

**अनुसंधान सलाहकार समिति  
की  
कार्यवाही रिपोर्ट**

**PROCEEDINGS  
OF  
RESEARCH ADVISORY COMMITTEE  
MEETING**

**05-06 फरवरी /February, 2019**



**भाकृअनुप-केन्द्रीय कटाई-उपरान्त अभियांत्रिकी एवं प्रौद्योगिकी  
संस्थान, लुधियाना (पंजाब)  
ICAR-CENTRAL INSTITUTE OF POST- HARVEST  
ENGINEERING & TECHNOLOGY, LUDHIANA (PUNJAB)**

**Proceedings of Research Advisory Committee Meeting**  
*of*  
**ICAR- CIPHET Ludhiana**  
*held during*  
**05-06 February, 2019**  
*at*  
**Ludhiana, Punjab**

The second meeting of Research Advisory Committee (RAC) of ICAR-CIPHET (vide OO - F. No. A. Engg./4/2/2018-IA-II (AE) dtd. 7.2.2018) was held during 05-06 February, 2019 at ICAR-CIPHET, Ludhiana.

The Chairman & following members attended the meeting:

1. Prof. Anwar Alam     Chairman, RAC  
                              Former DDG (Engg.) ICAR and Former Vice Chancellor, SKUAST,  
                              Srinagar and Former Vice Chancellor, IGKV, Raipur
2. Dr. Nabarun           Member, RAC  
   Bhattacharya         Director, C-DAC, Kolkata
3. Dr. Vasudeva Singh   Member, RAC  
                              Former Chief Scientist, CSIR-CFTRI, Mysore
4. Dr. S. Ganapathy     Member, RAC; Professor & Head, Dept. of Food and Agricultural  
                              Process Engineering, CAE, TNAU, Coimbatore
5. Dr. S.K. Dash         Member, RAC; Dean, College of Agricultural Engg and Technology,  
                              Orissa University of Agriculture and Technology, Bhubaneswar
6. Dr. S. N. Jha         Ex-Officio Member, RAC ; ADG (PE), Division of Agricultural  
                              Engineering, ICAR, KAB II, New Delhi
7. Dr. R. K. Singh       Member, RAC  
                              Director, ICAR-CIPHET, Ludhiana
8. Dr. K. Narsaiah       Member Secretary, RAC; ICAR National Fellow and Pr. Scientist,  
                              AS&EC Division, ICAR-CIPHET, Ludhiana

Dr. S.D. Kulkarni, Member RAC and Former Project Director, SPU, ICAR-CIAE, Bhopal, sought the leave of absence due to personal reasons.

Dr. K. Narsaiah, PS & I/C Head, AS&EC Division; Dr. Mridula Devi, PS & I/C Head, FG&OP Division; Dr. Sandeep Mann, PS & I/C Head, TOT Division; Dr. Ramesh Kumar, PS & I/C Head, HCP Division and all the scientists of ICAR-CIPHET Ludhiana and Abohar also participated in the meeting.

## **Background**

**The ICAR-Central Institute of Post-Harvest Engineering and Technology (ICAR-CIPHET)** was established as a nodal institute to undertake lead researches, in the area of the post-harvest engineering and technology, which are appropriate at agricultural production catchments and agro-industries.

The second campus of the Institute was established on 19 March 1993 at Abohar, Punjab, India; which is primarily responsible for conducting research and development activities on fruits and vegetables, and commercial crops. CIPHET at Ludhiana is also a headquarter for two All India Coordinated Research Projects (AICRPs), namely All India Coordinated Research Project on Post-Harvest Engineering and Technology (AICRP on PHET) and All India Coordinated Research Project on Plastics Engineering and Technologies (AICRP on PET).

AICRP on PHET aims to develop location and commodity specific post-harvest technologies (tools, gadgets, and machinery, equipment, pilot plants and process protocols) for better utilization of agricultural produce and by-products and to minimize quantitative and qualitative post-harvest losses. The Project is currently operating through 31 centers (30 + 1 voluntary center) covering majority of States and the agro-climatic zones of India with Coordinating Cell at ICAR-CIPHET, Ludhiana.

AICRP on PET aims to undertake research and extension activity pertaining to water management, protected farming, post-harvest produce management etc. The Project is currently operating through 14 centers covering different agro-climatic zones of India with Coordinating Cell at ICAR-CIPHET, Ludhiana.

The second meeting of current RAC was convened to monitor progress made in implementation of approved program and to suggest research programs based on national and global context of research and development in the thrust areas and to review research achievements of the institute and to see that these are consistent with the mandate of the institute.

### **Inaugural session**

The program started with ICAR song and ceremonial lighting of lamp. Dr. K. Narsaiah, Member Secretary, RAC presented the schedule of the RAC meeting (Annexure-I) after a formal welcome of the RAC Chairman, Members and all the invitees. Dr. RK Singh, Director, ICAR-CIPHET sought guidance and invaluable help from RAC to steer the institute on research front in his welcome address. He observed that CIPHET scientists are putting in sincere efforts.

Dr. Vasudeva Singh (Member RAC), started his opening remarks with hope that earlier suggestions of RAC have been addressed appropriately. He said that there is no substitute for hard work and dedication. He delineated research on starch extraction from tapioca and maize, utilization of rice straw for silica and de-oiled hemp meal utilization. Although millets are nutritionally rich as compared to rice and wheat which are our staple food, millets take long time to digest. He exhorted scientist to work hard with dedication to face research challenges. He also mentioned that there are limitations in use of paddy straw due to presence of high proportion of silica (18%). Hemp seed (having 30% oil of medicinal value) and hemp seed meal (~ 30% protein, 5%-6% soluble fibers) are good candidates that need to be explored for putting them to good use. He informed that very good review papers and publications are there on honeys, which need to be consulted before starting work on honey.

Dr. Nabrun Bhattacharya, Member RAC, explained that selection of right problem is essential in current times of resource crunch. ICAR-CIPHET should explore partnerships with C-DAC and other technological institutes in the areas of artificial intelligence and advanced computing to solve problems of agricultural processing and utilization

Dr. S.N. Jha, ADG (PE) and Ex-Officio member, sought greater infusion of digital technologies in post-harvest sector. Indicators such as citations of research papers published or technologies developed in proportion to funds received may be developed to show the positive impact of the Institute. The research, in CIPHET, should focus on challenging problems with potential to yield high end technologies leading to substantial increase in revenue generation. Externally funded projects at ICAR-CIPHET should be encouraged to bring resources. Processable varieties of tomato, onion and potato may be documented. He advised to publish in high impact factor journals. DG ICAR also desires that scientists should strive for high citation, high impact factor publications. Dr Jha said that the next EFC exercises are going to start soon and scientists need to move proposals with strong justifications. He informed that scientific and technical manpower are likely to be strengthened and possibility of a new division at CIPHET is also there.

Dr. S.K. Dash, Member RAC, advised scientists to focus on demand driven research. All scientists should strive to distinguish themselves in their specified areas. He advised not to stop at functional design level, but take CIPHET designed machines to the manufacturing design and commercialization stage

Dr. S. Ganapathy, Member RAC, emphasized the importance of food processing as a sunrise industry and envisaged leadership role for ICAR-CIPHET with greater engineering inputs to realize the research potential in this sector and to solve the teething problems of budding entrepreneurs, becoming beacon in the area of PHET. CIPHET has good concentration of young post-harvest engineers. He observed that basic problems of drying and storage are not yet fully addressed. Packaging is equally important value-addition technology.

In his opening remarks, Prof. Anwar Alam, Chairman RAC, highlighted the role and importance of ICAR-CIPHET to solve problems of national dimension such as doubling the farmer's income by 2022 through PHET. Imaginative thinking is essential ingredient for achieving these goals. Scientists should strive hard to get international exposure to broaden their vision. Economic analysis should be integral part of research and technology development. Mechanisms at the institute should be strengthened to upgrade the developed technologies from lab to field adoption. The Chairman RAC summed up the opening remarks of members and urged that now is the right time to seize opportunities and create new ones in postharvest sector and take leadership position.

### **Action Taken Report (ATR) on the Recommendations of the earlier RAC**

The Action Taken Report (ATR) on the recommendations of the RAC held during 25-26 April 2018 was presented by the Member Secretary (Annexures-II, III, IV and V). Director, ICAR-CIPHET informed that almost all of the RAC recommendations have been adopted by the Institute and these are reflected in the ongoing research programs. The RAC was satisfied with action taken.

### **Presentation by the Director ICAR-CIPHET**

Dr. R. K. Singh, Director, ICAR-CIPHET presented the major achievements of the ICAR-CIPHET since last RAC meeting and also laid out future plans. The achievements include pilot plant for pectin from kinnow peel, kit for detection of adulteration in spices, refractive window drying, rice flaking machine, hermetically sealed storage structure for

pulses, quality sensing system for mushroom. Pending externally funded projects of FCI on storage losses and fumigation of grapes by SO<sub>2</sub> for insect-proofing of grape export consignments for APEDA are concluded and are in final phase of submission. A few processed products were industrially liaised namely spray dried groundnut milk, jaggery based snack, Haldi powder, processed honey etc. He also highlighted the publications by the institute and other activities.

He informed that scientists at Abohar ran KVK-Abohar without additional scientific manpower. Post-Harvest Machinery and Equipment Testing Center is doing good work. No processing equipment can be sold in the market without test report and certification by CIPHET for public sector schemes.

### **Lists of Publication of ICAR-CIPHET, Ludhiana after last RAC meeting**

<b>#</b>	<b>Publication</b>	<b>Numbers</b>
1	Research papers in peer-reviewed and referred journals	53 (Published and Accepted)
2	Books	01
3	Book chapters	11
4	Compendium/ Training manual	07
5	Technical bulletins	02 (Published and Accepted) 01 (submitted)
6	Technical/ popular Articles/compendium chapters/training chapters	109
7	E-publication	02
8	Conference abstracts	21
9	Newsletter edited	03
10	Book edited	01

### **Presentation of the Progress Report by different Divisions**

Divisional presentations for progress under R&D projects and other activities for the period (May, 2018 to Jan, 2019) started with Agricultural Structures and Environmental Control (AS&EC) Division followed by Food Grains and Oilseeds Processing (FG&OP), Horticultural Crop Processing (HCP) and Transfer of Technology (TOT) Divisions.

#### ***Agricultural Structures and Environmental Control Division***

Dr. K. Narsaiah, PS & I/C Head presented activities of the division. There are 10 scientists on the rolls of the division. There are 11 on-going IRC approved projects. The mandate of the Division is:

- Adoption, development and improvement of eco-friendly technologies for safe storage of food grains, seeds, oilseeds, horticultural, aquaculture and animal produce for human consumption and feed for livestock and aquaculture.
- Basic and applied research on cryogenic engineering, modified and controlled atmosphere packaging and enhanced shelf life, handling, transportation and quality evaluation of valuable agricultural produce.

- Environmental up-gradation of animal shelters, poultry houses, fisheries *etc.* for higher productivity and animal health.
- Improving work environment and pollution control in agro-processing industries.
- Utilization of agricultural wastes/residues for commercial application.
- Adopt, refine and develop covered crop cultivation technologies for ensuring suitable environment to enhance quality and shelf life of crop produce.

The progress of ongoing R&D projects and other activities was presented.

### ***Food Grains and Oilseeds Processing Division***

Dr. Mridula Devi, PS & I/C Head, presented activities of the division. There are 11 scientists and 2 technical staff on the rolls of the division. There are 07 on-going IRC approved projects and 1 externally funded project. The mandate of the Division is:

- To undertake basic, applied and adoptive engineering and technological research in post-production sector of cereals, pulses and oils seeds.
- To adopt, develop and promote technologies for value addition to farm produce, products and by-products.
- To develop technologies including instruments, equipment and processes for modernization of post-harvest operations.
- To establish pilot plants for major cereals, pulses and oilseed crops to study and optimize each unit operations w.r.t. higher recovery with low energy consumption.

The progress of ongoing R&D projects and other activities was presented.

### ***Horticultural Crop Processing Division***

Dr. Ramesh Kumar, PS & I/C Head presented activities of the division. There are 11 scientists and 8 technical staff on the rolls of the division. There are 07 on-going IRC approved projects. The mandate of the Division is:

- On-farm primary processing and handling of horticultural produce.
- Technology refinement for storage and packaging of horticultural crops for enhancing their quality and shelf life.
- Development of technology for value added products from horticultural crops and byproduct utilization.
- Technology based EDP on improved post-harvest processes, equipment and machines for product development.
- Training, consultancy, contract research and quality evaluation facilities development.
- Adopt, refine and develop covered crop cultivation technologies for ensuring suitable environment to enhance quality and shelf life of horticultural produce.

The progress of ongoing R&D projects and other activities was presented.

### ***Transfer of Technology Division***

Dr. Sandeep Mann, PS & I/C Head presented activities of the division. There are 8 scientists and 2 technical staff on the rolls of the division. There are 9 on-going IRC approved projects and 3 externally funded projects. The mandate of the Division is:

- Development of agro processing centers, pilot plant facilities and conduction of adaptive trials
- Applied and adaptive research with special emphasis on transfer of technology aspects
- Technology assessment, refinement (mainly through liaison work) and dissemination
- Production and supply of prototypes, testing of prototypes
- Creation of data base on the status of post-harvest technology in the country

- Development of entrepreneurship through training & participatory programmes
- Development of linkages with other R & D institutions, industries for technology transfer and consultancy

The progress of ongoing R&D projects and other activities was presented.

### **Presentations on on-going projects**

During Divisional presentations, RAC looked at ongoing research projects and made observations, comments and recommendations as in Annexure-VI

### **Presentations of recently completed projects (RPP-III)**

Report/ salient achievements of the research projects (RPP-III) completed after previous RAC Meeting were presented by the respective PIs. The observations/ comments of the RAC have been presented project-wise in Annexure-VII.

### **New Project Concept Notes for RPP-I**

Total seven new project concep-notes were presented by the scientists/ PIs as pre RPP-I documents. Divison-wise presentations and observations/ suggestions/ recommendations of the RAC have been given in Annexure-VIII.

### **Proposed revisions in mandate of Divisions**

Annexure-IX gives proposed revisions in mandate of Divisions.

The chairman appreciated the efforts of ICAR-CIPHET in his concluding remarks and urged them to work harder, with even greater dedication to face the emerging challenges and to continue to be recognized as an institution of excellence. Projects should be taken in value chain mode. Concerted efforts need to be made towards doubling farmers' income. The observations of RAC regarding RPP III, RRP II and concept-notes for RPPI should be intimated to the scientists as soon as possible (preferably within 3 months after approval of the Council) for monitoring their timely progress so that the action is apparent and complete in true sense by the time of next RAC meeting.

## **Recommendations of Second Meeting for RAC (held on 05-06 February 2019)**

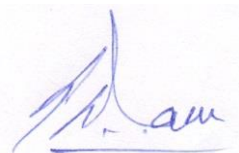
- i. Problem identification and project formulation should include socioeconomic factors and presumptive economic analysis so that prioritization can be done to solve issues of national importance. Interface meeting with industry and other stakeholders should be convened before IRC meeting to identify research problems with market demand.
- ii. All scientists should aim to publish at least 2 research papers in journals with good impact factor per annum preferably in journals of NAAS rating greater than 6.
- iii. With multidisciplinary research becoming the new norm, ICAR-CIPHET should strive for collaborations outside NARES to infuse domain knowledge from diverse engineering, scientific and technological institutions and this may be started with MOUs with C-DAC Kolkata and Government Medical College, Amritsar.
- iv. Concerted efforts should be made to kick start work on automation, sensors, robotics and artificial intelligence (AI) etc. for application in food safety, environment control in food production and processing systems.
- v. Comprehensive impact assessment of few technologies developed by ICAR-CIPHET (e.g. makhana popping machine, groundnut milk, low fat meat products, multi grain atta,) to be taken up on priority.
- vi. More externally funded projects (including international collaborations) should be submitted to pave way for strengthening infrastructure facilities and scientific man power of the institute
- vii. ICAR-CIPHET should establish a sales counter/outlet and sell the products developed in attractive packaging through sales-outlet for wide consumer acceptability.
- viii. Commercialization of promising technologies with high market potential such as wadi making system, makhana popping system and multi grain atta, protein isolates, pectin extraction, chilli destalking etc., should be given priority. Composition of CIPHET-Multigrain Atta be kept confidential till patent is filed.

The meeting concluded with vote of thanks proposed by Dr. D.N. Yadav OIC, PME to the Chairman and Members of the RAC, all the PCs/HoDs, Scientists of institute and other staff associated in conducting this meeting.



**(K. Narsaiah)**

**Member Secretary**



**(Prof. Anwar Alam)**

**Chairman**



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**Annexure-I**

**PROGRAMME SCHEDULE OF RESEARCH ADVISORY COMMITTEE (RAC)**

**Date: 05-06 Feb, 2019**

**Venue: Conference Hall**

<b>Day 1- 05 Feb,2019</b>	
<b>Rapporteur: Dr. Tanbir Ahmad, Dr. Armaan U. Muzaddadi and Dr. Sunil Kumar</b>	
<b>Time</b>	<b>Agenda item</b>
<b>10.00 - 10.15 h</b>	Interaction of RAC Chairman and Members with Director, HoDs & PCs
<b>10.15 - 10.25 h</b>	Welcome by Member Secretary, RAC Dr. K. Narsaiah, Principal Scientist
<b>10.25 – 10.35 h</b>	Address by the Director
<b>10.35- 11.25 h</b>	Remarks by RAC members
<b>11.25 – 11.45 h</b>	Address by RAC chairman
<b>11.45 – 12.00 h</b>	Tea Break
<b>12.00- 12.30 h</b>	Action Taken Report on the recommendations of the previous RAC meeting held on <b>25-26 April 2018</b> by Dr. K. Narsaiah, Member Secretary, RAC
<b>12.30- 12.45 h</b>	Discussion on Action Taken Report
<b>12.45 -13.15 h</b>	Achievements during previous one year & Future Plan of the Institute by Dr. R.K. Singh, Director, ICAR-CIPHET Ludhiana
<b>13.15 - 14.00 h</b>	<b>Lunch Break</b>
<b>14.00 - 17.00 h</b>	<b>Presentations of achievements and activities during last one year and discussions</b> a) Agricultural Structures and Environment Control (AS&EC Division) by Dr. K. Narsaiah b) Food Grain and Oilseeds Processing (FG&OP Division) by Dr. Mridula D. c) Horticultural Crop Processing (HCP Division) by Dr. Ramesh Kumar d) Transfer of Technology (ToT Division) by Dr. Sandeep Mann
<b>17.00 - 17.30 h</b>	Remarks by the Chairman and members of RAC
<b>Day 2-06 Feb 2019</b>	
<b>10.00 – 12.00 h</b>	Presentation of the RPP-III of completed research projects (13 Nos.) 1. AS&EC Division - 01 2. FG&OP Division - 06 3. HCP Division - 04 4. TOT Division - 02
<b>12.00 - 13.30 h</b>	<b>Presentation of the Concept Notes (Pre- RPP-I) proposals by the individual scientist/ HoD (07 Nos)</b> HCP Division - 05 FG&OP Division - 01 AS&EC Division - 01
<b>13.30 – 14.15 h</b>	<b>Lunch Break</b>
<b>14.15 – 15.15 h</b>	Discussion on future Research Priorities of the Institute
<b>15.15 – 16.15 h</b>	Recommendations/ observations by Members of RAC
<b>16.15 – 16.30 h</b>	Concluding remarks by the Chairman, RAC

<b>16.30 – 16.40 h</b>	Vote of thanks by Dr. D.N. Yadav, OIC, PME
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## Annexure – II

### Action Taken Report (ATR) on the Recommendations of RAC made in its first meeting held on 25-26 April, 2018 at ICAR-CIPHET, Ludhiana

#	Recommendation	Action taken
1	Development of value chains for commodities of significance (Tomato, mango, castor, etc.) with backward and forward linkages for taking up to consumer level with complete solutions to be a priority.	<ul style="list-style-type: none"> <li>▪ Comprehensive project on Value chain on mango was approved (with certain modifications) with one component at Ludhiana on bioactives of mango seed kernel and other component on utilization of mango fruit waste at Abohar</li> <li>▪ Value chain on castor is being initiated under AICRP on PHET</li> <li>▪ Value chain on tomato was submitted to NASF and will be explored for alternative funding avenues</li> </ul>
2	Bioprocessing needs greater fillip for enhancing utilization of crop residues/other biomass for purposes like value added products, high value ingredients, animal feed to overcome the problem of burning of crop residues.	<ul style="list-style-type: none"> <li>▪ Crop residue management is promoted through KVK with training as well as on farm demonstration in 133 acres using Happy Seeder, mulcher and reversible mouldboard plough</li> <li>▪ Project on Protein isolates from doiled cakes under NASF (Aug 2018-July 2021, budget Rs.1.57 Crores) was taken up</li> <li>▪ One project on maize biomass utilization is completed. Production of xylitol from corn cob bioprocessing is targeted.</li> </ul>
3	Greater automation and infusion of emerging advanced ICT technologies such as robotics, artificial intelligence, machine learning with post-harvest engineering and technology should be one of the thrust areas.	<ul style="list-style-type: none"> <li>▪ Quality sensing system for packed mushroom</li> <li>▪ Project on sorting fruits with image processing and activity on automated solar dryer taken up.</li> <li>▪ Major work under this will be taken up after scientific staff with appropriate qualifications on roll in the new envisaged division of automation and sensors technology</li> </ul>
4	Screening / characterization of varieties for their suitability for processing and compilation of specification on processable characteristics of agricultural produce needs to be taken up	Will be taken up after increase in scientific staff strength
5	Strengthening of computer aided design and manufacturing, computer aided engineering analysis for simulation and modeling is recommended	<ul style="list-style-type: none"> <li>▪ CAD software CREO is revived</li> <li>▪ Recruited young professionals with CAD/CAE knowledge and made use of their expertise for design and simulation of meat ball making machine and spray chiller</li> </ul>

6	Post-harvest handling & marketing strategies and technological packages need to be evolved towards doubling farmers' income	<ul style="list-style-type: none"> <li>▪ Hand-holding of farmer groups to use value addition as tool to increase income in Farmer First project.</li> <li>▪ EDP on meat processing, packaging, functional atta, oats and buckwheat processing</li> </ul>
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### Action on General Comments

#	Suggestions/Comments of the RAC	Action Taken
1	Exercise to revise mandate of all divisions to be taken up	Proposed revision in mandate vis-à-vis existing mandate is given in Annexure –VI
2	Open house of institute facilities at least once in a year as per ICAR guidelines	Open house of institute facilities to be held on Science day (28 February) every year.
3	Situations like recent depletion of scientific human resources at middle level due to transfers need to be restricted at appropriate level	Taken up at appropriate level in the Council.

**Annexure – III**

**Action Taken Report (ATR) on RPP-III Observations and Comments made during RAC meeting held on 25-26 April, 2018 at ICAR-CIPHET, Ludhiana**

#	Project Title (RPF-III)	Presenter Duration	RAC Comments Observations	Action Taken
1	Development of animal handling and automated cooling systems for dairy farms	Dr. K. Narsaiah (PI) Start: 01.01.2013 End: 31.12.2016	Further efforts may be put to popularize the developed technologies	Technical bulletin on animal lifter published. One animal lifter under fabrication for sending to <b>ICAR-IVRI</b> for demonstration.  Technical literature is disseminated to cooperative dairies and <b>NDDB</b> .  Technology of HVLS fan published on <b>Agrinnovate</b> web site. Efforts are on to encourage small entrepreneurs to take up this technology.
2	Development of hybrid cold storage structure for onion and tomato	Dr. R.K Vishwakarma (PI) Start: 01.01.2013 End: 30.09.2016	Commercialization of the developed technology to be taken to end-users.	On field trial of the dehumidification system is going on at ICAR-CIPHET, Abohar centre for storage of onion in a separate project and results are awaited. Some commercial manufacturers were contacted and discussed in detail. Their specific need is the manufacturing of the guar straw balls in bulk and demanding for a small machine for this purpose. The guar straw balls preparation system has to be developed.
3	Development of fat replacer and hydrocolloid from pearl millet and barley	Dr. D.N. Yadav (Co-PI) Start: 01.01.2013 End: 30.09.2016	Scale up of process to be considered as new project.	For scaling up of the process of pearl millet starch separation requires hydro-cyclone separator. The new project to be initiated after creation of facilities.
4	Processing of buckwheat, amaranth and oat. Old Title:	Dr. Mridula D (Co-PI) Start: 01.01.2013 End:	Conduct EDP on oat dehuller  Relook into some of the	EDP on 'Oat processing & value addition' has been conducted during 18-19 January, 2019.  Total dietary fibre and soluble fibre in oat (whole) were found as 9.73% and 3.38%,

	Primary processing and value addition of pseudo cereals.	31.03.2017	physico-chemical properties (particularly soluble fiber in oats)	respectively while in dehulled oat the same are 9.92% and 3.45%, respectively.
5	Impact Assessment of Technologies from CIPHET and AICRP on PHT and APA	Er.Navnath Indore (Co-PI) Start: 01.06.2014 End:31.05.2017	Brief note showing impact of technologies to submitted.	One folder on impact assessment methodology had been published and submitted  Brief note on impact assessment of technologies has been prepared

## Annexure – IV

### Comments on On-going Projects by RAC in its meeting held on 25-26 April 2018 at ICAR-CIPHET, Ludhiana

#	Comments	Action Taken
<b>ASEC Division</b>		
1	Association of appropriate scientist is suggested for consideration in the project on low fat and high fiber meat products during IRC	Association of Er. AA Bashir is approved by the Chairman, IRC, ICAR-CIPHET
2	The production of ethylene absorbing packaging film, to complete the packaging trials of mandated fruits on higher scale, to be expedited	Process for optimizing the continuity of the film is under trial.
3	The materials developed using corn cob residue need to be characterized in terms of their properties relevant to processing and handling analyzed for e.g. thermal properties of clay and corn cob residue to derive equivalent thermal properties of cup made by combining them	Thermal conductivity was analysed for clay (0.15 w/mK), corn cob residue (0.14 w/mK), clay cup (0.21 w/mK) and corn cob powder blended clay cups (0.2 w/mK). The values depict that thermal conductivity of cup slightly decreased with addition of corn cob powder.
<b>FGOP Division</b>		
1	<i>Wadi</i> making system should be taken to logical conclusion and research team may be strengthened, if needed.	Objectives of the project completed and RPP III has been submitted. Integration of dryer and other for continuous production to be taken up as new project. Information w.r.t. ' <i>Wadi</i> making system developed at ICAR-CIPHET has been submitted to ITMU for technology dissemination purpose.
2	Feeding of roasted paddy to the flaking machine needs relooking from the point of view of damage to rubber roll shellers	After repeated experiments, it has been found that there was no visible damage observed on the rubber rolls. The reason behind this is that only 7-8 paddy grains per unit time are being fed to the rubber roll by controlling the paddy feed rate. The heat content of these small amount of paddy grains fed to the rollers do not produce any visible change/damage in the rubber roller. Besides, rubber has low thermal conductivity and due to the small residence time of the paddy grains in the rubber roll, damages were not



		observed.
3	Expedite the work on maize dryer	Engineering drawing has been completed. The dryer is designed to bring down moisture from 35% to 17%. The different parts like Heating Unit, Control Panel, Pipe, Hot air regulatory valve etc. have been procured. The drying bin has also been constructed. Further integration of blower, heater, sensors, pipes etc. to the drying bin is under progress.
4	Impact assessment report of nutritious functional chapatti flour to be done and glycemic index of developed flour to be validated from reliable third party	Efforts are being made to collect the information from M/S Saraswati Rice and General Mills, Jargon, Ludhiana, Punjab w.r.t. impact assessment report of nutritious functional chapatti flour. In order to evaluate the glycemic index of the nutritious multigrain chapatti flour, correspondence have been made with Dr. Girish Chandel, Professor, IGKV, Raipur.
5	The technology for detection of adulteration in spices needs to be validated at ICAR-IISR, Calicut	The developed kit for detection of adulteration in spices has been sent for validation to NABL Accredited Lab (Punjab Biotechnology Incubator Lab (PBTI, Mohali) as well as at ICAR-IISR, Calicut.
<b>HCP Division</b>		
1	Efforts may be put to license the technology of pectin extraction from citrus peel	Developed technology has been demonstrated to Punjab Agro Juice Limited, Mr. Sukhpal Singh Bhullar (progressive farmer) and Dr. Rajinder Singh Sekhon (Owner Kinnow waxing plant)
2	Performance report of de-poder for green pea and chick pea to be submitted in as early as possible	The prototype fabrication is completed and trials on fresh green pea (season: Mid Dec-March) are going on with necessary modifications in the prototype.
3	The work of whole system for citrus peeling to be done in 3 months and video of same should be submitted	The working video of citrus peeling using developed mechanical peeler is prepared and submitted.
4	In refractance window drying, the quality product should be compared with the quality of product using process earlier developed by the institute.	The fabrication work of the continuous RW drying system is in progress. The comparison among the product quality is under progress.

TOT Division		
	<p>Collaboration with C-DAC for development of software and automation for estimation of insect infestation in grains using developed technologies, if need be</p>	<p>C-DAC, Mohali has been contacted and they are ready for collaboration to develop software and automation for estimation of insect infestation in grains using developed technology</p>
	<p>Select few potential technologies of the institute and do a thorough impact assessment in project mode</p>	<p>Potential technologies for impact assessment selected and RPP-I being formulated for forth coming IRC. The following technologies are selected</p> <ol style="list-style-type: none"> <li>1. Makhana popping machine</li> <li>2. Groundnut milk</li> <li>3. Low fat meat products</li> <li>4. Fortified Atta</li> <li>5. Guava leather bar</li> </ol>

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**Annexure – V**

**Action Taken Report (ATR) New Project Concept-Note for RPP-I made during RAC meeting held on 25-26 April, 2018 at ICAR-CIPHET, Ludhiana**

<b>Agricultural Structures and Environmental Control Division</b>								
<b>1</b>	<p><b>Title: Mango seed kernel based composite coating for improving storage-life of Mango</b></p> <p>Team: Poonam Choudhary (PI) , Dr. Sanjeev Kumar Tyagi (Chemical Engineering), Ms. Surya Tushir (Agri. Microbiology )</p> <p>Duration : 2 Years</p>							
	<table border="1"> <thead> <tr> <th><b>Objectives</b></th> <th><b>RAC Inputs</b></th> <th><b>Actions</b></th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>- To optimize the process parameter for formulation of composite coating and evaluation of their anti-microbial efficacy</li> <li>- To study the effect of optimized composite coating on physico-chemical and biochemical properties of mango fruits during storage</li> </ul> </td> <td> <p>All mango related project be taken after internal review meeting in value chain mode.</p> <p>Not recommended for consideration to IRC as submitted.</p> </td> <td> <p>PMC meeting held on 24.09.2018 approved Mega project on Value chain improvement through post-harvest handling, storage and processing of mango.</p> <p>The project was revised and presented in IRC as Production of bio-active ingredients from mango seed kernels with the following objectives:</p> <ol style="list-style-type: none"> <li>1. Extraction, isolation and characterization of bio-ingredients from mango seed kernels</li> <li>2. To develop pilot plant for production of bio-ingredients from mango seed kernels</li> </ol> </td> </tr> </tbody> </table>	<b>Objectives</b>	<b>RAC Inputs</b>	<b>Actions</b>	<ul style="list-style-type: none"> <li>- To optimize the process parameter for formulation of composite coating and evaluation of their anti-microbial efficacy</li> <li>- To study the effect of optimized composite coating on physico-chemical and biochemical properties of mango fruits during storage</li> </ul>	<p>All mango related project be taken after internal review meeting in value chain mode.</p> <p>Not recommended for consideration to IRC as submitted.</p>	<p>PMC meeting held on 24.09.2018 approved Mega project on Value chain improvement through post-harvest handling, storage and processing of mango.</p> <p>The project was revised and presented in IRC as Production of bio-active ingredients from mango seed kernels with the following objectives:</p> <ol style="list-style-type: none"> <li>1. Extraction, isolation and characterization of bio-ingredients from mango seed kernels</li> <li>2. To develop pilot plant for production of bio-ingredients from mango seed kernels</li> </ol>	
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<b>2</b>	<p><b>Title: Design and development of smart solar dryer</b></p> <p>Team: Bidyalakshmi Devi (PI), Er. Yogesh Kalnar, Scientist, Dr. Manoj K Patel, Scientist, CSIR-CSIO</p> <p>Duration : 2 Years</p>							
	<table border="1"> <thead> <tr> <th><b>Objectives</b></th> <th><b>RAC Inputs</b></th> <th><b>Actions</b></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	<b>Objectives</b>	<b>RAC Inputs</b>	<b>Actions</b>				
<b>Objectives</b>	<b>RAC Inputs</b>	<b>Actions</b>						

<p>- To design and develop sensor based smart solar dryer for temperature and humidity control.</p> <p>- Performance evaluation of developed solar dryer</p>	<p>The project will be part of tomato or mango value chain.</p> <p>Recommended for consideration to IRC.</p>	<p>Taken up as divisional activity as per recommendation of PMC meeting held on 24.09.2018 and to be upgraded to RPP-I.</p>
<p><b>3</b></p>	<p><b>Title: Development of collagen hydrolysates from buffalo (<i>Bubalus bubalis</i>) skin and its effect on osteoarthritis</b></p> <p>Team: Dr. Tanbir Ahmad Scientist (LPT), Dr. A.U. Muzadaddi PS (FPT), Mr. Vikas Kumar, Scientist (FPT) Faculty member from PAU/GADVASU</p> <p>Duration : 3 Years</p>	
<p><b>Objectives</b></p>	<p><b>RAC Inputs</b></p>	<p><b>Actions</b></p>
<p>To extract the collagen hydrolysates from buffalo skin</p> <p>To characterize the isolated collagen hydrolysates</p> <p>To evaluate the efficacy of the extracted collagen hydrolysate</p>	<p>Take care of handling and storage aspects of source material.</p> <p>Recommended for consideration to IRC</p>	<p>Handling and storage of source material will be dealt with standard operating procedures and this is included in the RPP-I</p> <p>Sample materials are cleaned immediately upon arrival in the lab and kept at -20 °C in nicely packed polyethylene bags in small quantities.</p>
<p><b>Food Grains &amp; Oilseeds Processing Division</b></p>		
<p><b>1</b></p>	<p><b>Title: Development of continuous chickpea milling pilot plant for improved recovery</b></p> <p>Team: Er. Chandan Solanki, Scientist (APE), Dr. Deepika Goswami, Scientist (Food Tech)</p> <p>Duration : 3 Years</p>	
<p><b>Objectives</b></p>	<p><b>RAC Inputs</b></p>	<p><b>Actions</b></p>

<p>To design/develop the continuous type pulse milling system.</p> <p>To evaluate the performance of the developed system.</p>	<p>The proposed pretreatments appear to be not practical. Needs further review and reformulation.</p> <p>Not recommended for consideration to IRC.</p>	<p>-</p>
<p><b>2</b> Title: <b>Development of Near Infra-Red Spectroscopy Based Rapid Detection Method for Adulterants in Chickpea flour (Besan) and Turmeric</b></p> <p>Team: Dr. Manju Bala (PI)</p> <p>Duration : 2 Years</p>		
<p><b>Objectives</b></p>	<p><b>RAC Inputs</b></p>	<p><b>Actions</b></p>
<p>To develop near infra-red based models for quantitative and rapid detection of chemical adulterants from besan and turmeric.</p> <p>To determine the minimum detectable concentrations of adulterants with the developed models using market samples</p>	<p>Recommended for consideration to IRC.</p>	<p>Project was presented in the PMC and it was suggested to present the project in the next IRC.</p>
<p><b>3</b> Title: <b>Development of process protocol for cryogenic grinding of selected medicinal plants/herbs (Curry leaf, Nutmeg and Safed musli)</b></p> <p>Team: Dr. Pankaj Kumar (PI)</p> <p>Duration : 3 Years</p>		
<p><b>Objectives</b></p>	<p><b>RAC Inputs</b></p>	<p><b>Actions</b></p>
<p>Optimization of process protocol for cryogenic grinding of selected medicinal plants/herbs.</p> <p>Physico-chemical characterization of cryogenically ground</p>	<p>Ashwagandha suggested for inclusion</p> <p>Optimization in smaller imported unit and validation in</p>	<p>Ashwagandha has been included in RPP-1</p> <p>It was included in the RPP-1(Technical program)</p>

powders. Comparative study of conventionally and cryogenically ground powder of selected medicinal plants/herbs.	indigenous unit based CIPHET Technolgy  Recommended for consideration to IRC	The project was presented in the IRC and approved by the IRC.
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### Horticultural Crops Processing Division (1 PI+ 1 CO-PI only at present)

<b>1</b>	<b>Title: Development of process protocol for enzyme assisted processing of selected fruits</b> Team: Dr. Sunil Kumar, Pr. Scientist (Biochemistry) Duration : 3 Years	
	<b>Objectives</b>	<b>RAC Inputs</b>
	- To develop process protocol for peeling of selected fruits using enzymes  - To develop process protocol for pulping and enhanced juice recovery  - To assess the quality of value added products prepared of extracted fruits/pulp/juices	Recommended as divisional activity to begin with  Preliminary studies were carried out on citrus fruit and its peel. The enzymatic peeling removed the whitish portion completely and was effective in peeling
<b>2</b>	<b>Title: Process protocol for storage of Aonla and development of soft textured products</b> Team: Dr. Perna Nath Scientist (Food Technology) Duration : 3 Years	
	<b>Objectives</b>	<b>RAC Inputs</b>
	- To optimize process for storage of fresh aonla fruits.	Thorough review needed  - Thorough review was done and accordingly the title and objectives of the project were reframed.

<p>- To optimize process for development of soft textured aonla products.</p> <p>To develop strategies for packaging and storage of developed products.</p>	<p>Blanching time in preliminary trials appears high</p> <p>Should be piloted through a divisional activity on Aonla candy</p>	<p>- Blanching time in experimental trials was optimized as 10 minutes. Divisional activity on development of aonla candy has already been conducted during September 2017-February 2018 (F. No. 2(115)/2013 PME Cell (115)/date 09/08/2017</p>
<p><b>3</b></p>	<p><b>Title: Utilization of mango fruit waste for development of novel value added products</b></p> <p>Team: Dr. Ramesh Kumar Pr. Scientist (Hort), Dr. Sunil Kumar Pr. Scientist Biochemistry), Dr. Rahul AnuragSr. Scientist (Food Tech)</p> <p>Duration : 3 Years</p>	
<p><b>Objectives</b></p>	<p><b>RAC Inputs</b></p>	<p><b>Actions</b></p>
<p>- To identify energy efficient method for stabilization of processing waste.</p> <p>- To isolate and characterize starch from mango seed kernel</p> <p>- To optimize process parameter for formulation of value added products from mango peel and kernel.</p> <p>- To evaluate the functional properties of fruit residue flour, proximate composition, microbiological stability and consumer acceptability of developed product</p>	<p>- All mango related project be taken after internal review meeting in value chain mode.</p> <p>- Not recommended for consideration to IRC as submitted.</p>	<p>- Project was discussed in internal review meeting on 24.09.18 and revised proposal was presented in 28th IRC under mango value chain mode with sub-project entitled “Utilization of mango processing waste through extraction and development of novel value added products” and was approved subject to certain modifications</p>
<p><b>4</b></p>	<p><b>Title: Development of processing based model value chain for tomato and its by-products utilization</b></p> <p>Team: Pankaj K Kannaujia</p> <p>Duration : 3 Years</p>	



Objectives	RAC Inputs	Actions
<ul style="list-style-type: none"> <li>- Identification of suitable varieties for processing according to specific demand of processing industry</li> <li>- To asses and optimize process technologies and establish model processing facilities in catchment area for intermediary products for processing industries</li> <li>- To link producer groups and strengthen them with tomato processing and value addition facilities</li> <li>- To facilitate producer-processing industries-market for strengthening the value chain of tomato</li> </ul>	<ul style="list-style-type: none"> <li>- Project on value chain development for commodities of significance like tomato may be taken up after thorough discussion at Division/institute level for consideration to IRC.</li> </ul>	<ul style="list-style-type: none"> <li>- This project has been submitted to NASF for external funding.</li> </ul>

### Transfer of Technology Division

<b>1</b>	<p><b>Title: Development of ACE-Inhibitory Peptides from Fish and Livestock Processing Waste</b></p> <p>Team: Mr. Vikas Kumar Scientist (Fish Processing Technology), Dr. Yogesh Kumar Scientist (SS) (LPT), Dr. Tanbir Ahmad Scientist (SS) (LPT)</p> <p>Duration : 3 Years</p>		
	<p><b>Objectives</b></p> <p>To develop ACEIP from fish and livestock processing waste</p> <p>To evaluate <i>in vitro</i> efficacy</p>	<p><b>RAC Inputs</b></p> <p>As the end product is high value, standardize process with a definite / specific source with justification</p> <p>An engineering</p>	<p><b>Actions</b></p> <p>Fish trimmings/ skin and poultry skin were decided to be specific source because these contain a significant amount of protein-rich material.</p> <p>3<sup>rd</sup> objective was not approved by</p>

<p>of developed ACEIP in regulating blood pressure</p> <p>To develop a pilot plant for extraction of ACEIP</p>	<p>scientist be included in the team from the beginning and schematic for pilot plant to be developed is prepared. The project, with these modifications, may be submitted for consideration to IRC.</p>	<p>the IRC.</p>
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## Annexure – VI

### **Observations/ Comments/ Recommendations on Divisional Presentations made to RAC in its meeting held on 05-06 February 2019 at ICAR-CIPHET, Ludhiana**

#### **Comments**

- For all completed projects, demonstration of machine/product/technology should be done in RAC meeting prior to RPP III presentations
  - ICAR-CIPHET should organize big technology mela once in a year.
  - Secondary, tertiary processing and products of high value to be the focus
- a. Agricultural Structures and Environmental Control Division**
- Field trials of mustard based antimicrobials to be expedited
  - The threshold limit of detection of added sugar should be lowered
  - A technical bulletin on honey should be prepared.
  - Review the work of Central Leather Research Institute for collagen hydrolysates
- b. Food Grains & Oilseeds Processing Division**
- Integrate pitting machine with ICAR-CIPHET dhal Mill to improve dhal recovery
  - SAMEER to be consulted for applications involving microwaves
  - Considering the difficulties in regeneration, the use of desiccant for maize drying should be avoided.
  - Efforts to commercialize multigrain flour to big players to be sustained
  - Sale of all products developed to be commenced through APC
- c. Horticultural Crops Processing Division**
- Sustain the efforts to license the technology of pectin extraction from citrus peel
  - Expedite performance evaluation of de-poder for green pea and chick pea
- d. Transfer of technology Division**
- Document the success stories of trainees
  - Jaggery with less use of chemicals should be promoted in farmers first project

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## Annexure – VII

**Observations/ Comments/ Recommendations on specific projects RPP-III by RAC in its meeting held on 05-06 February 2019 at ICAR-CIPHET, Ludhiana**

#	Project Title (RPF-III)	Presented by and duration	Observations/ Comments/ of the RAC
1	Bio- transformation of Corn by-products for protein and other value added products.	Dr. Surya Tushir (PI) Start: 01.04.2016 End: 31.03.2018	<ul style="list-style-type: none"> <li>▪ Publications in peer reviewed journals are expected in time bound manner</li> <li>▪ Further efforts may be put to popularize the developed technologies</li> </ul>
2.	Development of vegetable mixed-wadi making system	Dr. Sandeep Mann (PI) Start: 01.10.2013 End:30.09.2017	<ul style="list-style-type: none"> <li>▪ Expedite licensing of design of the machine to take it to end-users.</li> <li>▪ New project on integrated line of wadi production may be taken up</li> <li>▪ Sale of wadi produced by machine should commence through APC</li> </ul>
3	Development of nutritious and convenience foods using extrusion processing technique for 'at risk' children.	Dr. Mridula D (Co-PI) Start: 01.07.2014 End:31.12.2017	<ul style="list-style-type: none"> <li>▪ Licensing of technology with commercially available low cost extruder should be explored</li> <li>▪ Sale of developed products should commence through APC</li> </ul>
4	Development of process protocol for extraction of anthocyanins from pigmented indigenous rice varieties and its utilization in functional foods	Dr. S.K. Nanda (PI) Start: 01.07.2015 End: 31.12.2017	<ul style="list-style-type: none"> <li>▪ Extraction using methanol should be relooked or avoided</li> <li>▪ Degree of polishing should be standardized for optimizing pure anthocyanin extraction</li> <li>▪ Publications in peer reviewed journals are expected in time bound manner</li> </ul>
5	Development of process protocol for gluten analogue and its application in maize and millets flour	Dr. Manjubala (PI) Start: 01.07.2015 End: 31.12.2017	<ul style="list-style-type: none"> <li>▪ Drum dryer may be explored for pre-gelatinizing starch to serve as gluten analogue</li> <li>▪ Publications in peer reviewed journals are expected in time bound manner</li> </ul>
6	Development of testing kits for detecting adulterants in selected spices	Dr. Manjubala (PI) Start: 01.04.2016 End:31.03.2018	<ul style="list-style-type: none"> <li>▪ The kit should be marketed/licensed to some company within six months</li> <li>▪ Development of the improved kit should be communicated to FSSAI for wider adoption in field for quality testing of</li> </ul>

			spices
7	Development of groundnut based milk powder analogue	Dr. S.K. Nanda (PI) Start: 01.07.2015 End: 31.12.2017	<ul style="list-style-type: none"> <li>▪ Market assessment of products developed to be done</li> </ul>
8	Development of a process for extraction and utilization of low methoxyl pectin from citrus fruit residue	Dr. Sunil Kumar (PI)  Start: 01.04.2014 End:31.12.2017	<ul style="list-style-type: none"> <li>▪ Efforts to commercialize technology should be sustained.</li> </ul>
9	Development of technology for destalking and packaging of dried chillies	Dr. Kirti Jalgaonkar (PI)  Start: 01.04.2016 End:31.03.2018	<ul style="list-style-type: none"> <li>▪ Develop a prototype with all product contact parts with food grade materials and liaise with industry to license the technology</li> <li>▪ Explore chilly stalks for phytochemicals</li> </ul>
10	Process Protocol for production of quality Green Raisins	Dr. Prerna Nath (PI)  Start: 01.04.2016 End:31.06.2018	<ul style="list-style-type: none"> <li>▪ Cost economics should be worked out for final product vis-à-vis commercially available green raisins</li> <li>▪ Mechanize the existing process of grape drying</li> </ul>
11	Development of composite peeler cum juice extractor for sweet orange and kinnow	Dr. M.K. Mahawar (PI)  Start: 01.07.2015 End:31.12.2017	<ul style="list-style-type: none"> <li>▪ Mechanized feeding with multiple channels may be considered for increasing the capacity</li> <li>▪ RPF-IV should be taken up in coming IRC</li> </ul>
12	Development of woman-friendly semi-automatic fish cleaning-cum-dressing system	Dr. A.U. Muzaddadi (PI)  Start: 01.04.2016 End:31.03.2018	<ul style="list-style-type: none"> <li>▪ Publications in peer reviewed journals are expected in time bound manner</li> <li>▪ Commercialize the technology with existing model</li> <li>▪ RPF-IV may be submitted to prepare second model</li> </ul>
13	Skill development and capacity building for income generation and employment security through agro-processing	Dr. Ranjeet Singh (PI)  Start: 01.04.2016 End:31.03.2018	<ul style="list-style-type: none"> <li>▪ Monitor the progress of entrepreneurs for effective hand holding</li> <li>▪ Prepare extension literature, leaflets and technical bulletins for wider reach</li> </ul>

**Annexure – VIII**

**Observations/ Comments/ Recommendations on New Project Concept-Note for RPP-I  
by RAC in its meeting held on 05-06 February 2019 at ICAR-CIPHET, Ludhiana**

#	Concept Note Title	Team	Duration	Objectives	RAC Suggestions/ Observations
<b>Agricultural Structures and Environmental Control Division</b>					
1	Development of Lab-on-a-Chip Device for detection of animal species in meat products	Dr. Yogesh Kumar (PI)	2 years	To develop bio-sensor based protocol for detection of animal species in meat products.  To develop lab-on-a-chip device for detection of animal species in meat products.	Detection of multiple species in single run should be attempted.  Explore possibility of collaboration with C-DAC, Kolkata  Recommended for consideration to IRC.
<b>Food Grains &amp; Oilseeds Processing Division</b>					
1	Processing of pigeon pea, black gram and their by-products for diversified food uses Co-PI: Co-PI:	Dr. Deepika Goswami, PI	3 years	To reduce anti-nutritional factors in pigeon pea, black gram and their by-products for diversified food uses  To develop nutritious convenience foods from pigeon pea and black gram using conventional and extrusion technique	Needs further review and reformulation.
<b>Horticulture Crops Processing Division</b>					
1.	Development of kit/chip for enhancing the shelf-life of fresh fruits	Dr. Sunil Kumar Pr. Scientist (Biochem)	3 years	To explore the possibility of selected chemicals and metal ions for ethylene removal  To standardize formulation of kit/chip for ethylene removal during storage and transportation  Testing the efficacy of	Omit the word “chip”  Review thoroughly both patents and other literature and come out with program to better existing commercial products

				kit/chip for enhancing the shelf-life of selected fruits under different storage conditions	Recommended for consideration to IRC.
2.	Design and development of mechanized system for dragon fruit processing	Dr. Manoj Kumar Mahawar, (Scientist, ASPE)	3 years	To design and develop mechanized system for fruit handling and pulp extraction  To evaluate the performance and cost economics of the developed system	Prepare a detailed project report and submit it outside for external funding of complete line.
3.	Process Technology for Development of Low Calorie Aonla Products	Dr. Prerna Nath Scientist (Food Technology)	2 years	To evaluate different alternative sweetener's for preparation of selected low calorie aonla products.  To standardize the packaging and storage techniques for developed low calorie aonla products	Preliminary work may be done to see feasibility  Advised to focus on high value products with bioactives
4.	Development of encapsulated probiotic based functional fruit and vegetable juice	Dr. Ajinath Dukare, Scientist (Agricultural Microbiology)	2 years	To screen and select suitable carrier (fruits/vegetable juice) for development of probiotic functional juice  Optimization of suitable encapsulating material and drying process for developing encapsulated probiotics.  To evaluate quality attributes (microbiological safety, cell viability, physico-chemical etc.) of developed probiotic during storage	Thorough review needed to assess earlier work identify critical gaps/issues such as settling of microcapsules, product market feasibility  Recommended for consideration to IRC.
5.	Design and Development of Photoreactor for Ethylene	Dr. Bhupendra M Ghodki (Scientist-ASPE)	3 years	To develop a photoreactor for removal of ethylene based on hybrid photochemical and photocatalytic oxidation technique.	Preliminary work may be done to see feasibility and submit it for external funding.



	Removal in Storage of Climacteric Fruits			<p>To evaluate the effect of different operational parameters on ethylene removal in the developed system.</p> <p>Performance evaluation of photoreactor for storage of selected climacteric fruits at different storage conditions.</p>	
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**Revised Mandates of the Divisions by RAC  
in its meeting held during 05-06 February 2019 at ICAR-CIPHET, Ludhiana**

<i>Old Mandate</i>	<b>Revised Mandate</b>
<b>AS&amp;EC Division</b>	
<p><i>Adoption, development and improvement of eco-friendly technologies for safe storage of food grains, seeds, oilseeds, horticultural, aquaculture and animal produce for human consumption and feed for livestock and aquaculture.</i></p> <p><i>Basic and applied research on cryogenic engineering, modified and controlled atmosphere packaging and enhanced shelf life, handling, transportation and quality evaluation of valuable agricultural produce.</i></p> <p><i>Environmental up-gradation of animal shelters, poultry houses, fisheries etc for higher productivity and animal health. Improving work environment and pollution control in agro-processing industries.</i></p> <p><i>Utilization of agricultural wastes/residues for commercial application.</i></p> <p><i>Adopt, refine and develop covered crop cultivation technologies for ensuring suitable environment to enhance quality and shelf life of crop produce.</i></p>	<ul style="list-style-type: none"> <li>▪ <b>Adoption, development and improvement of eco-friendly technologies for safe storage of food grains, seeds, oilseeds, horticultural, aquaculture and animal produce for human consumption and feed for livestock and aquaculture.</b></li> <li>▪ <b>Development of climate resilient instrumentation and sensor based technologies for agricultural and livestock systems to enhance the productivity and animal welfare</b></li> <li>▪ <b>Development of rapid protocols, micro-devices, automation and sensor based technologies for quality evaluation of agricultural and livestock produce</b></li> <li>▪ <b>Development of sensors and packaging based interventions for shelf-life enhancement, safe storage and transportation of agricultural and livestock produce</b></li> </ul>
<b>FG&amp;OP Division</b>	
<p><i>To undertake basic, applied and adoptive engineering and technological research in post-production sector of cereals, pulses and oils seeds.</i></p> <p><i>To adopt, develop and promote technologies for value addition to farm produce, products and by-products.</i></p> <p><i>To develop technologies including instruments, equipment and processes for</i></p>	<ul style="list-style-type: none"> <li>▪ <b>To undertake basic, applied and adoptive engineering and technological research for modernization of post-harvest operations of food grains, pulses, oilseeds and their by-products.</b></li> <li>▪ <b>To develop and scale up technologies with higher recovery and energy efficient automated processes for value added products.</b></li> <li>▪ <b>To design and establish pilot plants for</b></li> </ul>

<p><i>modernization of post-harvest operations.</i>  <i>To establish pilot plants for major cereals, pulses and oilseed crops to study and optimize each unit operations w.r.t. higher recovery with low energy consumption.</i></p>	<p><b>modernized processing of food grains, pulses and oilseeds</b></p>
<p><b>HCP Division</b></p>	
<p><i>On farm primary processing and handling of horticultural produce.</i></p> <p><i>Technology refinement for storage and packaging of horticultural crops for enhancing their quality and shelf life.</i></p> <p><i>Development of technology for value added products from horticultural crops and byproduct utilization.</i></p> <p><i>Technology based EDP on improved post harvest processes, equipments and machines for product development.</i></p> <p><i>Training, consultancy, contract research and quality evaluation facilities development.</i></p> <p><i>Adopt, refine and develop covered crop cultivation technologies for ensuring suitable environment to enhance quality and shelf life of horticultural produce.</i></p>	<ul style="list-style-type: none"> <li>▪ <b>Design and development of machines and tools for on farm primary processing and handling of horticultural produce</b></li> <li>▪ <b>Technology refinement for storage, processing and packaging of horticultural crops for improving their quality and shelf life</b></li> <li>▪ <b>Development of advanced technologies for value addition and byproduct utilization of horticultural crops</b></li> <li>▪ <b>Dissemination of technology through EDP and training on post-harvest management and processing of horticultural produce</b></li> <li>▪ <b>Undertake consultancy and contract research</b></li> </ul>
<p><b>TOT Division</b></p>	
<p><i>Development of agro processing centres, pilot plant facilities and conduction of adaptive trials</i></p> <p><i>Applied and adaptive research with special emphasis on transfer of technology aspects</i></p> <p><i>Technology assessment, refinement (mainly through liaison work) and dissemination</i></p> <p><i>Production and supply of prototypes, testing of prototypes</i></p> <p><i>Creation of data base on the status of post-harvest technology in the country</i></p>	<ul style="list-style-type: none"> <li>▪ <b>Technology assessment, refinement and dissemination through applied/adaptive research, linkage development, database generation in post-harvest sector</b></li> <li>▪ <b>Human resource and entrepreneurship development in post-harvest processing &amp; value addition.</b></li> <li>▪ <b>Development of entrepreneurship through training and participatory programs</b></li> <li>▪ <b>Preparation of extension literature and</b></li> </ul>

<p><i>Development of entrepreneurship through training &amp; participatory programmes</i></p> <p><i>Development of linkages with other R &amp; D institutions, industries for technology transfer and consultancy</i></p>	<p><b>messages</b></p>
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