complete universe of Central Sector Schemes, which inter-alia requires the following steps to be taken by each Ministry/Department:-

(i) All central schemes have to be mapped / configured and brought on the PFMS platform.

(ii) All Implementing Agencies (IAs) receiving and utilizing funds needs to be mandatorily registered on PFMS.

(iii) Usage of PFMS modules has to be made mandatory for all registered agencies for making payments, advances and transfers.

(iv) All Departmental Agencies incurring expenditure in respect of Central Sector Schemes must register and compulsorily use the PFMS Modules.

(v) All Grantee Institutions have to adopt PFMS modules for making Payments/Transfers / Advance from Grants received from the Central Govt. This will enable generation of on-line Utilization Certificates for claiming funds from the Central Government.

(vi) Ministry has to take an action for integrating their respective systems/applications with the PFMS.

Modules to implement the Mandate

Modules developed/under developed by PFMS for stakeholders as per the Union Cabinet approval and mandate are as under:

I. Fund Flow Monitoring [EAT Modules]

a. Agency registration
b. Expenditure management and fund utilization through PFMS EAT module
c. Accounting Module for registered agencies
d. Treasury Interface
e. PFMS-PRI fund flow and utilization interface
f. Mechanism for State Governments towards fund tracking for State schemes
g. Monitoring of Externally Aided Projects (EAP)

II. Direct Benefit Transfer (DBT) modules

a. PAO to beneficiaries
b. Agency to beneficiaries
c. State treasuries to beneficiaries

III. Interfaces for Banking

a. CBS (Core Banking Solutions)
b. India Post
c. RBI (Reserve Bank of India)
d. NABARD & Cooperative Banks

Modules to Implement Enhanced mandate

1. PAO Computerization-Online payments, receipts and accounting of Govt. of India
   a. Programme Division module
   b. DDO module
   c. PAO module
   d. Pension module
   e. GPF & HR module
   f. Receipts including GSTN
   g. Annual Financial Statements
   h. Cash Flow Management
   i. Interface with non-civil ministries
2. Non-Tax Receipt Portal.

Other Departmental Initiatives

To leverage the capabilities of PFMS, several other departments have approached PFMS for developing utilities for their departmental need as follows:-

(i) CBDT PAN Validation
(ii) GSTN bank account validation

Implementation Strategy

An Action Plan has been prepared and approved by Ministry of Finance for phased implementation of Public Financial Management System (PFMS).

Improved Financial Management through:

- Just in Time(JIT) release of funds
- Monitoring of use of funds including ultimate utilization

Strategy

Universal roll-out of PFMS which inter alia includes

- Mandatory registration of all Implementing Agencies (IA) on PFMS and
- Mandatory use of Expenditure Advance & Transfer (EAT) Module of PFMS by all IAs

I. Implementation Strategy for Central Sector (CS) schemes/transaction

- Activities to be completed
- Mandatory registration and use of EAT module by IAs
- Mapping of all relevant information of Schemes
- Uploading of budget of each scheme on PFMS
- Identify implementation hierarchy of each scheme
- Integration of System Interface of specific schemes with PFMS e.g. NREGASoft, AwasSoft
- Deployment and training of trainers

II. Implementation Strategy for Centrally Sponsored Schemes

- Activities to be undertaken by states
- State Treasury Integration with PFMS
- Registration of all SIAs on PFMS (1st level and below)
- Mapping of state schemes with corresponding central schemes
  - Configuration of State schemes on PFMS
  - Configuring State Schemes components
- Identify and configure hierarchy of each state scheme
- Integration of PFMS with schemes specific software application
- Deployment and training of trainers
- Continuous support for implementation

At present, all ten (10) Pay & Accounts Offices of M/o Agriculture farmer welfare, four (4) PAOs are located in Delhi/NCR, Two in Mumbai, One each in Chennai, Cochin, Kolkata and Nagpur are functioning successfully on PFMS. All payments are routed through PFMS and e-payments being directly credited into the beneficiary's bank account.

I. Employees Information System (EIS) Module of PFMS: This Module has been implemented in all Drawing & Disbursing Offices of Ministry of Agriculture & Farmer welfare.

II. CDDO Module of PFMS: CDDO module of PFMS has been rolled out in all Cheque Drawing and Disbursing Offices of Ministry of Agriculture & Farmer welfare.

III. Online Portal (Bharatkosh) for collection of Non-Tax Revenue in the Ministry:

- The objective of Non-Tax Receipt Portal (NTRP) is to provide a one-stop window to Citizens/ Corporate /Other users for making online payment of Non-Tax Revenue payable to Government of India (GoI).
- Non-Tax Revenue of Government of India comprise of a large bouquet of receipts, collected by individual departments/ministries. Primarily these receipts come from Dividends, Interest receipts, Spectrum charges, RTI application fee, purchase of forms/magazines by students and many other such payments by citizens / corporate/other users.
- The online electronic payment in a completely secured IT environment, helps common users /citizen from the hassle of going to banks for making drafts and then to Government offices to deposit the instrument for availing the services. It also helps avoidable delays in the remittance of these instruments into Government account as well as eliminates undesirable practices in the delayed deposit of these instruments into bank accounts.
- NTRP facilitates instant payment in a transparent environment using online payment technologies such as Internet Banking, Credit/ Debit Cards.
- NTR Portal has been functional in new Ministry of Agriculture & Farmer welfare since inception in FY 2019-20.
- The collection of Non-Tax revenue of the Department of Agricultural Research and Education in the current Financial Year 2021-22 up to 31.12.2021 is Rs.11.00 Crores, and of it Rs.06.31 Crores have been collected through Bharat Kosh on NTR e- Portal.

IV. Expenditure, Advance and Transfer (EAT) Module of PFMS: All eight (08) Autonomous Bodies of Ministry of Agriculture & Farmer welfare have been on-boarded on Expenditure Advance Transfer (EAT) module of PFMS.

- **Treasury Single Account (TSA)**
- The Expenditure Management Commission (EMC) vide Para 125 of its September, 2015 report has recommended that in order to minimize the cost of Government borrowings and to enhance efficiency in fund flows to Autonomous Bodies, Government should gradually bring all Autonomous Bodies (ABs) under the Treasury Single Account (TSA) System.

  Under Department of Agricultural Research & Education, the TSA is implemented in the following:-

- Indian Council of Agricultural Research (ICAR)
- Central Agriculture University, Imphal

The details of the Budgetary Provision & Expenditure their against is reflected below:-

TSA Figures as on 31-12-2021

(Rs. In Crore)

Name of ABs	Budget Estimate	Releases	% of Releases
1	2	3	4
ICAR	8008.02	6006.02	75%
Central Agriculture University, Imphal	210	105	50%

New Developments in the Ministry

I. Enforcement of enhanced security layers in online payment process in Public Financial Management System (PFMS)

In order to ensure safety measures on PFMS platform, the following features are being enforced for treasury operations:

a. Verification of each payment request with physical bill without fail before putting the digital signature by Pay & Accounts Offices (PAOs).

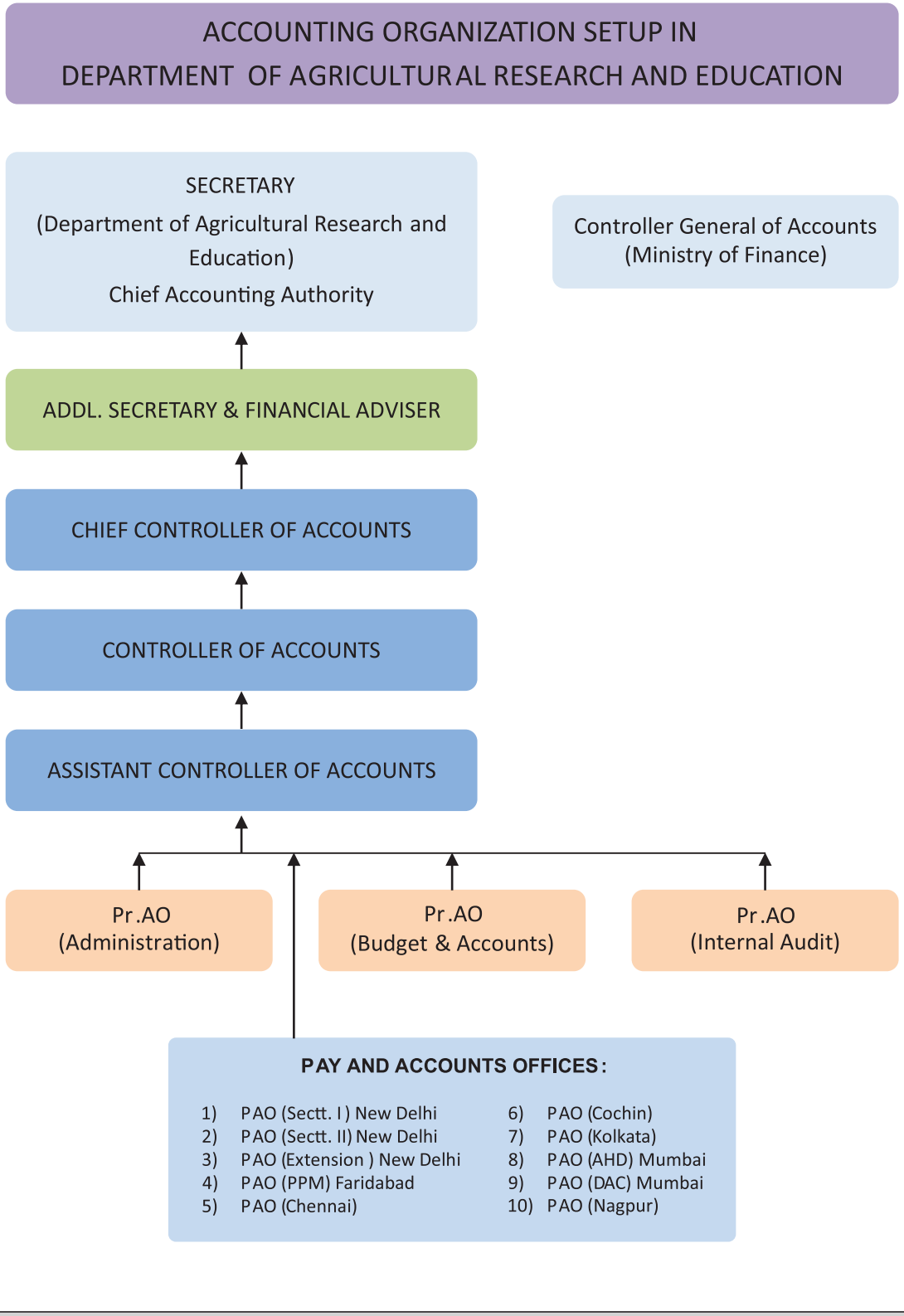
b. Use of NIC/GOV domain e-mail IDs for user registration by the officials dealing with PAO and DDO module of PFMS.

c. Immediate deactivation of user(s) found to be no longer active

d. Deactivation of user ID/Digital key of PAO/ AAO user type at the time permanent transfer/ superannuation).

e. Implementation of OTP based log in system on PFMS in phased manner.

ACCOUNTING ORGANISATION OF THE DEPARTMENT



APPENDICES

Appendix -I

Subjects allocated to DARE

Part-I

The following subjects which fall within List I of the Seventh Schedule to the Constitution of India:

1. International cooperation and assistance in the field of agricultural research and education including relations with foreign and international agricultural research and educational institutions and organizations.
2. Fundamental, applied and operational research and higher education including coordination of such research and higher education in agriculture, agro-forestry, animal husbandry, dairying, fisheries, agricultural engineering and horticulture including agricultural statistics, economics and marketing.
3. Coordination and determination of standards in institutions for higher education or research and scientific and technical institutions in so far as they related to food and agriculture including animal husbandry, dairying and fisheries, Development of Human Resources in Agricultural Research/Extensions and Education.
4. Cell for financing to the Indian Council of Agricultural Research and the Commodity Research Programmes other than those relating to tea, coffee and rubber.
5. Sugarcane research

Part-II

For Union Territories the subjects mentioned in Part I above, so far as they exist in regard to these Territories and in addition the following subject which falls within List II of the Seventh Schedule to the Constitution of India.

6. Agricultural Education and Research.

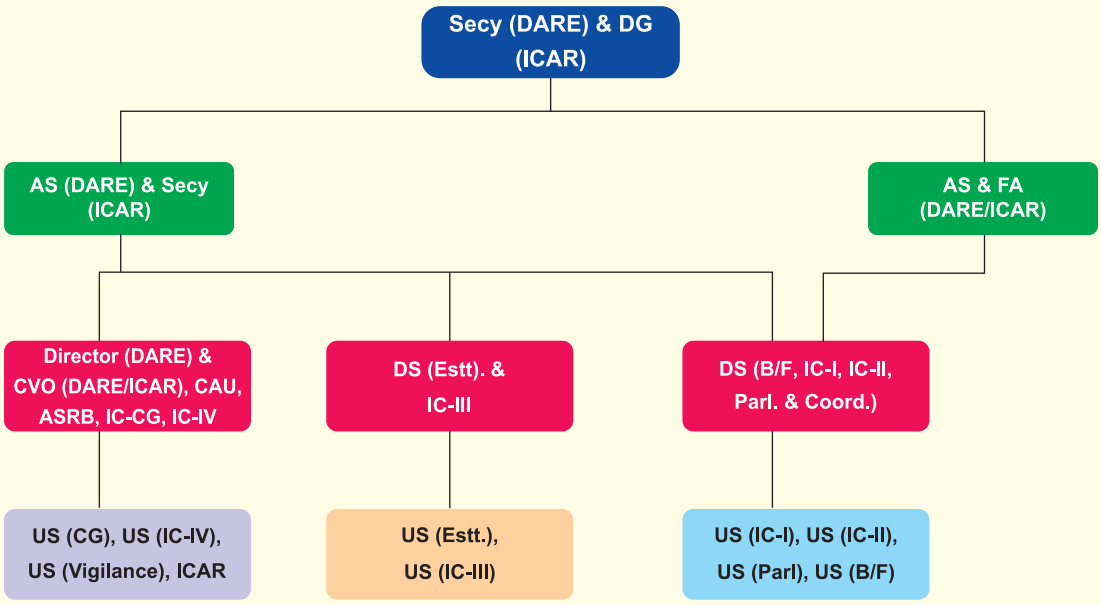
Part-III

General and Consequential:

7. Plant, animal and fish introduction and exploration.
8. All-India Soil and Land Use Survey relating to research training, correlation, classification, soil mapping and interpretation.
9. Financial assistance to State Governments and Agricultural Universities in respect of agricultural research and educational schemes and programmes.
10. National Demonstrations.
11. Indian Council of Agricultural Research and its constituent Institutes, National Research Centres, Project Directorates, Bureaux and All India Coordinated Research Projects.
12. Research and Development on production and improvement of bio-fuels plants.

Appendix -II

ORGANISATIONAL CHART
Department of Agricultural Research & Education



Appendix –III

SANCTIONED STRENGTH AND IN POSITION OF DARE (Proper) (as on 01.12.2021)

Group	Designation	Sanctioned strength	Filled up	Vacant
A	Secretary	1	1	0
A	Additional Secretary and Financial Advisor	1	1	0
A	Additional Secretary	1	1	0
A	Director	1	1	0
A	Deputy Secretary	2	2	0
A	Senior PPS/ Principal Staff Officer	1	1	0
A	Joint Director	1	0	1
A	Under Secretary	7	7	0
A	Principal Private Secretary	3	0	3
A	Assistant Director (Official Language)	1	1	0
B	Private Secretary	3	1	2
B	Section Officer	8	3	5
B	Assistant Section Officer	5	3	2
B	Personal Assistant	4	0	4
B	Senior Translation Officer	1	1	0
C	UDC-cum-Cashier	1	0	1
C	Senior Secretariat Assistant (UDC)	1	0	1
C	Stenographer Grade D	3	5	(-) 2
C	UDC-Hindi Typist	1	0	1
C	Staff Car Driver	1	0	1
C	Junior Secretariat Assistant (LDC)	1	0	1
C	Daftry	1	0	1
C	MTS	5	1	4
	Total	**54**	**29**	**25**

NAMES OF THE IMPORTANT FUNCTIONARIES (as on 01.12.2021)

S. No.	Name	Designation
1.	Dr Trilochan Mohapatra	Secretary (DARE) and DG (ICAR)
2.	Shri Sanjiv Kumar	Additional Secretary and Financial Advisor (DARE/ICAR)
3.	Shri Sanjay Garg	Additional Secretary (DARE) and Secretary (ICAR)
4.	Shri Shaleen Agrawal	Director
5.	Shri Mohinder Kumar	Principal Staff Officer
6.	Shri Uday Shanker Pandey	Deputy Secretary
7.	Shri P. Ramamoorthy	Deputy Secretary
8.	Shri Rajesh Kumar	Under Secretary
9.	Shri Jitendra Misra	Under Secretary
10.	Shri Prem Prakash Maurya	Under Secretary
11.	Shri A G Subramanian	Under Secretary
12.	Shri Balraj	Under Secretary
13.	Shri Shailendra Kumar Upadhyay	Under Secretary
14.	Shri Surajit Saha	Under Secretary

Appendix-IV

Budget Allocation: DARE/ICAR

(₹ in Crores)

Sr. No.	Name of the Scheme	Budget Estimate	Revised Estimate	Budget Estimate
		2020-21	2020-21	2021-22
1	Crop Science	715.50	612.25	708.00
2	Horticulture Science	194.00	181.72	212.00
3	ICAR Hqrs Admn including Intellectual Property Rights Management and DKMA	5137.75	4997.15	5322.02
4	Agricultural Extension	242.50	237.49	328.00
5	Agricultural Education	480.00	319.90	355.00
6	Economic Statistics and Management	30.00	30.00	33.00
7	Agricultural Engineering	70.00	58.55	65.00
8	National Fund for Basic, Strategic and Frontier Application Res in Agriculture	55.00	42.00	48.00
9	National Agriculture Higher Education Project	230.00	180.00	225.00
10	Natural Resource Management Institutes including Agro-Forestry Research	174.00	173.38	195.00
11	Climate Resilient Agriculture Initiative	52.00	49.83	55.00
12	Animal Husbandry	330.00	274.12	302.00
13	Fisheries	156.00	145.76	160.00
	Total ICAR-A	7866.75	7302.15	8008.02
14	International Cooperation-Other Programmes	6.30	6.71	6.73
15	Central Agricultural University, Imphal	203.90	190.00	210.00
17	CAU, Bundelkhand	110.00	102.84	110.95
18	Central Agricultural University, Bihar	145.90	135.68	150.00
19	National Academy of Agricultural Science and Indian Agricultural Universities Association	1.60	1.60	1.60
20	Agricultural Scientists Recruitment Board	20.58	17.00	19.00
21	Secretariat	7.55	6.40	7.32
	Total DARE-B	**495.83**	**460.23**	**505.60**
	Grand Total= A+B	**8362.58**	**7762.38**	**8513.62**

Budget Allocation of DARE (Proper)

(₹ in Lakhs)

Sl No.	Budget Head	Accounting Head	BE- 2020-21	RE- 2020-21	BE- 2021-22
I	DARE-Secretariat				
	Salaries	345100090090001	540.00	527.00	560.00
	OTA	345100090090003	0.00	1.00	0.00
	Medical Treatment	345100090090006	15.00	12.00	12.00
	DTE	345100090090011	60.00	10.00	30.00
	FTE	345100090090012	40.00	10.00	30.00
	Office Expenses	345100090090013	60.00	70.00	70.00
	OAE	345100090090020	40.00	10.00	30.00
		Total: Secretariat	**755.00**	**640.00**	**732.00**
II	Membership Contributions				
	CABI	241580798010032	25.35	60.00	60.00
	CCGIAR	241582798020032	545.00	549.75	550.00
	APAARI	241582798040032	9.00	9.00	10.00
	NACA	241580798050032	46.00	48.00	48.00
	ISTA	241580798070032	4.25	4.25	5.00
	ISHS	241580798080032	0.40	0.00	0.00
		Total: Contribution	**630.00**	**671.00**	**673.00**
III	Central Agricultural Universities				

00.259 General (Agricultural Research & Education Schemes) (Minor Head)			
01 GIA to Central Agricultural University, Imphal			
01.00.31 Grants-in-Aid General	2400	2400	2500
01.00.35 Grants for creation of Capital Assets	9000	5287	5500
01.00.36 Grants-in-Aid Salaries	8990	11313	13000
Total-GIA General to Central Agricultural University, Imphal	**20390**	**19000**	**21000**
2415-Agricultural Research & Education (Major Head)			
80.120 Assistance to other Institutions (Minor Head)			
02 GIA to RLB Central Agricultural University, Bundelkhand (Jhansi)			
02.00.31 Grants-in-Aid General	500	550	550
02.00.35 Grant for creation of Capital Assets	10000	8900	9695
02.00.36 Grant-in-Aid Salaries	500	834	850
Total-GIA to CAU, Bundelkhand, Jhansi	**11000**	**10284**	**11095**
03 GIA to RP Central Agricultural University, Pusa, Bihar			
03.00.31. Grants-in Aid General	1100	1100	1500
03.00.35 Grants for creation of Capital Assets	6000	3968	4500
03.00.36 Grant-in-Aid Salaries	7490	8500	9000

Total-GIA to Central Agricultural University, Bihar	**14590**	**13568**	**15000**
Total Budget : All three Central Agricultural Universities	**45980**	**42852**	**47095**
IV. NAAS and IAUA			
05.00.31 Grant-in-Aid general	160	160	160
Total-GIA to NAAS and IAUA	**160**	**160**	**160**
V. ASRB			
06.00.31 Grant-in-Aid general	900	900	900
06.00.35 Grant for creation of Capital Assets	500	200	350
06.00.36 Grants-in-Aid Salaries	658	600	650
Total: GIA to ASRB	**2058**	**1700**	**1900**

Summary

DARE (Proper)

(₹ in lakhs)

S. No.	Budget Head	BE (2020-21)	RE (2020-21)	BE (2021-22)
1	DARE Secretariat	755.00	640.00	732.00
2	Membership Contribution	630.00	671.00	673.00
3	CAUs	45980.00	42852.00	47095.00
4	NAAS & IAUA	160.00	160.00	160.00
5	ASRB	2058.00	1700.00	1900.00
	Total	49583.00	46023.00	50560.00

Department of Agricultural Research and Education
Ministry of Agriculture and Farmers Welfare
Government of India