

RAC 2018 Action Taken Report

S. No	RECOMMENDATION	ACTION TAKEN
<u>RESEARCH</u>		
School of Crop Improvement		
1	Programs aimed at meeting specific industrial quality requirements such as biscuit making properties in wheat should be undertaken in consultation/support of concerned Industries in order to develop a complete value chain.	Australian varieties such as Barham, Longreach Orion, Yenda, Yitpi and Qualbis, well known for soft textured products such as muffins, cookies/ biscuits and cakes have been studied along with indigenous lines to assess the quality parameters. Two genotypes with soft grain and weak and extensible gluten suitable for soft textured products have been developed. We have initiated linkage with Naga Mills, Tamil Nadu; Lotte India Corporation Ltd. Rohtak, Haryana & Calpro Specialities Pvt. Ltd., Naraina, Delhi for research on soft textured products for DBT-BIRAC funding.
2	Hectolitre Weight in wheat is now being used as a primary parameter at the market level by private bulk purchasers and should be ensured at high level of expression through breeding as well as crop management programs to safeguard the interest of farmers.	Hectolitre weight (HW) in wheat is an important trait and is highly influenced by environment especially the soil characteristics and atmospheric moisture during grain filling. Thousand grain weight, grain shape and diameter are important genetic traits that influence HW. A systematic screening of germplasm revealed wide range of HW (33-82 kg/100 litre), and identified several promising donors with HW of >75 kg/100 litre. Research programme on improving HW through crop management including early seeding, has also been initiated.
3	Heat tolerance during grain filling stage in wheat should be included for studies in the Phenotyping Facility by the School of Basic Sciences to enable identification of suitable markers for use in wheat improvement programs since this is one of the major constraints in achieving further yield gains.	A total of 24 QTLs for various component traits related to terminal heat stress tolerance explaining 7-23 % phenotypic variance have been identified from crosses HD 2733X WH 730, GW366X WH 730 and HI 1500 X DBW 43, validated and being used in breeding programme. In Phenomics facility under the School of Basic Science, identification of new potential donors and mapping of heat stress tolerance trait during grain filling stage will be undertaken using RIL population form cross Raj 3765 X HD 2329.
4	In rice, development of varieties with low glycaemic index should receive focus considering the ever increasing diabetes menace.	Twenty wild rice accessions from 18 different species have been analysed for amylose, amylopectin, total starch, Glycaemic index (GI), <i>in vitro</i> starch digestion kinetics and crude fibre content. The GI in the wild rice accessions ranged from 41.25 to 63.57. The accession from the species, <i>Oryza rhizomatis</i> (C genome) was found to have the lowest GI of 41.24 followed by 44.35 (<i>O. spontanea</i> – A genome) and 44.66 (<i>O. australiensis</i> – E genome). Evaluation of starch quality parameters

		and GI in an association panel of 192 accessions is under progress.
5	There is need to further strengthen MAS facilities for crops like wheat to enable rapid incorporation of additional specific genes for desirable/useful characters/feature into well established popularly grown varieties to increase their utility/lifespan.	Six MAS-derived lines in the genetic background of HD 2967, HD 2733 and HI 8498 carrying genes for leaf and yellow rust resistance and quality traits have been nominated to AICRIP trial for testing during 2019-20. Besides, MAS for abiotic stress tolerance (especially for heat and moisture stress tolerance) for improvement of popular varieties like GW322, HD2733 and HD3086 is under progress and materials are in advanced stage of testing. MAS for improving the industrial quality are also ongoing and 15 isogenic lines from cross DBW14*2//Barham/DBW14 in BC2F4 and 50 isogenic lines in BC3F3 (HI1563*3//Barham/HI1563) are in Station Trial during 2019-20

School of Horticultural Sciences

6	Efforts should be made to popularize/commercialize the vegetable varieties/hybrids to enhance IARI visibility in market.	The proposal of newly developed vegetable varieties and breeding lines were submitted to ZTMU for commercialization. The proceedings for the same were approved for further submission to Agri- Innovate.
7	In pre-breeding programme, emphasis should be given on development of genetic stocks through collection, evaluation and characterization of wild species to address the major problems of horticultural traits and biotic stress resistance. Attempts should be made to hybridise these with improved types and develop elite germplasm by transferring useful genes from wild types for use in development of improved cultivars.	A large number of genotypes of tomato, brinjal, chilli, cauliflowers, cucumber, bitter gourd, okra, melons were introduced from different location within and outside India through NBPGR. These genotypes were evaluated against important disease pests in the respective crops for their use in breeding programme. Besides, wild species of tomato, brinjal, chilli, cauliflowers, okra, cucumber, Luffa and melons were evaluated for important horticultural traits and biotic stress resistance. Inter specific hybridization was attempted in tomato, brinjal, chilli, cauliflower, cucumber, bitter gourd and okra through hand pollination. Later on, embryo rescue were attempted (whenever needed) for successful inter-specific hybridization in cauliflower, okra, chilli, brinjal, tomato, bitter gourd and melons for introgression of desirable traits from wild species into improved genotypes.
8	Feasibility of production technology of musk melon variety Pusa Sharda under protected cultivation should be standardized during winter season in North India.	Technology for production of specilaity melon (Pusa Sharda) in protected structures has been developed for off season production in north Indian plains. Transplanting during 3 rd week of August in net house and 2 nd week of September in poly house could produce higher yield and fruits from net house were available during November while it can be harvested up to December from Poly House and higher TSS were found in polyhouse than net house.
9	In crops where commodity based institutions are working, such as	The Division works on improvement and production technologies of subtropical grapes. Duplications have

	grapes, IARI research priority should be redefined avoiding duplications.	been avoided and will also be taken care while planning the experiments for 2020-2025.
10	The School may explore new areas such as industrial farming, vertical farming and organic production	We have already started trials on vertical gardening and organic farming. At this stage few high value exotic vegetables and flower crops were selected for this speciality type of farming. Vertical farming technology development includes design of structures, selection of soil less media, estimation of crop water demand, design of drip irrigation system and economic analysis. Four structures were designed, cost of making structure, growing material and nutrient solution were estimated as Rs. 28557.8, 55175.8, 4745.8 and 7956.80 for structures I, II and III and IV, respectively. Irrigation and fertigation system was developed. The yields of crops were observed as 140, 190, 120, 180, 150 and 200 gm per pot for knol khol, cilantro leaves, lettuce, spinach and amaranths, respectively. However, more extensive trials will be planned in the next in-house projects for the period 2020-25.
11	Use of digital farming tools such as sensors, drones, mobile platform etc. may be harnessed.	Research was initiated to develop low cost sensors operated wireless system. Soil moisture and temperature sensors based automatic irrigation system with GSM technology and controller was developed which can be operated through mobile after getting SMS alert in the form of text message for operating solenoid valve and for controlling the pump. Soil Moisture, Ec, pH and climatic sensors controlled fertigation scheduling and crop water productivity on Greenhouse Chrysanthemum was developed. Temperature and relative humidity sensors were used for mathematical modeling and operation of cooling system and selection of crop inside protected structures.
School of Natural Resource Management		
12	Considering metal pollution of food and drinking water, research on chemistry of metals especially arsenic and metalloids in soil, extent of contamination and their transfer to the edible plant parts need to be strengthened. The arsenic atlas needs to be prepared for the Indo-Gangetic Plain and other regions.	In-depth research on assessment, monitoring and remediation of metal and metalloid polluted soils has been carried out. Recently, delineation work on metal and metalloid status in soil, plant and water of basmati growing area has been initiated in a ICAR-sponsored project entitled "Risk assessment of metals and metalloids in water-soil-plant continuum under basmati growing areas of northern India" under Niche Area of Excellence. Besides, detailed work on chemistry and availability of metals and metalloid in arsenic affected area of West Bengal has been conducted. Seven Ph.D. and one M.Sc. students are working in the area of metal and metalloid pollution.
13	Emphasis should be laid on improving nutrient use efficiency	Efforts have been made to enhance the nutrient use efficiency through biological and chemical intervention

	<p>through different management options including development and validation of novel fertilizer products.</p>	<p>as well as adopting CA practices. Novel fertilizer products for major and micronutrients were synthesized and evaluated. In order to enhance the use efficiency of applied phosphorus (P), super absorbent P loaded nano-clay polymer composite (NCPC), nano-clay bio polymer composite and self-polymerizing natural oil coated DAP (OC-DAP) were prepared and evaluated. Nano clay polymer composite based Zn and B fertilizer products were developed and evaluated earlier extensively. Use efficiency of Zn and B applied through these novel products could be enhanced up to 5-6 times. Further, an attempt has been made to substitute the synthetic polymer with natural ones to reduce the cost of these products.</p> <p>Nutrient management protocols for N, P and K with enhanced nutrient use efficiency specific to CA have been developed.</p> <p>Agronomy Division of IARI is studying different aspects of improving nutrient use efficiency such as inclusion of legumes in cropping systems, leaf litter recycling of short duration pigeon pea. Scheduling of nitrogen using precision tools, like Green Seeker, SPAD meter, LCC and Nutrient Expert®, residue recycling and optimizing nutrient use under different crops/cropping systems.</p> <p>As for as validation of fertilizer products is concerned, currently division of Agronomy is involved in evaluation of different fertilizer products like, Poly-4 (Polyhalite), Urea-S (different customized product), calcium cyanamide and Zinc nano particle embedded NPK.</p>
14	<p>With regard to Pusa hydrogel, multi-location trials under different agro-ecological conditions and under different moisture regimes for different crops should be done particularly in arid zone/dry area under AICRP on dryland agriculture and AICRP on water management. Licensing of Hydrogel should be done with big firms rather than many smaller firms. Pusa Hydrogel use as a carrier for nutrient should be explored and also cost of hydrogel needs to be brought down.</p>	<p>Evaluation of Pusa hydrogel was carried out under variable moisture stress conditions in soybean wheat cropping system through 2107-19 in IARI and other vegetable crops. Various formulations of Pusa hydrogel were also evaluated (mungbean, mustard) at Regional Research Station, CCSHAU, Bawal (Haryana). Field evaluation (2017-18 and 2018-19) of hydrogels (SPG1118, SPG 1818, Pusa hydrogel) in rapeseed mustard at NRC, Mustard, Bharatpur was carried out. Multi-locational trials in barley crop under AICRIP wheat and Barley programme (Rabi 2018-19) at Hisar, Durgapura and Agra involved evaluation of Pusa gel and SPG 1118 at four moisture levels.</p> <p>Pusa Hydrogel and its improved version SPG1118 gel have been evaluated during 2017- contd., under limited</p>

		<p>and rain-fed conditions under semi-arid conditions at HAU RS Bawal, Haryana, NRC Rapeseed Mustard, Bharatpur, Multilocational trials under AICRP Pearl millet, field and vegetable crops under limited, irrigated and drip irrigated conditions in IARI.</p> <p>CRIDA has been requested through proper channel to conduct trials as recommended by RAC. Response is awaited.</p> <p>Bench scale knowhow of micronutrient, biocontrol agent, PGPRs and phosphatic fertilizer enriched hydrogel have been developed. Efforts are being made to transform these as pallet formulations.</p> <p>Commercialization efforts: Through Agriinnovate, ICAR: efforts on to license technology to ICL (P) Ltd, Israel UPL India (P) Ltd has expressed interest to take the technology. Besides, efforts on to propose a mechanism with NRDC.</p>
15	In waste water management project, for use of waste water in agriculture, crop wise waste water use guidelines should be prepared similar to FAO guidelines. In this regard, three R approach (Reduce, Reuse and Recycle), should be followed.	As evident from the program's objectives, during the ongoing plan period, the subject program is already based on the three R approach (i.e. Reduce, Reuse and Recycle), for which a number of field experiments comprising of a number of field/ vegetable and non-food crops under varying land-water management strategies were planned. The experiences/ findings from these field experiments shall now be extended and further validated through next level of focused field experiments, during next plan period, to develop robust crop - soil - water - weather condition specific wastewater use guidelines.
16	Efforts should be made for expansion of Integrated farming system models in wider domain. Studies on resource availability and biophysical situations should be done, where, when and how we can replicate FSR model. There is need to work out the cost of establishing the Integrated Farming System Model at IARI to enable its outscaling.	<p>Farming system models for small holders (1 ha) and marginal holders (0.4 ha) are being demonstrated among different stake holders such as farmers, policy makers, researchers, students etc., on regular basis.</p> <p>In order to assess the resource availabilities and available infrastructure with different household situations, a PDCO study was started during the current year. Using those information's in 'Farm Design Tool', different scenarios will be developed and optimized farming modules will be worked out.</p> <p>Cost of IFS model is being computed considering fixed assets cost and variable cost along with their interest rate for certain period.</p> <p>The final economics of IFS models, gross return and net</p>

		return is being worked out for each enterprise month wise in a given calendar year.
17	Evolve and suggest preparedness for target of reducing emissions of Green house gases by 33% and for probable changes in pests and pathogens due to 1.5°C elevated temperature.	<p>India is committed for reducing the GHG intensity. The emission of GHG is 73% from energy sector whereas Agriculture, Forestry and Other Land Use (AFOLU) sector contributes only 16.2% to the total GHG emission and about 12% of India's GHG emissions are offset by the Land Use Land Use Change and Forestry (LULUCF) sector.</p> <p>CESCRA has taken up field and modelling studies to develop adaptation strategies and their mitigation benefits.</p> <p>CESCRA is working on probable changes in pest and pathogens due to 1.5°C elevated temperature in collaboration with Division of Entomology and Plant Pathology through field experiments.</p>
18	The issue of burning of straw after harvest <i>in-situ</i> needs to be addressed more strongly. Paddy straw management is an important issue. Both <i>In-situ</i> and <i>ex-situ</i> management are relevant.	<p><i>In-situ</i> and <i>ex-situ</i> management strategies are being employed extensively through on farm demonstrations using well developed microbial consortia in capsule/liquid formulations and indigenous mechanization</p> <p>Niti Aayog has recently awarded funding to Division of Microbiology for bringing out viable solutions for paddy straw burning.</p>
19	Use of biofertilizers is effective for sustainable agriculture. Farmers readily accept IARI's cultures. Facility for mass production of these cultures should be looked into.	<p>IARI maintains the quality of the biofertilizers, hence these find acceptance by the farming community.</p> <p>We have commercialized and licensed the biofertilizer Production Technologies for it to be mass produced by various agencies to reach the farmers</p> <p>Also applied to RKVY funding...for improving the infrastructure to upscale the production</p>
20	Digital farming and big data – use for precision agriculture are to be focused.	Drone remote sensing was done using multispectral sensor for plant N mapping and crop condition monitoring in wheat experiment with differential treatment of N and water. Developed protocol and software for drone image analysis almost near real time monitoring of crop condition and growth.
21	The efforts on commercialization of excellent innovations in Agricultural Engineering and taking them to farmers' field should be further intensified. The constraints faced in carrying the machine to different places may be overcome by providing facilities like mobile	<p>Six technologies were proposed for patenting which were approved by ITMC.</p> <p>Divisional technologies for biomass management are being demonstrated in Ambala region with assistance of KVK Ambala under a CNHi funded project.</p> <p>Most of the developed technologies were evaluated at farmers' field in the areas near Hapur (UP) and Jhajjar</p>

	demonstration vehicle:	(Haryana). Mobile demonstration vehicle is very much required. Proposal and modalities are to be explored for the same.
22	In case of rain fed agriculture project, TNAU model should be tried. There is need for out of box thinking in this regard. In addition to studies on moisture deficit stress, studies on moisture excess/flood conditions should also be conducted.	Studies on rainwater harvesting and in situ moisture conservation are going at Water Technology Centre. These studies are in line with TNAU studies. Study on integrated farming system being conducted by the concerned Divisions under School of NRM.
School of Crop Protection		
23	In case of export-oriented commodities, sanitary and phyto-sanitary measures are of paramount importance. Use of bio-control agents will avoid build up of pesticide residues. Research efforts to develop greener plant protection arsenals such as EPN, <i>Trichoderma</i> , parasitoids and predators etc., should get due emphasis.	In the Division of Plant Pathology, <i>Trichoderma</i> based bioformulations have been commercialized and also being given to farmers. Collection and identification of natural enemies of various pests infesting rice is initiated to strengthen the ongoing work on natural enemies One project under Crop protection is only on EPNs addressing both basic and applied research needs. Nematology division also supplies EPN cultures and other rearing technology to industry
24	Population of natural enemies and pollinators in the IARI farm may be periodically monitored.	About 20 general of pollinators of 6 different families have been recorded
25	Instead of random synthesis and screening of new molecules, biorational approach may be deployed towards achieving effective new bio-pesticide. A recent knowledge paper by Federation of Indian Chambers of Commerce and Industry (FICCI) has short listed pesticides that will become off patent. Such molecules may be chosen as prototypes for newer versions.	1. The new project being formulated for 2021-2025, in consultation with industry, only those off patent molecules having commercial value that are registered in country will be identified and pursued. 2. Rationale of work on new molecules. will also be based on computational molecular docking
26	In case of NPC and ITCC, opportunities and avenues in discovering races and species becoming relevant in changing climate conditions may be studied in collaboration with other relevant institutions. Information on Brown Plant Hopper (BPH) should also be digitized. Pathogen	Under ITCC, efforts have been initiated to identify and characterize cryptic species. Pathogen genomics of nationally important plant pathogens such as <i>Tilletia indica</i> , <i>Magnaporthe oryzae</i> , <i>M. grisea</i> , <i>Fusarium fujikuroi</i> <i>Ralstonia solanacearum</i> , <i>B. sorokiniana</i> initiated to utilize the genomics data for disease management. An illustrated diagnostic key is prepared for different BPH in rice ecosystem

	genomics to be strengthened on emerging nationally important fungal and bacterial pathogens.	
27	The neem coated urea pioneered by the institute has received wide recognition in the last five years. Currently, 100 % of urea produced in the country is neem coated. The DAC committee under the chairmanship of Dr. C Devakumar has recommended the Division of Agricultural Chemicals to be recognized as an advanced centre for research in this area. Therefore, further work on this product should be continued.	Under ICAR's Niche area of excellence scheme in Agricultural Chemicals Division and in its next in house program (2020-25), research on improved knowhow for neem oil formulations, method of coating and standardization will be pursued.
28	Division of Agricultural Chemicals should be supported to keep Instruments in working condition.	Presently equipment in different divisions is maintained using funds from both in house and externally funded projects. Additional fund requirement will be projected during the next EFC for 2020-2025.

School of Basic Sciences

29	Research on heat tolerance in rice and wheat need to be intensified in collaboration with Genetics & NRM disciplines.	<p>In the ongoing in-house projects, Scientists from Division of genetics are associated with heat tolerance in rice and wheat.</p> <p>A multi Institutional (IARI, UDSC, IGKV) research project on "<i>Identification of superior donors and alleles for spikelet fertility and low chalkiness under thermal stress in rice</i>" was initiated under NASF in 2018.</p> <p>Under NICRA project, research work on QTL mapping heat tolerance in rice is in progress in collaboration with Division of Genetics.</p> <p>CSIR funded project on "Functional validation of polyamine biosynthesis genes for reproductive heat stress tolerance in rice" was initiated in 2018</p> <p>A research work on characterizing the heat-linked QTLs and Enzymes associated with starch biosynthesis pathway in wheat is in progress in close collaboration with Division of Genetics (also through under EMR project of ICAR).</p> <p>A work on whole transcriptome sequencing of wheat for the identification of stress-associated and grain quality related genes is going on with CESCRA under NICRA project.</p> <p>Characterization of wheat mutant population developed</p>
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		<p>by BARC, Mumbai for heat tolerance and quality is going on under BRNS project.</p> <p>In the new project 2020-2025, research on heat tolerance in rice and wheat will be further intensified in collaboration with Genetics & NRM disciplines.</p>
30	The presentation of work must reflect very unambiguously the interdisciplinary nature and also the larger goal in pursuing the smaller steps and protocols.	Presentation of work in the report is as per the suggestions given
School of Social Sciences		
31	Impact analysis of IARI Technologies (varieties / hybrids / products / processes) involving various stakeholders should be taken up on priority with proper documentation. Impact study methodologies used by IFPRI may be used.	<p>On farm trials of IARI technologies are being assessed in terms of yield and economic gain and diffusion in project and neighboring areas. Same are regularly shared at institute level meetings.</p> <p>ZTM & BPD unit is proposing to conduct impact analysis on Agri Tech startup and incubators established under different schemes like ABIC and RAFAAR and developing the proposal for the same to take this study for next plan.</p> <p>Improvement of income of farmers through adoption of IARI varieties mainly paddy and wheat in the Delhi state was assessed through linear programming approach. The optimal crop plan had the potential of increase in net income by more than 150, 80 and 50 percent among small, medium and large farmers respectively.</p> <p>The monetary gain for the consumption of ICAR biofortified varieties was estimated for various food commodities. The monetary gain due to consumption of zinc enhanced rice varieties was about Rs 7,700/- crores per annum, if 5 per cent of total consumption of rice is biofortified variety. Similarly, iron enriched ICAR pearl millet varieties monetary gain was estimated to be Rs 2839.48/- crores per annum. The disability adjusted life years (DALY) saved through Zinc biofortification was found to be Rs 45,400 crore.</p> <p>Most of the impact analysis methodologies used in divisional research are also adopted by IFPRI. Some of the studies are listed are as follows: <i>Impact of Agricultural Credit on Income of households:</i> The impact of credit on the income of the rural households is analyzed based on survey data of 2641 households of Eastern India under the IFPRI- ICAR</p>

		<p>collaborative project. The 'Endogeneity- Switching Regression model' was used to estimate the impact and the results indicated that the impact of credit on income is to the tune of Rs 35085 per household. Similarly, the impact of credit on farm income is to the tune of Rs 31234/- per household per annum. This calls for increasing the flow of credit to the agriculture sector and make it more inclusive.</p> <p><i>Impact of dibbling method of redgram cultivation:</i> Based on a primary survey of 220 redgram growing households in Kalaburgi district of Karnataka, the impact of the dibbling method of redgram cultivation is assessed using a two-stage endogeneity correction model suggested by Heckman and the Difference in Difference (DID) methods. DID estimates reveal that the yield advantage of technology is to the tune of 2.33 quintals per acre. Using these parameters in the partial budgeting analysis, the monetary gain of new technology was estimated at approximately 9600 Rs per acre.</p> <p><i>Willingness to pay for crop insurance:</i> Willingness to Pay (WTP) for crop insurance was estimated from a survey of 620 wheat farmers in Punjab using double-bound contingency valuation. The study indicated that WTP for crop insurance is around Rs 297 / acre, which is less than the existing rate of premium which is approximately Rs. 400 /acre (premium rate of 1.5%).</p>
32	Studies on successful farmer's led entrepreneurship development should be undertaken.	Cases of farmer led entrepreneurship development were undertaken as part of IARI in-house project Maximizing Farm Profitability through Entrepreneurship Development and Farmer Led Innovations to design a framework for developing agri-preneurship.
33	Studies on impact and opportunities under various flagship schemes of the Central Govt. may be undertaken.	<p>In this direction, CATAT is implementing a research project as NEP in collaboration with ICAR institutes/SAUs and Voluntary Organizations to assess IARI technologies in different parts of the country. Under this project, technologies related to improved crops, varieties, oilseeds, pulses, NRM including bio-fertilizers and bio-pesticides etc. have been assessed at different locations.</p> <p>Two seed hubs, one for Northern States and one for Eastern states have been developed to diffuse IARI technologies in different parts of the country.</p> <p>A case study of Cluster frontline demonstration (CFLD), one of the ICAR-flagship programs was conducted in the Junnar taluk of Pune, Maharashtra.</p>

		<p>The results indicated that 125 percent increase of chickpea yield of adopters as compared to non-adopters.</p> <p>Farmers Producer Organizations (FPO's) in Telangana had positive performance over non FPO's. The members of FPO realised 13.86 % higher returns over non-members. The members also obtained a B-C ratio of 2.69 from cultivation of organic chilli as compared to B. C Ratio 2.16 of non-members.</p> <p>Estimated the impact of RKVY scheme on farm investment, adoption of technology and productivity in Pune and Ahmednagar districts of Maharashtra. The study observed higher amount of farm investment by the beneficiary farmers compared to non-beneficiary farmers.</p> <p>The status of e-NAM in terms of percentage of farmers covered and extent of various stakeholders' participation such as traders and commission agents was studied. Out of 2456 regulated markets, 585 (24%) markets were covered under eNAM and only 286 eNAM markets were doing online trading. The overall farmer's coverage under eNAM was 13 percent of total cultivators in India. Although, highest number of farmers registered in UP and MP, the highest percentage coverage was in Haryana (94%), followed by Telangana (57.6%).</p> <p>Costs and returns of banana cultivation under drip and flood irrigation was studied in Maharashtra in 2017-18. The realization of yield was 17% more on drip adopted farms than flood irrigated farms. Net income was 31% more on drip adopted farms than flood irrigated farms. Due to drip irrigation, water saving is 31 to 26% in comparison to flood irrigation and electricity use efficiency (Kwh/yield) is almost double in banana cultivation.</p>
34	Disruptive innovations being made by grassroots innovators may be scientifically analyzed to understand their bases and opportunities of up-scaling.	Tool for delineating scalability of innovations was standardized and the successful farmer led innovations were tested on scalability criterion. Facilitative factors for scaling up as well as constraints were studied to devise and test the strategy in collaboration with respective ATARIs and other institutions where innovations took place and demonstrated by farmers.
35	Policy Advisories pertaining to different areas of agriculture need to be prepared.	Policy brief is being prepared on important issues.
36	Research on Big data in agriculture needs to be initiated.	A research project funded by NASF on 'Leveraging institutional innovation for inclusive and market led

	agricultural growth in eastern India' is going to be undertaken which involves Big data analysis.
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Post Graduate School

37	The status and grant for Institution of Excellence to IARI should be pursued with MHRD.	<p>IARI intends to be among the world class universities of Agriculture. IARI has applied for Institutions of Eminence (IoE) scheme of MHRD. On a call for applications of IoE, a total 113 eligible applications were received by MHRD. These Institutes, including IARI were called for the presentation & interaction with Expert Empowered Committee for Selection of IoE. From Agriculture, four Institutes/Universities were eligible and invited for presentation: Indian Agricultural Research Institute, Delhi; Anand Agricultural University, Gujarat; Punjab Agricultural University, Punjab; Tamil Nadu Agricultural University, Coimbatore.</p> <p>Sectoral and narrowly focused institutions eg. Management, agriculture, technology, medicine, etc. were not selected by EEC under as IoE category. However, EEC has recommended selected Institutions for "Special Institutions" category, and recommended to the Government to establish a special program to invest in them and allow them to excel on the world stage in their own chosen field. Under this Category ICAR-IARI & PAU have been selected (As mentioned in the Report of the Empowered Experts Committee of IoE). However, no official communication has been received, so far, in this respect from MHRD/UGC.</p>
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Administration/ Finance

38	IARI should facilitate hassle-free renewal of CGHS annual subscription of pensioners.	A consolidated cheque is being sent to CGHS regarding renewal of CGHS cards of pensioners so that it may be renewed automatically.
39	Filling of technical and supporting staff vacancies should be taken up on priority.	47 post of T-3 have been filled. Proposal for Revival of 39 posts of T-1 is pending with the Council. There is ban on recruitment of SSS posts at present.

General Recommendation

40	The institute being the only large institute encompassing various schools of agriculture, a brief annual review of agricultural research in India may be started in order to strengthen its mandate of "providing national leadership in agricultural research, education, extension and technology assessment and transfer"	The division of Agricultural Economics is taking up impact analysis of important technologies and policy briefs consultation with relevant school.
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