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F. No. 1 (58)/2022-23/PHET/38th/AW

Coordinator's Report

2022-23

Presented in
XXXVIII Workshop of AICRP on PHET
(20-22 February 2023)

Held at
ICAR-CPCRI, Kasargod (Kerala)

COMPILED & EDITED BY

Dr. R. K. Vishwakarma
Dr. S. K. Tyagi
Dr. Sandeep P. Dawange
Dr. Th. Bidyalakshmi Devi
Dr. Dhritiman Saha
Dr. Kavita Singh

ICAR-AICRP on Post-Harvest Engineering & Technology
ICAR-Central Institute of Post-Harvest Engineering & Technology
P.O. : PAU Campus, Ludhiana-141004, Punjab (India)
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CONTENT

AICRP ON POST-HARVEST ENGINEERING AND TECHNOLOGY

1. BACKGROUND

The All India Coordinated Research Project on Post-harvest Technology was launched by the Indian Council of Agricultural Research, Department of Agricultural Research & Education, Ministry of Agriculture, Government of India, in September 1972 with R&D Centres at 10 locations. Coordinating Cell of the Project was established in the Division of Agricultural Engineering at Indian Agricultural Research Institute, New Delhi. The Co-ordinating Cell of the Project was shifted to CIAE Bhopal in February 1976. With the establishment of the Central Institute of Post-harvest Engineering & Technology at Ludhiana, the Coordinating Cell was further shifted from CIAE Bhopal to CIPHET Ludhiana in December 1989. The project is renamed again in 2015 as "All India Coordinated Research Project on Post-Harvest Engineering and Technology" (AICRP on PHET). The Project is currently operating from 30 centres covering majority of states and the agro-climatic zones of India.

1.1. OBJECTIVES

The Project aims to develop location and crop specific post-harvest technologies (tool, gadgets, and machinery, equipment and process protocols) for better utilization of agricultural produce and by-products and to minimize quantitative and qualitative post-harvest losses. These technologies assure better economic returns to the farmers from their marketable surpluses and by-products and generate employment, make available primary processed food in production catchments and thereby improvements in quality of life and overall economic development.

1.2. THE SPECIFIC OBJECTIVES OF THE PROJECT

- To study the prevailing post-harvests practices and identify unit operations, equipment and their components that need improvement or substitution, adequacy and inadequacy of the prevailing practices.
- To develop and adopt farm level cleaners, graders and dryers for cereals, pulses, oilseeds, plantation crops, tubers, other field crops, livestock produce and fish. To develop simple processes, low cost equipment and pilot plants for farm/village level processing of food grains, oilseeds and other crops for rural consumption, as well as selling value added products to semi-urban and urban areas for better economic returns. To develop simple processes and equipment farm/village level for better economic utilization of bio-wastes and by-products as food/feed/fuel etc. for increasing profitability of the commodity and income of the farmer.
- To undertake studies on techno-economic feasibility and economic viability of on farm/village level processing industries and other enterprises.
- To field evaluate laboratory proven technologies and carry out operational research trials on the developed technologies for villages to identify technical, managerial and social constraints and take remedial measures before releasing for popularization.
- To facilitate creating of post-harvest technology consciousness and transfer of proven technologies in selected villages and monitoring its effects on economics and social development.
- To generate income and employment in rural areas through adoption of proven technologies and equipment through establishing agro-processing centres.

1.3. MANDATE OF THE PROJECT

- To develop location and crop/commodity specific post-harvest technologies for minimization of quantitative and qualitative losses to produce in agriculture and allied sectors.
- To adapt and develop improved post-harvest processes and equipment for value addition to food grains and other produce at rural threshold for higher income and generation of rural employment.
- To develop processes and equipment for economic utilization on bio-wastes and by-products.
- To conduct operational research and multi-location trials on developed technologies to identify technical, financial, managerial and social constraints for better market acceptability to technologies.
- To establish need based Agro-Processing Centres (APC) and Crop Processing Training cum Incubation Centres (CPTIC)
- To assess, refine and transfer proven technologies.

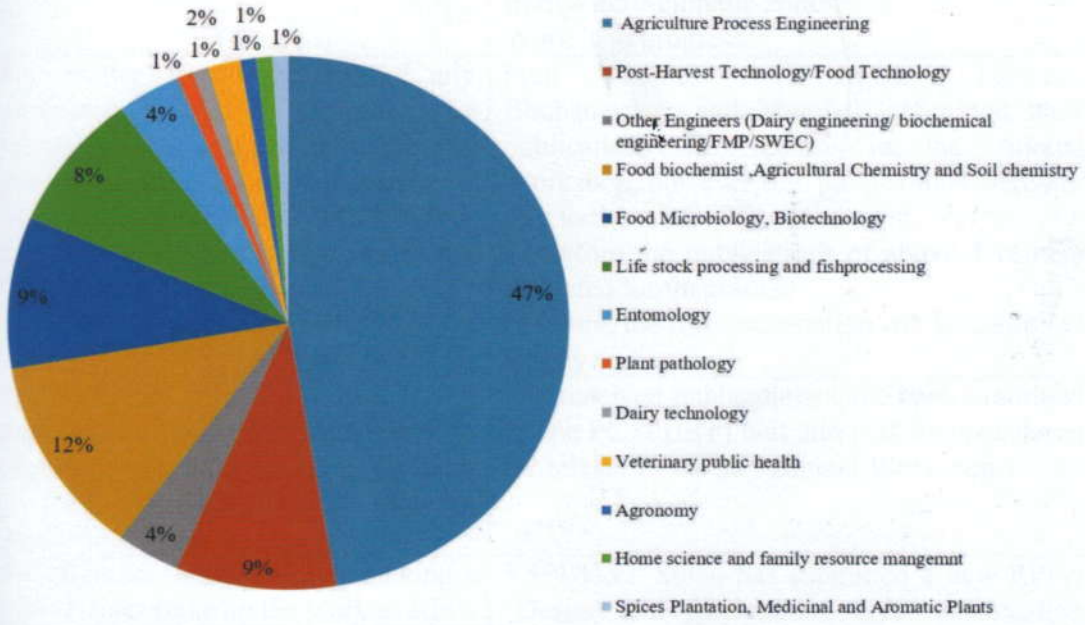
2. LIST OF COOPERATING CENTRES OF AICRP ON PHET AT JANURAY 2022-FEBRUARY 2023

The lists of cooperating centres are presented in this section.

1. College of Agricultural Engineering, Dr. Punjab Rao Deshmukh Krishi Vidyapeeth, **Akola** (Maharashtra)
2. Vivekanand Parvartiya Krishi Anusandhanshala, **Almora** (Uttaranchal)
3. Regional Agricultural Research Station, **Anakapalle** Acharya N.G. Ranga Agri. University Andhra Pradesh)
4. University of Agricultural Sciences, **Bangalore** (Karnataka)
5. College of Agriculture, Acharya N.G. Ranga Agri. University, **Bapatla** (Andhra Pradesh)
6. College of Agricultural Engineering, Orissa University of Agri. & Technology, **Bhubaneshwar** (Orissa)
7. Tamil Nadu Veterinary and Animal Sciences University, **Chennai** (Tamil Nadu)
8. College of Agricultural Engineering, Tamil Nadu Agricultural University, **Coimbatore** (Tamil Nadu)
9. College of Agricultural Engineering, CCS Haryana Agricultural University, **Hisar** (Haryana)
10. Central Agricultural University, **Imphal** (Sikkim)
11. College of Agricultural Engineering, Jawaharlal Nehru Krishi Viswa Vidyalaya, **Jabalpur** (Madhya Pradesh)
12. College of Agriculture, Assam Agricultural University, **Jorhat** (Assam)
13. College of Agricultural Engineering, Junagadh Agricultural University, **Junagadh** (Gujarat)
14. Central Plantation Crops Research Institute **Kasargod** (Kerala)
15. Assam Agricultural University, **Khanapara** (Assam)
16. Indian Institute of Technology, **Kharagpur** (West Bengal)
17. Regional Sugarcane & Jaggery Research Station, **Kolhapur** (Maharashtra)
18. Indian Institute of Sugarcane Research, **Lucknow** - 226 002 (U.P.)
19. College of Agricultural Engineering, Punjab Agricultural University, **Ludhiana** (Punjab)
20. Karnataka Veterinary, AH & Fishery Science University, **Mangalore** (Karnataka)

21. Maharashtra Animal and Fisheries Science University, **Mumbai** (UP)
22. Central Island Agricultural Research Institute (CIARI), **Port Blair Centre** (A & N Islands)
23. College of Agricultural Engineering, Dr. Rajendra Central Agricultural University, **Pusa** (Bihar)
24. College of Agricultural Engineering and Technology, University of Agricultural Sciences, **Raichur** (Karnataka)
25. Indira Gandhi Krishi Vishwa Vidyalaya, **Raipur** (Chhattisgarh)
26. Birsa Agricultural University, **Ranchi** (Jharkhand)
27. College of Horticulture, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, **Solan** (Himanchal Pradesh)
28. Sher-e-Kashmir University of Agri. Sciences and Technology, **Srinagar** (Jammu & Kashmir)
29. Kerala Agricultural University ,KCAET, **Tavanur** (Kerala)
30. Central Tuber Crops Research Institute (ICAR), **Thiruvananthapuram** (Kerala)
31. College of Technology & Agri. Engg., Maharana Pratap Agricultural University, **Udaipur** (Rajasthan)

3. SCIENTIFIC STRENGTH AS ON 31 January 2023



Faculty strength Discipline wise	Numbers
Agriculture Process Engineering	55
Post-Harvest Technology	12
Food Technology	2
Dairy engineering	1
Biochemical engineering	1
Farm Machinery and Power	2
Soil and Water Conservation Engineering	1
Biochemistry	7
Chemical Engineering	1
Veterinary Biochemistry	1

Agricultural Chemistry and Soil chemistry	3
Food Microbiology	8
Biotechnology	1
Life Stock Processing Technology	5
Fish Processing Technology	1
Entomology	3
Plant Pathology	1
Dairy Technology	1
Veterinary Public Health	2
Agronomy	1
Home Science and Family Resource Management	1
Spices Plantation, Medicinal and Aromatic Plants	1
Post Harvest Management of Horticultural Crops	1
Total	**120**

Action taken on general recommendation dated 24.03.2022 of 37th Annual Workshop commenced on 27-29 January 2022

S. No.	General Recommendations	Action taken
1.	It was suggested by DDG (Engg.) that one committee under the chairmanship of Director ICAR-CIPHET and few members as experts & PC as Member Secretary to be formed for evaluating the RPP-III of last five years.	The committee has been formulated. However, the RPP-III of last 5 years has been received from 20 centers only. It is targeted to evaluate the RPP-III by June 2023 and submit report to the DDG (Ag. Engg.).
2.	Impact assessment of popular technologies should be done within three months.	A project on "Techno-economic feasibility assessment and socio-economic impact analysis of selected post-harvest technologies" has been initiated in ICAR-CIPHET, Ludhiana. A total 03 technologies (APC, PDKV dal mill, and Vivek thresher cum pearler) have been included in this study. Data of APCs has been collected from 4 agro-climatic zones. Work is in progress.
3.	The matter for the release of any publication should be submitted one month in advance to the PC Unit and after making necessary corrections, it should go to council for perusal before printing and only printed version of the publication will be released.	Four centers (Kasargod, Tavanur, Bhubaneswar, and Mumbai) submitted their publications for release in the Annual Workshop, however, the publications were not sent to the ADG (PE) for consent. Therefore the publications of above 4 centers are listed for the release. In future, the recommendation will be complied strictly.
4.	Incorporating with all checks and balances AICRP-PHET should provide a specific procedure for any publication to be released during Annual Workshop.	The received publications have been examined by the PC (PHET) unit and may be considered for release in the 38th Annual Workshop.
5.	Solan centre should work on making a hybrid dryer (take up the work as RPP-IV or submit a new RPP-I). The centre may involve a scientist from ICAR-CIPHET or any other centre for engineering work.	YSPUH&F Solan has submitted a new RPP-I "Design and fabrication of osmo-sonication dyer: potential applications in processing". An engineering scientist has joined at the center. A scientist from ICAR-CIPHET will be associated from ICAR-CIPHET during the deliberations.
6.	Monthly progress report should be focused on research work with picture of the process or technology.	This recommendation is being complied for the MPRs.
7.	CIPHET should develop an App, which have all the information regarding new research, process protocol, machinery, and technology,	A project on this aspect has been taken up by ICAR-CIPHET on "development and updating of post-harvest machineries and technologies database". Necessary information has been

	including good picture of the technology.	collected and quotation for development of App has been floated.
8.	All AICRP centres should prepare the good quality picture of established APCs with ICAR logo, on signage and packaging materials.	All the centers have taken action in this direction.
9.	Research paper should be published in reputed journals and should be written in proper scientific way, acknowledging the funding from AICRP on PHET.	Communicated to all centers. Improvements in the publication has been done by some centers (Kasargod, Coimbatore, Bengaluru, Ludhiana, etc.). Still a long way has to go. PC unit will emphasize for quality publications in the future also.
10.	Vocational program should be conducted of different technologies.	Some vocational programs (for example Entrepreneurship on dal milling by PDKV Akola and 36 dal milling units were established during 2022-23) are being taken up. This will be a continuing activity of the centers and centers will be encouraged to conduct the vocational programs.
11.	All research projects should fit in or be in line with our national programmes/priorities only.	Majority of the new proposals are offered in line of the national program including millets processing, automation, etc.
12.	The result of the research should be correlated with energy emission or reduction in carbon emission. Correlate with loss reduction of food etc.	Energy audit has been one of the objectives of the new proposals by the centers.
13.	ATR of 2021 workshop was not properly presented, it should be corrected and resubmitted to Director & expert for acceptance.	Corrections in the ATR is being done. The recommendations of 2021 Annual workshop will be complied during 2023-24 and revised ATR may be submitted latest by April 2023 to the Director ICAR-CIPHET and experts.
14.	Last three year of ATR should be examined by the committee of Dr. D.C. Joshi, Dr. R. C. Maheshwari, Dr. V. K. Sehgal, and Dr. Nachiket Kotwaliwale for knowing the level of their completion.	The action will be taken latest by June 2023 and a report will be submitted to the Council.
15.	A letter to be written to VC/Director research/directors about poor performance of the Kolhapur centre.	Letter to the VC/Director about poor performance has been sent to Kolhapur center and other 8 centers as per the recommendations of QRT (2012-17).
16.	Documentation of AICRP-PHET of the last 50 years since inception should come out by next workshop; impact assessment of scheme technologies should be carried out on priority.	Compilation of the AICRP on PHET work has been done up to 2014. Compilation of the remaining period is in progress and it may be finalized by June 2023. Impact assessment of the technologies is going on and report is expected by the end of 2023.
17.	Thrust area of each centre to be decided by PC for undertaking new project,	Majority of the new project proposals are in the line of the recommendation.

	each centre should work or take project either on machine or product keeping in view of One District One Product (ODOP)/national program.	Further, this recommendation has been recorded for the future programs also.
18.	Protein isolation techniques developed by different centres is altogether different, which one is the best, should be compared and come-up with a final recommendations.	Dr. D.N. Yadav, Pr. Scientist, ICAR-CIPHET, Ludhiana has been nominated to evaluate the protein isolation techniques. Final recommendation is expected by April 2023.
19.	Training should be arranged for young scientist in the area of IoT, Sensor, Robotics; PC should decide and look into the matter, so that majority of projects should be taken using these modern fields of research.	Some of the new projects are proposed in the area of IoT and sensors. This recommendation has been recorded for future compliance also. Action could not be taken up due to paucity of budget in 2022-2023.
20.	Work of each center should be evaluated and suitably declared as specialized centre for a particular or group of commodities such as Rice, Pulse, Jaggery etc.	The action will be taken up in 2023-24 after the evaluation of RPP-III of last 5 years.
21.	Obtain list of farmers from all cooperating centres, whose income has been doubled in last 3-5 years using AICRP technologies.	A few centers have responded because of the nature of PHET activities. However, the efforts are going on and possibly come with compiled information within 3 months.
22.	Content of presentation for RPP-I, II and III are not upto the mark, RPP-II, which were not get presented should be seen by PC and give remarks of satisfactory or not. Centre should follow the guidelines and time limit given for presentation.	Centers has been asked to give their best presentation in the 38th Annual Workshop. For the presentation of one project, a time of maximum 10 min. is allocated. Screening of the RPP-I has already done by the Director CIPHET, ADG (PE, and PC (PHET). Therefore, a background exercise has been ready to reduce the discussion time.
23.	Software should be developed for uploading of all project achievements/progress online at given interval for progress monitoring.	A Google Form is under development for monthly progress report and will be implemented within a short period.
24.	A drive for labeling each machines, tools developed and procured under AICRP-PHET as Funded by AICR-PHET within three months and reports with photographs should be submitted to PC Unit.	All the centers have taken action in this direction.
25.	Revenue generated by technologies licensed/commercialized and trainings conducted under AICRP PHET should be compiled for last five years and a brief report should be submitted for total revenue generated in this project.	Necessary direction has been issued to the centres. However, action is not complete. A proforma is being developed to collect the data because majority of the centers do not have separate information for a particular AICRP or scheme.

CENTER'S WISE PROGRESS REPORT (2022 – 2023)

1. Centre Name: Dr. PDKV, Akola (Maharashtra)

Manpower (Jan-Dec 2022)

S. No.	Categories	Sanctioned Positions	Filled positions, nos.
1.	Scientific	6	5 (2 Contractual & 3 Permanent)
2.	Technical	7	5 (5 Contractual)
3.	Administrative	1	1
4.	Supporting	0	0

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate (₹ in lakh as per EFC)	Fund released (₹ in lakh)	Fund Utilized (₹ in lakh)
1.	Salary Head	95.00	85.00	59.53
2.	Recurring	10.50	8.30	6.42
3.	Non-recurring	4.00	2.00	1.67
4	Total	**109.50**	**95.30**	**67.61**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Development of mobile dal mill and grain cleaning - grading unit	PI: P.H. Bakane Co-PIs: S.R. Sakkalkar; R.D. Bisen; U.H. Khobragade; Indira B. Soneji; Ashwini M. Charpe; Vandana D. Mohod	Feb.2022	Jan. 2024
2.	Establishment of Agro Processing Centre	PI: P.H. Bakane Co-PIs: S.R. Sakkalkar; R.D. Bisen; U. H. Khobragade; Vandana D. Mohod; Ashwini M. Charpe; Indira B. Soneji	Apr. 2016	Continue
3.	Establishment of Value Chain on Pulses	PI: P.H. Bakane Co-PIs: S. R. Sakkalkar; R.D. Bisen; U.H. Khobragade; Vandana D. Mohod	Apr. 2017	Continue
4.	Development of onion spoilage detection device for management of onion storage.	PI: S.R. Sakkalkar Co-PIs: P.H. Bakane; A. M. Charpe; Vandana D. Mohod; R.D. Bisen; U. H. Khobragade; Indira B. Soneji	Feb. 2022	Jan. 2024
5.	Essential oil Impregnated active packaging to restrict green mold of Nagpur	PI: Ashwini M. Charpe Co-PIs: P.H. Bakane; Indira B. Soneji;	Feb.2022	Jan.2024

	mandarin and Standardization of protocol for UV-C Irradiation of sweet orange fruits to reduce post harvest decay caused by green mould under storage.			
Activity				
6.	Development of value chain on marking nut	PI: P.H. Bakane Co-PIs: S.R. Sakkalkar; R.D. Bisen; Indira B. Soneji; Ashwani M. Charpe; Vandana D. Mohod	Feb.2022	Jan.2023

Technology development and outreach activities (Jan-Dec 2022)

Kisan melas /Agri-fairs: Nos (4)

S. No.	Name of the venue	Organizer name	Month/ Year	No. of Participants
1.	Shivar Pheri-2022	Dr. PDKV, Akola	18-20 Oct. 2022	6,500
2.	Central Indias largest Agri Summit "Agro vision" (Workshop, National Expo & Conference)	Agrovision Foundation, Nagpur	25-28 Nov. 2022	1 lakh
3.	Rajya Stariya Bhava Krushi Pradrshan "Agro Tech" at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.	Dr. PDKV, Akola	27-31 Dec. 2022	9.50 lakh
4.	State Level Krushi Mohastov 2023 at Sillod, Aurangabad	Govt. of Maharashtra	1-5 Jan. 2023	2 lakh

Technology demonstration/FLD: Nos (12)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	AICRP on PHET, Dr. PDKV, Akola	18/10/2022 20/10/2022	185	140	200	525
2	AICRP on PHET, Dr. PDKV, Akola	12/10/2022	35	-	-	35
3	AICRP on PHET, Dr. PDKV, Akola	20/12/2022.	100			
4	AICRP on PHET, Dr. PDKV, Akola	21/12/2022	-	51	-	51
5	AICRP on PHET, Dr. PDKV, Akola	23/08/2022	85	-	-	85
6	AICRP on PHET, Dr. PDKV, Akola	22/08/2022	40	-	-	40

7	Village Pimpalkhuta, Tq. Patur, Dist. Akola	28/01/2022	30	10	-	40
8	AICRP on PHET, Dr. PDKV, Akola	20/07/2022	55	-	-	55
9	AICRP on PHET, Dr. PDKV, Akola	20/07/2022	10	5	-	15
10	AICRP on PHET, Dr. PDKV, Akola	10/08/2022	30	5	-	35
11	AICRP on PHET, Dr. PDKV, Akola	27/06/2022	20	-	-	20
12	AICRP on PHET, Dr. PDKV, Akola	15/06/2022	15	3	-	18

Trainings organized

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	AICRP on PHET, Dr. PDKV, Akola	16 March 2022	100	60	-	160
2	AICRP on PHET, Dr. PDKV, Akola. (Funded by ATMA, Nagpur)	15-17 Nov.2022	35	-	-	35
3	AICRP on PHET, Dr. PDKV, Akola. (Funded by ATMA, Parbhani)	16-18 Jan.2023	8	-	-	8
4	AICRP on PHET, Dr. PDKV, Akola	28 Feb.2022	30	-	-	30

Salient achievements of the centre (Jan-Dec 2022)

Publications

1. Peer reviewed
   1. Ashwini Charpe, P. H. Bakane and M. N. Ingole (2022). Restricting sour rot of Nagpur Mandarins under ambient storage by post harvest fruit wash with sodium hypochlorite and wax application**.** Multilogic in Science.12 (43): 20-23. (NAAS Rating 4.51)
   2. BP Bahatkar, SJ Gahukar, AA Akhare, DR. Rathod, AM Charpe and YV Ingle (2022). Isolation, screening and identification of cellulose degrading bacteria from different types of samples. The Pharma Innovation Journal 11(12): 2500-2507 (NAAS Rating 5.23)
   3. Ashwini M. Charpe and Mohini M. Dange (2022). Neem-based Pesticide Formulations and Agro-Entrepreneurship. Accepted for publication in December 2022 issue of Multilogic in Science. (NAAS rating 4.51)
   4. Mohini M. Dange, Ashwini M. Charpe and P. H. Bakane (2022). Performance evaluation of fruit grader for spherical fruits. Accepted for publication in December 2022 issue of Multilogic in Science. (NAAS rating 4.51)
   5. Indira B. Soneji, Pramod H Bakane (2022). The Role of Pectinase in the Rotting of fruits and Vegetables: A Review, International Journal of trend in Scientific Research and Development (IJTSRD).

2.	Other publications 1. Vandana D. Mohod, P. H. Bakane, Jayshri Ughade, Dipti Dhumale and Sonal nage (2022). Evaluation of combined effect of botanicals and diatomaceous earth against Pulse beetle, Collosobruchus spp. in stored Pigeon pea, Scientist, 2022 1(3).4700-4711. 2. Mohini M. Dange, Ashwini M. Charpe and P. H. Bakane (2022). Surface polishing of black mold affected sorghum. Accepted for publication in "International Journal of Current Microbiology and Applied Sciences". 3. P. H. Bakane, G. M. Bele and U. H. Khobragade (2022). Effect of Temperature and Relative Humidity on Ripening of Custard Apple (Annona squamosa L.). Accepted for publication in "PKV Research Journal".
3.	Proceedings, compendiums, technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET 1. हुरडा होणार चवदार; कृषी विद्यापीठाने विकसित केले काढणी यंत्र!, लोकमत, पेज नं. ४, ५ मार्च २०२२. 2. मॉइश्चरची चिंता मिटली; 'ड्रायर' वाळविणार सोयाबीन!, पेज नं. ४, १५ ऑक्टोबर २०२२. **Annual Reports:** 1. Research Review Committee Annual Report Year 2022. 2. Joint Agresso Report Year 2022. **Leaflet:** 1. PKV Mini Dal Mill (English), Publication No; Folder/Dr. Pdkv/Pub/1392/2022. 2. PKV Mini Dal Mill (Marathi) प्रकाशन क्र. घडीपात्रिका/:डॉ . पं. दे. कृ. वि/प्रका/१३९२/२०२२. 3. PKV Cleaner Grader (English) Publication No: Folder/Dr. Pdkv/Pub/1397/2022. 4. पंदेकृवी सफाई व प्रतवारी यंत्र प्रकाशन क्र.:घडीपात्रिका:/डॉ . पं. दे. कृ. वि/प्रका/१३९८/२०२२. 5. PDKV Hurda (Tender Sorghum) Extractor Publication No: Folder / Dr. PDKV /Pub /1395/2022. 6. पंदेकृवि ज्वारी हुरडा काढणी यंत्र प्रकाशन क्र.:घडीपात्रिका:/डॉ. पं. दे. कृ. वि/प्रका/१३९६/२०२२. 7. पंदेकृवी **मिरची बिज निष्कासन यंत्र** प्रकाशन:घडीपात्रिका:/डॉ. पं. दे. कृ. वि/प्रका/१४००/२०२२ 8. PDKV Wet Red Chilli Seed Extractor Publication No.: Folder/ /Pub /13/ Dr. PDKV 99 /2022.

Awards received

1	AICRP on PHET, Dr. PDKV, Akola center received **First Prize in Agro-Tech 2022** in Agricultural Engineering Division.

Agro-Processing Centre (APC) established (Jan-Dec 2022)

S. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1	Lakshmi Agro Processing Centre. Shri Ketan Eknath More, At-Kavathe, Tq. Shirur, Dist. Pune.	04/04/2022.	Dal milling, Wheat Cleaning	4,75,000
2	Balaji Agro Processing Centre, MRS Nanda Bhujbal, At. Shikapur, Tq. Shirur, Dist. Pune.	18/06/2022	Dal Milling, Wheat and Rice Cleaning	8,50,000
3	Gurumauli Agro Process Centre, Mr. Sandip Salve, At. Amadabad, Tq. Shirur, Dist. Pune.	16/05/2022	Dal milling, Besan Mill, Wheat Cleaning	16,85,000
4	Kisan Agro Processing Centre, Shri. Vinod Ganar, At. Village Kalmeshwar, Dist. Nagpur.	12/10/2022	Dal Milling	3,50,000

5	Shri Ram Agro Processing Centre, Shri. Shamrao lambat, At. Village Kothulna, Tq. Saoner, Dist. Nagpur.	26/10/2022	Dal Milling, Wheat Cleaning	2,65,000
6	Adamane Agro Process Centre, Shri. Satish Andmane, At. Village Monda, Tq. Hingna, Nagpur.	07/11/2022	Dal Milling, Wheat Mlilling	2,65,000
7	Swarna Agro Processing Centre, Shri. Ashutosh Nandgowda, At. Rautwadi, Mothi Umari, Akola.	17/08/2022	Dal Milling, Wheat Cleaning	4,50,000
8	Shri. Gajanan Maharaj Agro Processing Centre, Shri. Chandrashekhar Ukirde, At. Village Ukirde, Tq. Barshi, Dist. Solapur.	12/01/2022	Dal Milling, Wheat Cleaning	2,30,000
9	Ojas Agro Processing Centre, Shri. Yashvant Patil, At. Tarwadi, Tq. Navasa, Dist. Ahemadnagar	03/09/2022	Dal Milling, Wheat Cleaning	4,55,000
10	Vaishnavi Agro Processing Centre, Shri. Khopse, At. Tamaswadi, Tq. Nevasa Dist. Ahemdnagar.	11/12/2022	Dal Milling, Wheat Cleaning	2,23,000

Entrepreneurship established (Jan-Dec 2022)

Sr. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1	Kavita Subhash Thombare, At. Adgaon Khurd, Tq, Dist- Aurangabad	March 2022	Dal Milling	1,50,000
2	Avinash Baban Shirsat, At. Ppimpalgaon Tappa, Tq- Pathardi, Dist- A. Nagar	Feb.2022	Dal Milling	2,10,000
3	Hariom Dal Mill, At. Khalapuri, Tq- Shirur (Kasar.) Dist- Beed, Radhika Swayam Sahayata Bachat Gat	June 2022	Dal Milling	1,90,000
4	MRS Kirti Santosh Mandlecha, At. Near Raut Mangal Karyalay, Dattnagar Akaluj, Tq-Malshiras, Dist- Solapur	May 2022	Dal Milling	3,00,000
5	Vinod Patil, At. Hingona (Javkheda) Tq- Dharangaon, Dist- Jalgaon	Feb.2022	Dal Milling	2,50,000
6	Suresh Thote, Chincholi Nimbaji, Tq- Junnar, Dist- Aurangabad	Feb.2022	Dal Milling	1,50,000
7	Vishnu Kalvile, Madani, Tq-Sillod, Dist- Aurangabad	March 2022	Dal Milling	2,50,000
8	Mr. Santosh Mahadev Kadam, Beed	Jan.2022	Dal Milling	1,10,000
9	Mr. Ganesh Shahaji Ghorpde, Parbhani	Jan 2022	Dal Milling	1,15,000
10	Mr. Rajeshwar Anantrao Papulwad, Nanded	Jan 2022	Dal Milling	1,25,000
11	Mr. Shrishna Asaram Chavan, Beed	Feb.2022	Dal Milling	1,50,000

12	MRS Lilabai Bhaurav Patil, Jalgaon	Feb.2022	Dal Milling	95,000
13	Mr. Ambadas Sheshrao Ghogre, Jalna	Feb.2022	Dal Milling	90,000
14	Mr. Bhagwan Dadarao Mulak, Jalna	Feb.2022	Dal Milling	1,25,000
15	MRS Sakhubai Gulabrao Bombale, Parbhani	March 2022	Dal Milling	1,45,000
16	Mr. Manik Bhagwan Bombale, Parbhani	March 2022	Dal Milling	1,35,000
17	MRS Yashoda Kamalkar Dhanwani, Aurangabad	March 2022	Dal Milling	1,40,000
18	Mr. Ramchandra Shankarro kadam, Parbhani	March 2022	Dal Milling	1,52,000
19	Mr. Anna Madhav Pawar, Aurangabad	March 2022	Dal Milling `	1,55,000
20	Mr. Ashwini Nandkishore Bobade, Chandrapur	June 2022	Dal, flour and chilli powder	2,00,000
21	Mr. Gangadhar Kinkar, Karanja.	June 2022	Dal Milling	1,25,000
22	Mr. Sandip Shingne, Akot	Jully 2022	Dal Milling	1,00,000
23	Mr. Vikas Vishnu Janavale, Tq. Shirur kasar, Dist. Aurangabad	Jan.2022	Dal Milling	1,85,000
24	MRS Sima Hanuman Patil, Village-Ladjalgaon, Ahmadnagar.	Jan.2022	Dal Milling	1,98,000
25	Mukund Patil, ATP. -Karulap, Tq. Valava, Sangli	Jan.2022	Dal Milling	3,50,000
26	Suraj Khaire, Atp. Nipani Nimgaon, Tq. Newasa Dist. Ahemdnagar	May 2022	Dal Milling	1,50,000
27	Krushna Fopse, Atp. Tamasvadi, Tq. Newas, Dist. Ahmednagar	May 2022	Dal Milling	1,75,000
28	Narendra Dongre, Mu. Po. Aagar, Tq. Malegaon	Mar 2022	Dal Milling, Papad Milling	3,50,000
29	Ratilal Santosh Baviskar, Shelsura sanpule, Tq. Chopda, Dist- Jalgaon	Jan 2022	Dal Milling	1,50,000
30	Avinash Waghmare, Sindkhed, Tq Aundha, Dist Hingoli	Nov 2022	Besan Milling	3,50,000
31	Gopal Dhepe, Tq. Achalpur, Amravati	Feb 2022	Dal Milling	2,00,000
32	Sudrshan Bike, Village-Chakirde, Tq. Barshi, Dst. Solapur	May 2022	Besan milling	3,85,000
33	Somnath Thube, Village- Rahata, Ahamdnagar	May 2022	Dal Milling	1,50,000
34	Prathmesh Raipure, Tq. Daryapur, Dist. Akola	June 2022	Dal Milling	1,00,000
35	Mr. Abasaheb Dawale, Jamkhed, Dist. Ahmednagar	March 2022	Dal Milling	1,20,000
36	Mr. Jysingh Dhawale, Shrigonda, Dist. Ahmednagar.	March 2022	Dal Milling. Sevai, peanut Shelling.	2,50,000

2. Centre Name: ICAR-VPKAS, Almora (Uttarakhand)

Manpower Detail (Jan-Dec 2022) ICAR centre

S. No.	Categories	Sanctioned	Filled	Vacant
1.	Sr. Scientist (AS&PE)	1	*	1
2.	Research Engineer	1	*	1
3.	Scientist (Biochem/Food Tech)	1	*	1
4.	Technician (T-II-3 / Workshop)	1	*	1
5.	Lab Tech. T-1/ Workshop Tech.	2	*	2
6.	Tech. T-1 (Lab. Tech. /Data Entry Operator)	1	*	1
7.	Jr. Clerk	1	*	1

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate (₹ in lakh as per EFC)	Fund released (₹ in lakh)	Fund Utilized (₹ in lakh)
1.	Salary Head	0	0	
2.	Recurring	5.20	5.20	4.42
3.	Non-recurring	1.00	1.00	0.00
4.	Refunded			0.50
	Total	**6.20**	**6.20**	**4.94**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Extraction of turpentine oil from pineneedle and utilization of pine needle for product development	PI: Shyam Nath Co-PIs: Kushagra Joshi, Tilak Mondal, Hitesh Bijarniya	Apr 2021	Mar 2023
2.	Adaptive trial on improved post harvest equipments suitable for NW Himalayan region	PI: Shyam Nath Co-PIs: Kushagra Joshi, Tilak Mondal, Hitesh Bijarniya	Mar 2005	Continue

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (05)

Name of machine	**Small scale steam distillation unit for Pine Needle**
Capacity	10 kg per batch
Use	Steam distillation of Pine needle for extraction of essential oil
Details	The steam distillation unit comprises of heating unit, steaming chamber, condensation and separating unit Over all Dimension: Length: 90 cm, Width: 60 cm, Height: 180 cm

Photographs	
Cost (₹)	₹ 20,000/-

Name of machine	**Pine charcoal making unit**
Capacity	7 kg/batch
Use	Partial combustion of digested pine needle to make charcoal
Details	It is cylinder within cylinder unit. A weight (4 kg) in the form of circular disc was used to compress the digested and dried pine needle.6 mm hole was provided to the Inner cylinder for partial supply of air during combustion. Overall Dimension: Length: 60 cm, Width: 60 cm, Height: 230 cm
Photographs	
Cost (₹)	₹ 7,000 /-

Name of machine	**Pine needle chapping machine**
Capacity	300 kg/h
Use	Cutting of fresh and free fall pine into pieces for steam distillation
Details	It consists of feeding and cutting hopper, blower, 3 Hp motor, and frame to support all the parts. The feeding and cutting hopper comprise of two layers cutting blades on circular disc. Top layer disc consist of 07 cutting blades and bottom disc comprises of 12 cutting blades. After cutting the cut pine pieces passes through the screen of 12 mm to circular blowing chamber. Output of machine was suitable for steam distillation process. Overall dimension: Length: 112 cm, Width: 106 cm, Height: 146 cm

Photographs	
Cost (₹)	₹ 40,000/-

Name of machine	**Manual Mixture machine**
Capacity	80 kg/h
Use	Mixing of pulverized and overnight soaked digested pine needle with fresh cow dung and lime
Details	This machine can easily be operated by one person for mixing the ingredients and aftermissing, it can be easily poured out. Overall Dimension: Length: 120 cm, Width: 80 cm, Height: 100 cm
Photographs	
Cost (₹)	₹ 20,000/-

Name of machine	**Mould for interlocking block making**
Capacity	
Use	For making the interlocking fencing blocks of prepared mixture (digested and overnight soaked pine needle, fresh cow dung and lime) and also for making the Pine peat block
Details	A manual pressing device was used to compresses the mixture in the block making mould up to pre-set distance for two minute retention time. After retention time the compressed mixture is taken out fromthe mould for sun drying. Screw compression is done by using round handle. Through this compressing unit, 10 blocks per hour can be prepared. **Overall Dimension:** Length:50 cm, Width: 50 cm, Height: 100 cm
Photographs	
Cost (₹)	₹ 8,000/-

Processes/products /protocol developed (Jan-Dec 2022): Nos (03)

Name of the products	**Pine needle essential oil from steam distillation**
Use	In cosmetics and pharmaceuticals
Details	TEST REPORT: GC-MS/MS from UAS Raichur
Photograph	
Cost	**₹ 500 per 100 ml**

Name of the process /products	**Ready to use pine needle peat**
Use	Raising nursery
Details	Annexure-1
Photograph	
Cost	**₹ 20/kg**

Name of the process /products	**Interlocking fencing blocks**
Use	To prepare fencing wall
Details	The chemical composition of pine needle basically composed of tannin (25-30%) and hemicelluloses (60-65%) and others (10%) chemical constituents. But due to presence of tannin; it is waxy in nature and it takes longer period of time for decomposition
Photograph	
Cost	**₹ 20/kg**

Adaptive trails (Jan-Dec 2022): Nos (4)

S. No	Name of the machine/technology	Name of the Trial place	Result/Inference
1	Multi-fruit cum vegetable grader	01	Technology is very much suitable for grading of fruits and vegetable in hilly regions
2	VL chaff cutter	02	Technology is very much suitable for cutting of fodder by single person
3	Wheat thresher	02	Technology suitable for threshing of wheat, But, is some higher in context of hill and if possible a multi-grain thresher can be developed by considering the purchasing capacity of hill farmers
4	Vivek Millet thresher cum pearler	02	Excellent technology for threshing and pearing of finger millet and barnyard millet in hills

Extension activities (Jan-Dec 2022) Nos (14)

Kisan melas /Agri-fairs: Nos (2)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	Kharif Kisan Mela-2022, ICAR –VPKAS Almora	ICAR –VPKAS	25 March 2022	580
2	Rabi Kisan Mela -2022, ICAR –VPKAS Almora	ICAR –VPKAS		500

Technology demonstration/FLD: Nos (11)

S. No.	Date	Particulars	No. of participants		
			Male	Female	Total
1.	07-09 March 2022	Training on Parvatiya Krishi hetu Unnat UtpadanTakneeki	23	05	28
2.	14-16 March 2022	Training on Parvatiya Krishi hetu Unnat UtpadanTakneeki	10	15	25
3.	24 March 2022	Training of Parvatiya Kheshtro me seed production of maize crop	22	00	22
4.	25 March 2022	Kharif Kisan Mela-2022	430	150	580
5.	27-31 May 2022	Short course training programme for BSc (Ag)BHU Students	17	14	31
6.	12-16 June 2022	Pravatiyo kshetro me income generation through protected cultivation	19	00	19
7.	17-21 June 2022	Short course training programme for BSc (Ag)BHU Students	15	13	28
8.	21 June 2022	Efficient use of fertilizer in hilly agriculture	20	23	43
9.	23-27 June 2022	Short course training programme for BSc (Ag)BHU Students	12	13	25
10.	17-19 Aug	Seed production of Onion and garlic	09	12	21

	2022				
11.	24.10.2022	Exposure visit of students of Army School,Ranikhet	14	10	24
12.	28.10.2022	Rabi Kisan Mela -2022	320	180	500
13.	1-5 January 2023	Short course training programme for BSc (Ag)BHU Students	19	11	30

Salient achievements of the centre (Jan-Dec 2022)

Publications

1.	Per reviewed publications: Nil
5.	Proceedings, compendiums, Technical bulletins, News paper, other**Magazine, annual reports other than ACIRP-PHET)** 1. Tilak Mondal, Shyam Nath, Manoj Parihar, Jeevan B. Renu Sanwal, Jaideep Kumar Bisht and Lakshmi Kant. "बनोस्पति दारा फलो मे तिट िथा रोग प्रबंधन". Marudhara Krishi. Jan-Feb, 2022 issue; 31-34. 2. Tilak Mondal, Shyam Nath, Rahul Dev, JP Gupta, Renu Sanwal, SC Panday and Lakshmi Kant. "mUkjk[kM d ioa rh; {ks=k e a dhoh Qy l a vk; l t u"Agri Articles. Nov-Dec 2022 issue; 40-43.

Awards received (Jan-Dec 2022)

1.	**Best Oral Presentation Award** for the research paper entitled "Use of pine needles extracted oils and residues against management of soil born pathogen Fusarium oxysporum and Root knot nematode Meloidogyne sp" during National Symposium on "Recent trends in Phytopathology to address emerging challenges for achieving Food Security" organized on 21-22nd February, 2022 at ICAR-VPKAS, Almora.

Entrepreneurship established (Jan-Dec 2022): Nos (02)

S. No.	Name and Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1	Agri-Kasar Green Tech Solution, Village Ghaneli, Hawalbagh, Almora	Manufacturing of machinery and equipment	19/09/2022	Startup
2	Jai Durga Agrotech	Manufacturing of machinery and equipment	22/10/2022	Startup

3. Centre Name: RARS, Anakapalle (Andhra Pradesh)

Manpower Detail (Jan-Dec 2022):

S. No.	Categories	Sanctioned positions, Nos	Filled positions, Nos
1.	Scientific	**2**	**2**
2.	Technical	**1**	**1**
3.	Administrative	**-**	**-**
4.	Supporting	**2**	**2**

Financial Detail (Jan-Dec 2022):

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC) (ICAR+ State share)	Fund released, (₹ in Lakh) (ICAR+ State share)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	101.33	76.80	49.86
2.	Recurring	18.80	18.40	10.87
3.	Non-recurring	8.00	8.00	2.41
4.	SC SP (General)	2.50	2.50	0
5.	SC SP (Capital)	2.50	2.50	0
	Total	**133.13**	**108.20**	**63.14**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Comparative Quality Assessment of Jaggery prepared by sugarcane cultivated through chemical pesticide (Chlorantraniliprole) and Herba formulation	PI: V. K. Jagannadha Rao Co-PIs: P. Sreedevi, R. Sarita, A. Sireesha	April, 2022	Jan. 2024
2.	Design and development of scrapped heat exchanger for granular jaggery making (Activity)	PI: P. Sreedevi Co-PI: V.K. Jagannadha Rao	April 2019	March 2023

Processes/products /protocol developed (Jan-Dec 2022)

Name of the process /products	a) Standardization of concentration level of disinfectant liquid for washing sugarcane to eliminate the bacterial colonies and fungal growth inhibition was determined using plate diffusion assay. b) Process technology to prepare little millet-based instant idly mix. c) Process technology to prepare foxtail millet-based instant upma mix. d) Process technology to prepare Soy bean incorporated little millet-based instant idly mix. e) Process technology to prepare Ragi malt flour f) Process technology to prepare little millet-based sev.

Use of the process/ products	a) Standardization of concentration level of disinfectant liquid for washing sugarcane to eliminate the bacterial colonies and fungal growth. Identified different bacterial colonies and fungal growth and standardized the concentration level of disinfectant liquid for washing sugarcane before crushing. b) Developed process technology to prepare little millet-based instant idly mix. c) Developed process technology to prepare foxtail millet-based instant upma mix. d) Developed process technology to prepare Soybean incorporated little millet-based instant idly mix e) Developed process technology to prepare Ragi malt flour. f) Developed process technology to prepare little millet-based sev.
Photographs of the process/ products	 **Little millet-based instant idly mix**  **Foxtail millet-based instant upma mix**  **Soybean incorporated little millet-based instant idly mix**  **Ragi malt flour**  **Little millet-based sev**
Cost of the process/ products	Little millet-based instant idly mix –₹ 350/- per kg Foxtail millet-based instant upma mix- ₹ 260/- per kg Soybean incorporated little millet-based instant idly mix- ₹ 300/- per kg Ragi malt flour-₹ 100 per kg Little millet-based sev –₹ 250/- per kg

Adaptive trails (Jan-Dec 2022):

S. No	Name of machine/Technology	Result/Inference
1.	Comparative quality assessment of the jaggery prepared by sugarcane cultivated through chemical pesticide (Chlorantraniliprole) and herbal formulation	The data on early shoot borer (ESB) depicted treatmental variation vividly. In variety 93A145, which is susceptible variety, the cumulative incidence of early shoot borer was more as compared to variety 2006A223. The treatment Chlorantraniliprole @ 0.375 ml/L recorded least incidence of ESB which was closely followed by herbal formulation @ 25 ml/L
2.	Slow-release urea material for enhancing sugarcane yield	The results of observation trial on urease inhibitor on sugarcane nutrient uptake at grand growth stage revealed that, the nitrogen uptake was found to be high with the treatment received 100% recommended dose of nitrogen along with urease inhibitor (254 kg/ha). However, the difference in nitrogen Uptake between the treatment received 100% recommended dose of nitrogen (230kg/ha) and 75% recommended dose of nitrogen along with urease inhibitor (226kg/ha) was found to be low. There was not much treat-mental difference was observed between three treatments on phosphorus and potassium.
3.	Effect of surface disinfectant on microbial load of sugarcane	The studies revealed that surface disinfectant at a concentration of 20 ml/L can remove maximum bacterial load and 40 mL/L can remove fungal growth on the surface of sugarcane.
4.	Performance evaluation of drone for spraying of biopesticides in maize to control fall army worm.	Conducted performance evaluation of drone with biocontrol agents in maize fields at Nagarapalem mandal, Ranasthalam mandal, Srikakulam district, A. P. Drone spraying of biopesticide at three different flight heights and velocities were evaluated.

Technology transferred (Jan-Dec 2022): 2 Nos

S. No	Name of machine/technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of technology transferred	Total revenue generated
1.	Process and machinery for making jaggery granules	One	M/s. Yerukanaidu, Agros, Jangalapalli, Makvarapalem, Anakapalle district	12-08-2022	2,50,000/-
2.	Process and machinery for making jaggery granules	One	University of Agricultural Sciences, GKVK, Bengaluru	18-06-2022	1,50,000/-

Extensions activities (Jan-Dec 2022):

Kisan melas /Agri-fairs: 5 Nos

S. No.	Name of the venue	Organizer name	Month/ Year	No. of Participants
1.	Kisan Mela -cum-Technology and Machinery Mela at N. T. R College of Agricultural Engineering, Bapatla.	Organized jointly by AICRP on PHET Centres, Bapatla and Anakapalle and AICRP on FIM Scheme, Bapatla	26-3-2022	1000
2.	Agri-fair at Togaram, Srikakulam Dt., A. P.	Organized by RARS, Anakapalle	29-9-2022	1000
3.	Kisan Mela at ARS, Vizianagaram	In collaboration with ARS, Vizinagaram	16-12-2022	1000
4.	Ag-Tech, RARS, Lam, Guntur	Acharya N G Ranga Agricultural University (ANGRAU)	3-5 Dec 2022	9000
5.	4th meeting of AP higher education universities	Acharya N G Ranga Agricultural University (ANGRAU)	29-30 Dec 2022	100

Technology demonstrations/FLD: 5 Nos

S. No.	Name of the venue	Organizer name	Month/ Year	No. of Participants
1.	Srikakulam District	"Preparation of Quality Jaggery and preparation of various value-added products from jaggery" to farmers of Gramina Sahaja Farmer Producer Organization, Srikakulam District at RARS, Anakapalle	02-02-2022	**7**
2.	L. Gavavaram, V. Madugula mandal, Anakapalle A.P.	Conducted demonstration on "Preparation of jaggery in the form of small cubes and value-added products of jaggery" at L Gavaravaram, V Madugugala mandal, Anakapalle district	06-4-2022	**15**
3.	KVK, Amadalavalasa	Training to Rural Youth (STRY) on Operation of farm machinery and equipment and preparation of value-added products from jaggery.	26-3-2022	**15**
4.	L. Gavaravaram, V Madugula mandal, Anakapalle	Conducted training programme to the tribal farmers on "Preparation of quality jaggery and its value added products" at L. Gavaravaram, V Madugula mandal, Anakapalle district.	03-06-2022	**31**
5.	RARS, Anakapalle	Organized 3 day training programme to the farmers of Chittoor district on "Preparation of quality jaggery and its value added products" in association with Andhra Pradesh Food Processing Society (APFPS), Vijayawada under PMFME scheme.	06-07-2022 to 08-07-2022	**17**

Salient achievements (Jan-Dec 2022):

Publications

1.	Peer reviewed 1. Jagannadha Rao, P V K., Das, M., and Das, S. K. Development of mechanized system for production of date-palm jaggery granules. Key Engineering Materials, 925,47-56 (Impact factor: 0.49) 2. Sreedevi, P., and Madhava, M. (2022). Quality Improvement of Non-Centrifugal Sugar as Affected by Blanching and Organic Clarification. Sugar Tech, 1-10. (NAAS rating: 7.20) 3. Sreedevi. P, Madhava, M and Jagannadha Rao, P V K. (2022). Evaluating the Bio-Energy Potential of Sugarcane Bio-Mass Briquettes. Pollution Research, 42 (1) (NAAS rating: 5.10)
2.	Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Popular Articles/ Technical Bulletins/Pamphlet: 17 Nos** 1. Success story of Rythu Jattu, technical knowledge provided by AICRP on PHET Centre, Anakapalle regarding jaggery and its value added products on 28-03-2022. 2. "Refractance Window Drying of Foods" published in Agriculture and Food:E-Newsletter, Monthly magazine, March. 3. "Micro encapsulation: An emerging technology in food processing" published in Agriculture and Environment: E-Newsletter, monthly magazine, August, 2022. 4. "Healthy Jaggery" in Dr. Y S R Rythu Barosa monthly Magzine, May 2022 5. "Agro processing centre equipment on rental basis-For the benefit of farmers" published in Eenadu daily news paper on 04-09-2022. 6. "Agro processing centre on rental basis" published in Andhra jyothi daily news paper on 04-09-2022. 7. "Agro processing centre equipment/machinery on rental basis" in sakshi daily news paper on 05-09-2022. 8. "Pootharekulu making using machine" in Andhra Jyothi daily news paper on 11-09-2022. 9. "Pootharekulu making becomes easy" in Sakshi daily news paper on 11-09-2022.

Patents (Jan-Dec 2022)

2	Patent granted a) Design patent on **"Semi-mechanized edible film making machine for paper sweet (pootharekulu)"** was granted on 07-09-2022 vide Patent No.406007. **Contributors:** Dr. P. V. K. Jagannadha Rao, Dr. A. Padma Raju, Dr. Raja Reddy and Dr. P. Sreedevi

Details of awards received by the centres (Jan-Dec 2022): 1 No.

1	"**Certificate of Special Recognition**" from Hon'ble Vice-Chancellor, ANGRAU at Lam, Guntur on 21-01-22 during 51st REAC meeting held virtually and offline at Lam, Guntur, AP.

Agro-Processing Centre (APC) established (Jan-Dec 2022): 2 Nos

S. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1.	Established Agro Processing Centre (APC) for preparation of quality jaggery and value added products at S. Kota, Vizianagaram by "Sri Gowri Rythu Bidda Agriculture and Horticulture mutually added cooperative society limited", comprising of 300 jaggery farmers	10-1-2023	Bhavaninagar, S. Kota, Vizianagaram, Andhra Pradesh	25.0 lakhs
2.	Established Agro Processing Centre (APC) for preparation of quality jaggery and value added products from jaggery and millets by "Rythula Jattu", FPO, Badangi, Vizianagaram, Andhra Pradesh comprising of 400 jaggery farmers This processing centre is involved in processing of jaggery, millets, and pulses.	20-12-2022	Badangi village, Vizianagaram district, Andhra Pradesh	50.0 lakhs

Entrepreneurship established (Jan-Dec 2022): 2 Nos

S. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1.	**Shubham Foods India Private Limited**, Podugupalem (Village), Visakhapatnam-Dist Represented by: Sri Surya	Area: 10,000 sq. ft	26-1-2023	Total budget: 120.0 lakhs
2.	**Sri Kalyani Cashew Industry**, Chinapakhila Village, Ravikavatam Mandal, Anakapalle district. Represented by: Lakshman	Area: 1300 sq. ft	June, 2018	Total budget: 15.0 lakhs

Details of success stories (Jan-Dec 2022):2 Nos

1.	Name of the **of success stories/ name of the beneficiary/ address** Shri. Vegi Srinivas garu is a resident of Jangalapalli Village, Makavarapalem Md., Anakapalle district, A. P. under the technical guidance of AICRP on PHET, Regional Agricultural Research Station, Anakapalle, has established M/S. Yeruka Naidu Agros in the month of September, 2020. The firm was established in an area of 6000 sft in Jangalapalli Village, Makavarapalem Md., Anakapalle district, A. P. . Approximately 500 tonnes of jaggery in the form of solid, granular and syrup was produced per year in this manufacturing unit. Jaggery was sold at a price of ₹ 65-70 per kg. Around 360 tonnes of jaggery was exported to Dubai and United States of America. Approximately, ₹ 120.00 lakhs of profit was obtained per year though the sales of jaggery in India and abroad.

	M/S. Gramina Sahaja, Farmer Producer Company Ltd was established in Nimmathorlada Village, Amadalavalasa Mandal, and Srikakulam District in August, 2019 and trained society members regarding preparation of jaggery and its value added products. Sugarcane is grown organically in an area of 100-120 acres. Organic chemical free jaggery of 50 tonnes per year was produced from this organization. Jaggery was sold at a price of rs 54 per kg and a profit of 30 lakhs exclusively from the sale of jaggery is being obtained. In addition, millets processing is also being carried out by this organization. In total ₹ 60 lakh profit is earned by this FPC through the sales of both jaggery and millets. During the year 2022, 5 tonnes of jaggery produced here was supplied to Tirumala Tirupathi Devastanam (TTD), Tirupathi towards making of the prasad laddus.

1. Any other relevant information (Jan-Dec 2022):

Studies on "Effect of surface disinfectant on microbial load of sugarcane"

Two types of bacterial colonies and one type of fungal colony were observed to be predominant in samples washed with disinfectant. Therefore, these colonies were purified and sent for characterization at CSIR- Institute of microbial Technology, Chandigarh. Characterization of bacterial and fungal colonies using 16S rRNA gene sequence analysis and ITS region sequencing respectively revealed the following results.

Type of culture	Identification
Fungal culture (SF1)	Fusarium oxysporum
Bacterial colony (SB1)	Bacillus altitudinis

Characterization of another bacterial colony is under progress.

Moreover, effective concentration level of disinfectant liquid for washing sugarcane to eliminate the above bacterial colonies was determined using plate diffusion assay. As the colonies were predominant on sugarcane surface even after washing the cane with surface disinfectant @ 20 mL/L concentration, the concentration levels from 40 to 100 mL/L were selected for inhibition studies. Nutrient agar plates were inoculated with respective bacterial strains followed by making wells in the agar plates. Different concentrations of surface disinfectant were introduced into the wells (50µl) and a control well was maintained without disinfectant. The agar plates were incubated for 24 h to develop inhibition zones.

The diameter of inhibition zone increased with increase in concentration of disinfectant. Inhibition zones for SB1 were found to be in the range of 1.5 to 2.1 cm and for SB2 were in the range of 0.5 to 1.8 cm. The minimum inhibitory concentration of disinfectant for SB1 and SB2 was found to be 40 mL/L.

Foxtail millet-based Instant Upma Mix

Foxtail millet-based instant upma mix was prepared using millet semolina (100 gm), dehydrated vegetables (carrots, green chilles- 5g each) and fried spices (mustard, jeera, bengal gram- 5gm each). Foxtail millet semolina was obtained by using mini pulveriser followed by sieving. Semolina was dry roasted for 5 minutes, dehydrated vegetables and spices were added to the mix and were packed in HDPE covers To prepare control sample, foxtail millet semolina in the above mix was replaced with wheat semolina. Results of sensory evaluation revealed higher acceptance of foxtail millet-based upma mix compared to control. Following parameters were analyzed for both the samples.

	Foxtail Millet Upma	Control Upma
Cooking time	10.5 minutes	12.5 minutes
Rehydration ratio	1:4	1:3
Water uptake ratio	60%	45%
Cooked weight	Increased by 4 times	Increased by 5 times

Little millet-based instant idly mix: Little millet-based instant idly mix was prepared using black gram flour, millet semolina, and rice ravva. Black gram and millets were roasted and milled to flour and semolina respectively. Different proportions of millet semolina, and rice ravva were mixed keeping black gram flour constant to standardize the instant idly mix. Results of sensory evaluation revealed higher acceptance of idly mix containing 25 g of blackgram, 60 g of rice ravva and 15 g of millet semolina compared to other formulae. Physical and cooking properties of instant idly mix such as bulk density, tapped density, pH, cooking time water uptake, rehydration ratio, texture of idly were studied.

Soy bean incorporated little millet-based instant idly mix: Little millet-based instant idly mix was prepared using black gram flour, millet semolina, soyabean flour and rice ravva. Black gram and millets were roasted and milled to flour and semolina respectively. Different proportions of millet semolina, soyabean flour and rice ravva were mixed keeping black gram flour constant to standardize the instant idly mix. Results of sensory evaluation revealed higher acceptance of idly mix containing 25 g of blackgram, 55 g of rice ravva, 6.5 g soyabean flour and 5 g of millet semolina compared to other formulae. Physical and cooking properties of instant idly mix such as bulk density, tapped density, pH, cooking time water uptake, rehydration ratio, texture of idly were studied.

Ragi malt flour: Ragi grains were cleaned, washed and blotted followed by soaking in water for 12h. Water was drained and kept for germination for 12 h at room temperature. Germinated ragi was dried at 40 °C in hot air dryer for 16 h. Dried ragi was milled in pulverizer to obtain flour and packed in packed in HDPE covers The price of ragi malt per kg was approved at ₹ 100/- by the university.

Little millet-based sev: Little millet-based sev was prepared using black gram flour, millet flour and besan. Varying the proportions of millet flour and besan and mixed with ingredients i. e., black gram flour, oil, spices by keeping them constant to standardize little millet-based sev. Results of sensory evaluation revealed higher acceptance of sev containing 40 g of millet flour and, 20 g of besan compared to other formulae.

Major Events Organized

Dr. P V K Jagannadha Rao, Research Engineer and Dr. P Sreedevi have participated in Kisan Mela -cum- Technology and Machinery Mela organized jointly by AICRP on PHET Centres, Bapatla and Anakapalle and AICRP on FIM Scheme, Bapatla at N. T. R College of Agricultural Engineering, Bapatla on 26-3-2022 and exhibited value added products of jaggery and explained importance of the jaggery and its value-added products to the farmers and students.

Kisan Mela -cum- Technology and Machinery Mela at N. T. R College of Agricultural Engineering, Bapatla on 26-3-2022.

4. Centre Name: UAS, Bangalore (Karnataka)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	8	5 Permanent
2.	Technical	10	5 (3 Permanent +2 contract)
3.	Administrative	1	1 (0+1 on contract)
4.	Supporting	0	0

Financial Detail (April-Dec 2022)

S. No.	Budget head	Budget Estimate (₹ in Lakh as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	160.00	88.00	90.00
2.	Recurring	10.50	6.30	09.26
3.	Non-recurring	3.00	2.00	0.00
4	Total	**173.50**	**96.30**	**99.26**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Development of Ready-to-Eat (RTE) and Ready-to-Cook (RTC) Quinoa-based Breakfast Mixes/Products	PI: Shobha, D. Co-PIs: M. Manjunatha, Suresha, K. B	April, 2021	March 2023
2.	Development of Dehuller for Buckwheat	PI: Darshan, M.B. Co-PIs: M. Manjunatha, Shobha, D.	April, 2021	March 2023
3.	Parboiling of Selected Small Millets to Improve Their Milling, Cooking and Nutritional Qualities	PI: Darshan, M. B Co-PIs: M. Manjunatha, Suresha, K.B.	April, 2021	March 2023
4.	Design and development of bioprocessor for nutri-cereals batter & fermented millet batter from foxtail and kodo	PI: M. Manjunatha Co-PIs: Mahesh Kumar G., Darshan, M. B., Suresha, K. B.	April 2022	March 2023
5.	Enzymatic modification of protein isolate(/s) from sunflower seed de-oiled cake and its utilization/application in food product	PI: Ramesh, B.N. Co-PIs: M. Manjunatha, Darshan, M. B.	April 2022	March 2024
6.	Development of Process Technology for coconut milk-based dairy analogues	Dr. KB Suresha (Co-PI)	April 2022	March 2024

Mchines/Gadgets tools/ instruments developed: Nos (02)

<table>
<tr><td>Name</td><td>Tamarind seed separator</td></tr>
<tr><td>Capacity</td><td>100 kg/h for continuous feeding</td></tr>
<tr><td>Use of machine</td><td>Separation of tamarind seeds from the pulp-seed mix obtained after deseeding process of dehulled and defibred tamarind pods in Tamarind Deseeder (UASB Model -1)</td></tr>
<tr><td>Details of machine</td><td>
<table>
<tr><th colspan="2">Brief Specifications of Tamarind Seed Separator</th></tr>
<tr><th>Components</th><th>Description</th></tr>
<tr><td>Perforated cylinder</td><td>510 mm diameter and 930 mm length
Material: GI mesh (square mesh 12 mm (for small seeds) and 15 mm (for big seeds), Cylinder speed: 40 rpm</td></tr>
<tr><td>Frame</td><td>Dimension (L × W ×H): 1180 × 680 ×690 mm
Material: MS Angle</td></tr>
<tr><td>Shaft</td><td>Dimension: 32 mm diameter and 1480 mm length
Material: MS Bright rod</td></tr>
<tr><td>Power drive</td><td>1 hp single phase electric gear motor
Drive pulley: 3″ diameter
Driven pulley: 8″ diameter</td></tr>
</table>
The prototype of Tamarind seed separator has a trommel type design and consists of perforated revolving cylinder (square mesh type perforations) supported on rigid rectangular frame. Perforated cylinder is made by using three flat rings which are attached to a central shaft with the help of three spokes and collar bush in each ring. Square GI mesh is fitted over upper surface of the flat rings to give perforated cylinder or trommel like structure. One end of the cylinder is kept open (Feed end) for feeding pulp-seed mix and another end (Outlet/discharge end) is closed with lid. Perforated cylinder along with shaft is inclined downward from feed end to outlet end. Slope of inclination is controlled by adjusting the legs of frame at outlet end. The cylinder revolves over a longitudinal axis with the help of pulleys and gear motor. A retention time for effective seed separation is controlled by speed of the cylinder, slope of the cylinder and operation time. The pulp collected after separation at outlet end can be taken by opening the closure lid and the seeds to be collected at bottom of the separator.</td></tr>
<tr><td>Photograph</td><td> 
Prototype of tamarind seed separator</td></tr>
<tr><td>Approximate Cost</td><td>₹ 20,000/-</td></tr>
</table>

Machine name	**Tamarind concentrate production plant from deseeded pulp (Pilot Scale Tamarind Processing Plant)**
Capacity	150 kg/batch
Use	It is used for production of tamarind pulp paste or tamarind pulp concentrate from tamarind pods.
Details	Tamarind Pulp Concentrate Plant is used for production of tamarind pulp paste or concentrate from tamarind pods. The following are the main components of pilot plant. a. Tamarind fruit bubble jet washer unit: It is a stainless steel (SS-304) unit having 30 kg/batch capacity and used for preliminary washing of pulp for removal of dirt, soil particle, etc. Dehulled and defibred tamarind pod/ deseeded tamarind raw pulp is cleaned by high whirl jet bubbles formed by bubble generator (Specifications: Volumetric Capacity- 50 lit, Water consumption -100 LPH, Bubble Generator- 0.5 HP Total power, Loading –Manual, Unloading -Manual by Tilting perforated basket. b. Trolley: It is movable SS tank (SS-304) to collect washed fruits from fruit washer c. Tamarind wet pulp and juice extraction unit with turbo agitator: It is a bottom jacketed vessel made up of SS-304 having 100 litres holding capacity and used for extraction of wet pulp/juice from washed tamarind pods/raw pulp. Steam is passed into bottom jacket to increase the temperature. Turbine type agitator is provided for easy extraction and uniform mixing. d. Pre-stratification unit: It is stainless steel tank (SS-304) and consists of filtering screens. e. Juice/Pulp Stratification Unit: It is a cylindrical tank with conical bottom. It is made up of 2 mm thick SS-304 and suitable for 150 kg/batch extraction (Maximum volume is 200 liters) f. Utilities section: It includes boiler for steam generation, Control Panel with Digital Indicators, all necessary electrical, SS piping, fittings, SS skid, centrifugal pumps, etc.
Photograph	 Tamarind Pulp Processing Plant (Pilot Scale Plant)
Approximate Cost	**₹ 20,56,666/-**

Processes/products /protocol developed (Jan-Dec 2022): Nos (04)

Name of the process/products	**Development of quinoa-based Ready-to-cook (RTC) mixes**
Use of the process/ products	Ready-to-cook (RTC) mixes, good source of Protein, dietary fiber, calcium and Iron. Can be cooked between 3-4 min.
Details of the process/ products	1. Quinoa-based Ready-to-Cook (RTC) Bisibele bath mix 2. Quinoa-based Ready-to-Cook (RTC) Pongal mix 3. Quinoa-based Ready-to-Cook (RTC) khara bath mix 4. Quinoa-based Ready-to-Cook (RTC) dhokla mix
Photograph	  **1. Quinoa-based Ready-to-Cook (RTC) Bisibele bath mix**   **2. Quinoa-based Ready-to-Cook (RTC) Pongal mix**   **3. Quinoa-based Ready-to-Cook (RTC) khara bath mix**   **4. Quinoa-based Ready-to-Cook (RTC) dhokla mix**
Approximate cost	1. Quinoa-based Ready-to-Cook (RTC) Bisibele bath mix **₹ 92**/100 g 2. Quinoa-based Ready-to-Cook (RTC) Pongal mix- **₹ 73**/100 g 3. Quinoa-based Ready-to-Cook (RTC) khara bath mix- **₹ 81**/100 g

	5. Quinoa-based Ready-to-Cook (RTC) dhokla mix- **₹ 71**/100 g

Extensions activities (Jan-Dec 2022): Nos (5+13+62)

Kisan melas/Agri-fairs: Nos (5)

	Name of the venue	Organizer name	Month/Year	No. of Participants
I	"Farm Machinery and Implements Mela-2022" held at ZARS, VC Farm, Mandya	ZARS, VC Farm, Mandya	30 March, 2022	2000 plus
ii	Demonstration of Tamarind Processing Machines held at ICAR-AICRP on PHET, UAS, Bangalore for the farmers of KVK, Konehalli arranged by PC	ICAR-AICRP on PHET, UAS, Bangalore	15 June, 2022	30
iii	Demonstrated Tamarind Processing machines developed by ICAR-AICRP on PHET (UAS-Bangalore) for farmers of Maharashtra	ICAR-AICRP on PHET, UAS, GKVK, Bangalore	1 July, 2022	30
iv	UAS Bangalore Centre with all Scheme staff participated and demonstrated to farmers 14 PHET Equipments developed by the Scheme over the years in UAS KRISHIMELA 2022 organized at GKVK Campus on Nov 3-6, 2022.	University of Agricultural Sciences, Bangalore	3-6 November, 2022	In lakhs
v.	Dr. K. B. Suresha displayed the millet varieties and millet-based value added products in the Millet Conclave-2022 representing UAS, Bangalore held at UAS, Raichur from 26-27th of August, 2022 organized by UAS Raichur and NABARD. (No. of participants -2000)			

Training Programmes Organized: Nos (13)

1. Dr. B. Kalpana, Dr. D. Shobha and Dr. M. B. Darshan conducted EDP training programme on "Processing and Value addition of Fruits and Vegetables" sponsored by ICAR SDC-TSP at Uluvagilu village, Mudigere taluk (Karnataka) during 17-18 March, 2022.
2. Dr. M. B. Darshan, Dr. K. B. Suresha and Dr. B. Kalpana EDP training programme on "Post-Harvest Processing and Value addition of Millets" sponsored by ICAR SC-SP at DATC, Ramakrishnapura, Anekal (Karnataka) during 22-23 March, 2022.
3. Dr. M. B. Darshan, Dr. D. Shobha and Dr. B. Kalpana conducted EDP training programme on "Processing and Value addition of Tamarind" sponsored by ICAR SDC-TSP at Punjanuru village, Chamarajanagara (Karnataka) during 25-26 March, 2022.
4. Dr. D. Shobha, Dr. B. Kalpana and Dr. Roopa B Patil conducted EDP training programme on "Processing and Value addition of Major cereal grains" sponsored by ICAR SDC-TSP at KVK, Chamarajanagara (Karnataka) during 25-26 March, 2022.
5. Dr. D. Shobha, Dr. M. B. Darshan and Dr. B. Kalpana conducted EDP training programme on "Post-Harvest Processing and Value addition of Tamarind" sponsored by ICAR SDC-TSP at Bannikuppe, Hunsur Taluk, Mysore District (Karnataka) during 28-29 March, 2022.
6. Dr. D. Shobha, Dr. B. Kalpana and Dr. Roopa B Patil conducted EDP training programme on "Processing and Value addition of Millets" sponsored by ICAR SDC-TSP held at KVK, Konehalli (Karnataka) during 29-30 March, 2022.

7. Dr. K. B. Suresha organized Training programme on “Production, Processing and Value addition of millets in collaboration with ATMA Mysore held at HD Kote and Centre of Excellence on nutricereals (Karnataka) during 6-7 April, 2022.
8. Dr. M. B. Darshan organized SDC Training programme as an Associate Co-ordinator on “Repair and Maintenance of farm Implements and Machinery” organized by ICAR-TSP at Kestur village, Kora Hobli, Tumkur taluk (Karnataka) during 19-21 July, 2022.
9. Dr. K. B. Suresha organized International Conference on “Food, Health and Natural ingredients for producing sustainable and safe food” at BIEC, Bangalore (Karnataka) during 21-23 September 2022.
10. Dr. K. B. Suresha organized Poshan Gyan on Nutricereals-Millets programme organized jointly by Mount Carmel College, Bangalore and Centre of Excellence for Nutri-Cereals at Auditorium-III, GJB, Mount Carmel College, Bangalore on 29.09.2022.
11. Dr. D. Shobha organized EDP training programme on “Maize processing and value addition” sponsored by ICAR SDC-TSP at KVK, Chamarajanagara (Karnataka) during 28-29 Sept, 2022.
12. Dr. M. B. Darshan organized HRD training programme on “Post-harvest Processing and Value addition of Forest produce” sponsored by ICAR SDC-TSP at V. G. Doddi Village, Magadi, Ramanagara (Karnataka) during 20-21 Octo, 2022.
13. Dr. K. B. Suresha organized SDC-SCSP training programme on “Siridhanyagala Samskarane mattu Moulyavardhane” sponsored by ICAR SDC-SCSP, AICRP on PHET, CoE-Nutricereals and FTI, UAS, GKVK, Bangalore held at FTI & CoE-Nutricereals, GKVK, Bangalore from 9.11.2022 to 10.11.2022.

Salient achievements (Jan-Dec 2022)

Publications (Jan-Dec 2022): Nos (15+18=33)

1.	**Peer reviewed** 1. Navjot Kaur., Ramesh Kumar., Alla Singh., Shobha D, Abhijit Kumar Das., Dharampaul Chaudhary, Yashmeet Karu., Pardeep Kumar., Priti Sharma and Baljit Singh., 2022, Improvement in nutritional quality of traditional unleavened flat bread using quality protein maize. Frontiers in Nutrition, Nov, 2022. DOI:10.3389/fnut.2022.963368. (NAAS 12.58) 2. G Mahesh Kumar, Manjunatha M, Divyashree HR and BA Anand, 2022, Reusable device for cooling beverages and liquid foods: A novel approach to replace ice in glass. Journal of Food Process Engineering DOI: 10.1111/jfpe.14074. (NAAS 8.36). 3. Veena U. K, Shobha D, Neena Joshi, Darshan M. B and Benherlal P. S (2022). Spirulina enriched gluten free quality protein maize (QPM) pasta as functional food. Emirates Journal of Food and Agriculture. 34(4): 279-288. (NAAS 7.64). 4. Mahesh Kumar G, Rekha M. R., Kiran N, Praneeth J, Chitranayak S, Manjunatha M and Sharana B.2022. Design and development of sub-baric thermal processer for frying of Gulabjamun: A deep-fat fried dairy product. Journal Food Process Engineering (NAAS 7.45). 5. Brundha AR., Shobha, D., Devaki, CS and Shekhara Naik, R., 2022, Nutritional, functional and shelf life studies of RTC little millet bisibelebath mix. The Pharma Innovation Journal, 11(3):476-484. (NAAS 5.86) 6. Monika Sharma and Rajasekhar Tellabati, Rupesh Prabhudas Datir, Menon Rekha Ravindra, Manjunatha M, 2022, Optimization studies on mixing of curd and ingredients during Lassi (Stirred Curd) manufacturing. Indian Journal of Dairy Sciences.75(2). (NAAS 5.95)

	7. Mallikarjuna Patil, Ramachandra, C. T., Mahesh Kumar, G., Suresha, K. B. and Prasanna Kumar, 2022, Design and Development of solid state cooling module for raw milk cooling. Indian J Dairy Sci., 75 (1): 37-44 (NAAS 5.95) 8. Venkatesh, R., Neena Joshi, Shobha, D and Thirumalesh, B V., 2022, Pesticide Residues in Ginger (Zingiberaceae) from Selected Rural Areas of Mysuru District, Karnataka, India. Pesticide Research Journal, 33 (2): 126-128. (NAAS 5.49) 9. Viswanatha Angadi, Shashikumar, J. N. and Suresha, K. B., 2022, screening of lactobacilli cultures for their antibacterial activity against food borne pathogens. The Pharma Innovation Journal,11 (3): 2183-2186 (NAAS 5.23) 10. Sachin, S. B., Darshan, M. B., Palanimuthu, V., Mohan Kumar, T. L. and Jayashree, G. C.2002, An experimental study on hybrid drying of Simarouba glauca leaves, The Pharma Innovation Journal-International Journal, 11 (7): 2381-2387. (NAAS 5.23) 11. Jayalakshmi, S. A., Sawant, A. A. and Suresha, K. B., 2022, Assessment of physicochemical, nutritional composition and texture qualities of proso millet (Panicum miliaceum L.) flakes. The Pharma Innovation Journal, 11(9): 1821-1824 (NAAS 5.23) 12. Jyothi, G. S., Chikkanna, Manjunath, R., Suresha, K. B. And Ambika, D. S., 2022, Production of spray dried jackfruit powder from enzymatic liquefied juice. The Pharma Innovation Journal, 11(10): 1626-1633 (NAAS 5.23) 13. Bhuva, S. S. and Darshan, M. B.2022, Study on Drying of Simarouba glauca leaves, International Journal of Agriculture, Environment and Biotechnology, 15 (Special issue): 445-453. (NAAS 4.54) 14. Shubhajit Sarkhel, Dronachari Manvi, CT. Ramachandra, Manjunatha M, Uday Kumar Nidoni, 2022, Studies on supercritical fluid extraction and spray drying effect on the quality of instant tea of Mulberry leaves (Morus alba L.) Measurement: Food 7 100052. https://doi. org/10.1016/j. meafoo.2022.100052. 15. Ravi, S. K., Ramesh, B. N., Shilpa, Kj., Poyya, J., Karanth, J and Raju, N. G., 2022, Neuroprotective role of herbal alternatives in circumventing Alzheimer's disease through multi-tartgeting approach-a review. Egyptian Journal of Basic and Applied Sciences, 9(1): 91-124
2.	**Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): Nos (18)** **Oral Presentations** 1. Shobha, D, Vasudevan, SN and Manjunatha, M, 2022, An agribased entrepreneurship on foxtail millet-based breakfast mixes. Oral presentation at International Conference on Biotechnology - Trends and Future prospects 2022 organized by Department of Biotechnology, UAS Bangalore held at UAS, GKVK, Bangalore from 13^{th}-15^{th} of September, 2022. 2. Manjunatha, M, Divyashree HR, Mahesh Kumar and Anand, BA, 2022, Reusable device for cooling beverages and liquid foods: A novel approach to replace ice in glass. Poster presented in the International Conference on Biotechnology - Trends and Future prospects 2022 organized by Department of Biotechnology, UAS Bangalore held at UAS, GKVK, Bangalore from 13^{th}-15^{th} September, 2022. 3. Suresha, K. B. and Sathishkumar, 2022, Nutri-Cereals (Millets): Processing and Value Addition In: International Conference Food, Health and Natural ingredients for producing sustainable and safe food held at BIEC, Bangalore from 21-23 September 2022 organised jointly by Informa Marketing, Mumbai and AFSTI, Bangalore Chapter. E-Compendium Pp.12-16

	4. Shivaleela, H. B. and Suresha, K. B., 2022, Millets - Natures unity of nutraceuticals in Daily Meal & health. In: International Conference Food, Health and Natural ingredients for producing sustainable and safe food held at BIEC, Bangalore from 21-23 September 2022 organised jointly by Informa Marketing, Mumbai and AFSTI, Bangalore Chapter. E-Compendium Pp.17-21 **Training Manual** 1. Shobha, D., Manjunatha, M., Kalpana, B., Suresha, K. B., Darshan, M. B., Veena, R., Poornima, D. S., 2022, "Siridhanyagala Samskarane matthu Moulyavardhane" under SDC Training programme held on 29-30th March, 2022. 2. Shobha, D., Manjunatha, M., Kalpana, B., Suresha, K. B., Darshan, M. B., Veena, R., Poornima, D. S., 2022, "Pramukha Aahara Dhanyagala Samkarane matthu Moulyavardhane" under SDC Training programme held on 25-26th, March 2022. 3. Kalpana. B., Shobha, D., Veena R., Poornima, DS., 2022, "Hannu mathu tharakarigala samskarane mathu moulayavardhane" under SDC Training programme held on 17-18th March, 2022 4. Palanimuthu, V., Kalpana, B., Suresh K. B., Shobha, D., Darshan M. B., Veena, R., Poornima D. S., 2022, "Post-Harvest processing and value addition of Millets under SDC Training programme held on 24-25th of March, 2022. 5. Shobha, D and Chandrakala Hanagi, 2022, "Post-Harvest processing and value addition of Maize under SDC Training programme held on 28-29th of September, 2022. **Popular article in Kannada** 1. Shobha, D and Sreedevi, M. S., 2022, "GeruHanina Samskarana taantrikathegalu haagu Moulyavardhane". Published in Krushi Vignana sanchike 46 (1): 9-13 2. Shobha, D and Sreedevi, MS., 2022, Kaachakki - Poushtika mahathva haagu Moulyavardhane. Krishi Vignana, April-June, 2022, 46(2): 8-12 3. D. Shobha and K. S. Shubhashree (2022) "AaharadaVivedhyathegagi beli ragi" Krishi vigyana, 46(3)/ 5-11 (Kannada) 4. D. Shobha and M. S. Sreedevi (2022) "Maveena hannina kylu haagu kyelinothara neervahane" Krishi vigyana, 46(3)/ 21-24 (Kannada) **Popular article in English** 1. Veena R and Shobha, D., 2022, Alternative and Non thermal Food Processing methods - Agriculture & Food: E-Newsletter ISSN: 2581-8317 Vol.4(05):34-36, May 2022. 2. Veena R and Shobha, D., 2022, Plantain Flour: Benefits and Uses - Agriculture & Food: E-Newsletter ISSN: 2581-8317 Vol.4(05): 46-47, May 2022. 3. Veena R and Shobha D (2022) Oil seed Cakes: Its Anti-Nutritional Factors, Agriculture & Food: E-News letter, 4(8) pp 246-248, Aug 2022 4. Veena, R and Shobha, D (2022) "Utilization of Pineapple Waste, Agriculture & Food: E-Newsletter ISSN: 2581-8317 Vol.4(11): 146-148, Nov 2022. 5. Rudragouda Chilur, Krishnareddy G S, Jayashree, G C and Darshan, M B., 2022, Kannada: Soura Shakti Chalitha Neeravari Pump Set Vyavaste (Solar energy operated Irrigation Pump Set System) - (under RKVY).

Awards (Jan-Dec 2022): Nos (08)

1.	1. Manjunatha, M, Divyashree HR, Mahesh Kumar and Anand, BA Received Best oral presentation award for the paper entitled Reusable device for cooling beverages and liquid foods: A novel approach to replace ice in glass in the International Conference on Biotechnology - Trends and Future prospects 2022 organized by Department of

	Biotechnology, UAS Bangalore held at UAS, GKVK, Bangalore from 13-15 Sep, 2022. 2. Shobha, D and Ravishankar C. R. Received "Best Oral Presentation award" for the paper entitled: "Suitability of germinated finger millet for the preparation of Ready-to-cook (RTC) mix" at International Conference on "Harnessing the Potential of Finger millet for achieving Food and Nutritional Security; Challenges and prospects (ICFM-2022)" organized by UAS, Bangalore at College of Agriculture, V. C. Farm, Mandya held from 19-22 Jan, 2022. 3. Shobha, D Received "Best Article Award" for article id 10759 entitled: Processing and Value addition of Baby Corn published in Agriculture & Food: e-Newsletter Vol 03- Issue 09 (2021) on 07.03.2022 through online. 4. MRS R. Veena Received Best Article Award for article id 35298 entitled: Fruit and Vegetable wastes: Base for Novel Added products published in Agriculture & Food: e-Newsletter Vol 03- Issue 12 in (2021) on 08.03.2022 through online. 5. Shobha, D, Vasudevan, SN and Manjunatha, M Received Best Oral Presentation award for the paper entitled an agribased entrepreneurship on foxtail millet-based breakfast mixes. Oral presentation at International Conference on Biotechnology - Trends and Future prospects 2022 organized by Department of Biotechnology, UAS Bangalore held at UAS, GKVK, Bangalore from 13^{th}-15^{th} September, 2022. 6. Kalpana, B, Veena, R, Ramya KG and Palanimuthu, V, Received Best Poster Presentation award for the poster entitled Protein concentrates from sunflower de-oiled cake- An alternative source of protein for food supplements. Poster presented in the International Conference on Biotechnology - Trends and Future prospects 2022 organized by Department of Biotechnology, UAS Bangalore held at UAS, GKVK, Bangalore from 13^{th}-15^{th} September, 2022. 7. Vishwaradhya M Biradar, Viresh kumar Gowda and Suresha, KB Received Best Poster Presentation award for the poster entitled Development of Ready-to-cook (RTC) pasta product from red rice. Poster presented in the International Conference on Biotechnology - Trends and Future prospects 2022 organized by Department of Biotechnology, UAS Bangalore held at UAS, GKVK, Bangalore from 13^{th}-15^{th} September, 2022. 8. Darshan M B was awarded with Karnataka Kalaa Kesari- 2022 jointly by Kannada mattu Samskruti Illakhe, GoK & Chiguru Cultural and Charitable Trust (reg), Bengaluru on 10-12-2022 at Kalagrama, Bengaluru for his Contributions in the field of Art, Literature and Culture.

5. Centre Name: ANGRAU, Bapatla (Andhra Pradesh)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	3	3
2.	Technical	3*	0
3.	Administrative	1*	0
4.	Supporting	-	-

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	**Salary Head**	100.00	80.00	68.35
2.	**Recurring**	18.80	17.74	15.09
3.	**SCSP Gen**	2.31	2.31	1.52
4	**SCSP Capital**	2.50	1.50	1.16
5	**Non-recurring**	8.00	6.66	4.97
	Total	**131.61**	**108.21**	**91.09**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1	Design and Development of Micro-climate Controlled Storage Bin for Groundnut Pods	PI: V. Vasudeva Rao Co-PI: B.V.S. Prasad	April, 2020	March, 2023
2	Pre-treatment effects of PAU sanitizer on millets for germination and storage	PI: B.V.S. Prasad Co-PI: V. Vasudeva Rao	April, 2022	March, 2024*

Extensions activities (Jan-Dec 2022) Nos (10)

Kisan melas /Agri-fairs: Nos ()

S. No.	Name of the venue	Organizer Name	Month/ Year	No. of Participants
1	Kisan mela-cum-technology demonstration mela at Bapatla	College of Agricultural Engg., Bapatla	03/2022	590
2	ANGRAU, Foundation Day at RARS, Lam, Guntur	ANGR Agricultural University, Guntur	06/2022	725
3	Ag-Tech Kisan Mela 2022 at RARS, Lam, Guntur	RARS, Lam, Guntur	12/2022 (3 days)	8567
4	Exhibition for the 4th meeting of AP Higher Education Planning Board meeting at ANGRAU, Lam	ANGRAU, Lam, Guntur	12/2022	327

Technology demonstration/FLD: Nos (1)

S. No.	Venue	Date	Number of participants			
			Male	Female	Student	Total
1	Dr. N.T.R. College of Ag. Eng.	26-03-22	390	120	80	590

Training organized

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	PHTC, Bapatla MANAGE-DAESI participants	12-09-2022	45	5		50
2	Post-harvest technology and management as a part of one-day capacity building training programme to the ADAs, ADHs, MAOs and HOs	22-10-2022	17	25		42
2	Post-harvest technology and management as a part of one-day capacity building training programme to the ADAs, ADHs, MAOs and HOs	29-10-2022	15	22		37
3	Procedures and protocols of GAP certification	01-11-2022	10	28		38
4	Conference Hall, M. D. O office, Pittalavani palem, Guntur Dist.	16-17 Nov, 2022	52	15		67
5	PHTC, Bapatla MANAGE-DAESI participants	22-12-2022	32	2		34

Salient achievements (Jan-Dec 2022)

Publications

1. Peer reviewed

   1. Vallu Tejaswini, G. Ravi Babu, H. V. Hema Kumar, B. V. S. Prasad and Ch. Sujani Rao. 2022. Status of water quality from agriculture drains in Guntur District, Andhra Pradesh, India. Current Journal of Applied Science and Technology (British Journal of Applied Science & Technology) 41(24): 1-9. (NAAS Rating: 4.71)
   2. V. Vasudeva Rao, Bitra, V. S. P., D. D. Smith, A. Mani and Vimala Beera. 2022. Optimization of enzymatic clarification of sapodilla juice using response surface methodology. The Pharma Innovation Journal SP-11(6): 1548-1552. (NAAS Rating: 5.23)
   3. N. Vinoda, Bitra, V. S. P., L. Edukondalu, Vimala Beera and V. Srinivasa Rao.2022. Effect of ultrasound-assisted osmo and air drying on quality of potato slices during storage period. The Pharma Innovation Journal 11(1): 1994-2001. (NAAS Rating: 5.23)
   4. Womac, A. R. and Bitra, V. S. P.2022. Assessment of first-generation cotton module technology for chopped switchgrass. Journal of the ASABE 65(2): 367-377. (Thomson Reuters Impact Factor: 1.188; NAAS Rating: 7.19)
   5. N. Vinoda, Bitra, V. S. P., L. Edukondalu, Vimala Beera and V. Srinivasa Rao.2022. Effect of ultrasound-assisted osmo and convective air drying on

	quality of potato slices. The Pharma Innovation Journal SP-11(1): 280-284. (NAAS Rating: 5.23) 6. Gopala Swamy S. V. S. and John Wesley B.2022. Bioefficacy of plant oils applied through wooden impregnation against pulse beetle, Callosobruchus maculatus F.) in green gram. Journal of Environmental Biology 43(2): 239-244. (NAAS Rating: 5.57) 7. Swamy, S. V. S. G., Raja, D. S., Ramesh, D. et al. Influence of grain traits on susceptibility of rice cultivars to stored product insects. Cereal Research Communications 50, 1137–1144 (2022). https://doi. org/10.1007/s42976-022-00274-1 (NAAS Rating: 6.85) 8. Karunya, M., Ratna Raju, Ch., Vasudeva Rao, V. and Raja Sekhar, M. (2022) Evaluation of empirical formulae for determination of hydraulic conductivity-based on inverse augur hole method for Medak district, Telangana state, The Pharma Innovation Journal, 11(11): 2704-2708. (NAAS Rating: 5.23)
2.	Number of books edited and compiled: **No (1)** Millets for Nutritional Security (Telugu).2022. PHTC, Bapatla Technical Bulletin # 58 by V. Vasudeva Rao, B. V. S. Prasad, S. V. S. Gopala Swamy, D. Sandeep Raja and M. Raja Sekhar
3.	Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos. (6)** **1.** Gopala swamy, S. V. S. and Venkata S. P. Bitra.2022. Biology of dried fruit beetle, Carpophilous hemipterus (L.), on peanut and its preference for various processed nut. Paper No. F 1060 T 3. Paper presented during International Conference 2022 of Indian Ecological Society on Sustainable Agricultural Innovations for Resilient Agri-Food Systems held during 13-15 October, 2022 organized by Sher-e-Kashmir University of Agricultural Science & Technology of Jammu, Chatha, Jammu, India. **2.** Gopala swamy, S. V. S. and Venkata S. P. Bitra.2022. Fumigant effects of plant essential oils against lesser grain borer and red flour beetle. Paper presented during National Seminar on Empowerment of Rural Youth with Novel Agricultural Technologies (ERTNAT-2022) held at Bapatla during 28-29 January, 2022 organized by The Andhra Agricultural Union, Agricultural College, Bapatla, Andhra Pradesh, India. **3.** Vasudeva Rao, V., Venkata S. P. Bitra, Gopala swamy, S. V. S. and Sandeep Raja, D.2022. Optimum conditions for osmotic dehydration of onion slices. Paper presented during National Seminar on Empowerment of Rural Youth with Novel Agricultural Technologies (ERTNAT-2022) held at Bapatla during 28-29 January, 2022 organized by The Andhra Agricultural Union, Agricultural College, Bapatla, Andhra Pradesh, India. **4.** Mohammod Jeelani, S., Gopala swamy, S. V. S., Dhanvi, V. K. R., Vasudeva Rao, V., Sandeep Raja, D. and Venkata S. P. Bitra.2022. Dal quality as influenced by packaging material. Paper presented during National Seminar on Empowerment of Rural Youth with Novel Agricultural Technologies (ERTNAT-2022) held at Bapatla during 28-29 January, 2022 organized by The Andhra Agricultural Union, Agricultural College, Bapatla, and Andhra Pradesh, India. **5.** Gopala Swamy, S. V. S., Vasudeva Rao, V., Dhanvi, V. K. R. ., and Prasad, B. V. S.2022. Vyavasaya utpattula surakshita nilvaku "hermetic paddati" (Telugu). Vyavasayam 14(3): 21-22.

	6. D. Sandeep Raja, S. V. S. Gopala Swamy, V. Vasudeva Rao and B. V. S. Prasad. Panta vuthpathullo aflatoxin lanu telusukovadam ela (Telugu), Rythu Barosa, February, 2022: 32-33.

Awards received by the centres (Jan-Dec 2022)

1	**Dr. B. V. S. Prasad**, Principal Scientist (Ag. Engg) and Head, PHTC, Bapatla received the Best Scientist Teacher of the Year Award-2022 (Agricultural Engineering) on 09-10-2022 under National Ideal Teaching Awards Programme -2022

Details of Agro-Processing Centre (APC) established (Jan-Dec 2022): No (1)

Sr. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1	G. Chakravarthy Krihi Agros Shop No.30, Ummareddy Complex, Near Bus Stand, Tenali, Guntur Dist. Andhra Pradesh.	May, 2022	Pulse milling	5 Lakhs

6. Centre Name: OUAT, Bhubaneswar (Odisha)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	6	4
2.	Technical	7	4
3.	Administrative	1	0
4.	Supporting	0	0

Financial Detail (2021-22)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	162.67	122.00	133.67
2.	Recurring	16.93	12.70	6.38
3.	Non-recurring	6.66	5.00	0
4	Total	**186.26**	**139.70**	**140.05**

Details of projects

	No ongoing projects			

Machines/Gadgets tools/ instruments developed: Nos (1)

Name of machine	**Black gram nugget mould and die**
Capacity	1 kg batter per batch
Use	Dropping flower shaped nugget
Details	Depending on the dimension of phool bari, dies were designed for dropping of blackgram nuggets in flower shape. Four flower shaped cuttings of 56 mm diameter with 2 mm slit openings were made on a stainless steel plate which act as the die. The mould consists of one larger (162 mm cube) and the other smaller size (156 mm) cubical open box made of stainless steel. The dimension of the two boxes are such that the smaller one can move freely inside the larger one. The die is fitted to the bottom of larger outer box while the bottom of smaller box is blind with stinless steel sheet. Bottom clearance of 5 mm was given in the outer box by providing four stays at four outer corners The two boxes are provided with 25 mm outer edge for holding and pressing the batter. The production capacity using the mould is 4 times higher than the traditional manual method.
Photographs	 
Cost (₹)	**3000/-**

Processes/products /protocol developed (Jan-Dec 2022): Nos (1)

Name of the process/ products	**Nano silver compounded packaging film**
Use of the process/ products	Packaging of fresh and minimally processed vegetables The PBAT-0.9%Ag nano-composite films exhibited strong antimicrobial activity against bacteria Escherichia coli and mould like Aspergilus flavus. The developed films have a high potential for being used as antimicrobial packaging films for fresh and minimally processed vegetables and also can be considered as a bio-degradable film. Shelf life of vegetables could be extended considerably using this film. The percentage biodegradability was 35% after 5 months of exposure to soil.
Details of the process/ products	First, Thermo Plastic Starch (TPS) was prepared by mixing dry starch with glycerol (10:3, w/w). Then, PBAT (70 wt%) and TPS (30 wt%) and respective nano particles were mixed and compounded in a twin-screw extruder. In the compounding preparation, a pilot co-rotating twin-screw extruder of M/s Specific Engineering, Vadodara, was used with the following processing conditions: screw diameter (D) of 20 mm, screw length of 35 D, screw speed of 100 rpm, feeder speed of 25 rpm, and a temperature profile of 115/135/135/135/135 °C. The extrudate polymers were passed through a water bath to reduce the temperature, followed by cutting into solid pellets (2.5 mm). The pellets were dried in an oven at 50°C for 24 h before film blowing. All of the extruded pellets were fed in a blown film machine of M/s Konark Plastomake Pvt. Ltd., Ahmadabad, to produce films under the following conditions: screw speed of 35 rpm, barrel temperature profile of 100/140/140/ 140 °C and a 50-mm film-blowing die. The winding speed and airflow in the matrix that formed the balloon was adjusted for each formulation to allow the formation of the balloon without tearing or cracking.
Photographs	 
Cost	**₹ 800/- per kg**

Details of adaptive trails (Jan-Dec 2022): Nos (3)

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1	Toddy palm seed extractor	Bhubaneswar	Efficiency: 30-40 fruits/h
2	Backgram nugget mould and die	Keonjhar, Bhubaneswar	Working satisfactory, slight modification required
3	Cashewnut butter preparation	Mahipur, Nayagarh	Product is acceptable for commercial purpose

Technology Transferred (Jan-Dec 2022): Nos (1)

S. No	Name of machine/technology transferred	No of units	Address	Date of technology transferred	Total revenue generated
1	Mahua flower processing technology	1	SHG members of Sundargarh,	25th July to 4th Aug 2022	25000/-

Extensions activities (Jan-Dec 2022) Nos (21)

Kisan melas /Agri-fairs: Nos (3)

S. No.	Name of the venue	Organizer name	Month/Year	No. Of Participants
1	Technology Demonstrated Mela at Gorada, Jagatsingpur	AICRPs of CAET	March 2022	500
2	Farmer's Fair	KVK Deogarh, Odisha	Nov 2022	100
3	Agro Processing Entrepreneurs' Meet	AICRP on PHET	Jan/2023	15

Technology demonstration/FLD: Nos (6)

S. No.	Venue	Date	Number of participants			
			Male	Female	Student	Total
1	Mminimal processing of tender jackfruit at Bhubaneswar	22.04.2022	5	0	0	5
2	Mahua stamen remover at Gopapur, Kankadahad, Dhenkanal	05.05.2022	4	16	0	20
3	Dal milling at Nuagaon, Nayagarh	23.06.2022	5	0	0	5
4	Mushroom storage and transport unit at KVK, Puri	14.9.2022	5	10	0	15
5	Mushroom processing at Chandanpur, Puri	20.10.2022	2	3	0	5
6	Orange juice processing at KVK, Deogarh	18.11.2022	0	10	0	10
7	Training programme for rural youth on operation & maintainance of rice mill, oil mill and dal mill of KVK, Puri	03.11.2022	16	0	0	16

Training organized

S. No.	Venue	Date	Number of participants Farmers)			
			Male	Female	Student	Total
1	Mushroom processing to women SHG	04.06.2022	0	12	0	12
2	Mango pulp processing at Ostapal, Dhenkanal	21.06.2022	0	20	0	20
3	Mahua processing at CAET, OUAT, Bhubaneswar in	25th July to 4th Aug	0	100	0	100

	collaboration with SCST Research and Training Institute, Bhubaneswar	2022				
4	Tamarind Processing at CAET, Bhubaneswar in collaboration with NGO Vasundhara	09.09.2022	0	30	0	30
5	Tamarind Processing at KVK, Deogarh	21.09.2022	0	18	0	18
6	Ragi Processing to SHG members at Nuagaon, Nayagarh	28.10.2022	0	6	0	6
7	Ragi processing at Khallikote, Ganjam	10.11.2022	0	17	0	17
8	Rural youth on Tomato processing at KVK, Jajpur	24.11.2022	0	29	0	29
9	Experiential learning programme of 4th year B. Tech (Agril. Engg.) on mango and orange juice RTS preparation at CAET, Bhubaneswar	1st-31st Dec 2022	0	0	47	47
10	Minimal processing of vegetables	17.12.2022	0	5	0	5
11	Processing and value addition of orange	30.12.2022	0	25	0	25
12	Processing of oyster mushroom	07.01.2023	13	14	0	27

Salient achievements (Jan-Dec 2022)

Publications

1.	Peer reviewed 1. Dash S. K., Rayaguru. K. Pal U. S.2022. Opportunities in higher education for agricultural engineering graduates. Agricultual Engineering Today. 46(2), 69-74 2. Swarnakar A., Mohapatra M., Das S. K.2022. A review on processes, mechanisms and quality influencing parameters for puffing and popping of grains. Journal of Food Processing and Preservation. doi. org/10.1111/jfpp.16891 3. Panda A., Mohapatra M., Nayak R. N., Sahu I., Panda M. K. (2022). Encapsulation of Anthocyanin from Jamun Pomace Extract and its Storage Stability, Biological Forum-An International Journal, 14(1): 601-607. 4. Mohapatra M., Ashok Kumar.2022. Moisture sorption behaviour of pre-conditioned rice for puffing, Pharma Innovation, 11(3), 709-716. 5. P. Abhilasha, Pal US, Panda MK, Rayaguru K.2022. Evaluation of Cooking and Physico-Chemical Properties of Rice, Indian Journal of Ecology (2022) 49(3): 900-904 6. Pal U. S., Panda M. K., Bakhara C. K., Sahoo N. R., Mohapatra M. and Nayak R. N.2022. Development and Evaluation of Mobile Two-way Reversible Air Flow Flat bed Paddy Dryer. J. of Agricultural Engineering, 59(3), 240-250. 7. Sahoo S. K., Bastia D. K., Tripathy s., Behera J., Sahoo K. C., Tudu S. and Nayak, R. N.2022. Long term effects of organic amendments on carbon sequestration rate, soil microbial and enzymatic activities in organically managed rice-rice cropping system in inceptisols of Odisha, The Pharma Innovation Journal, 11(10), 244-248

	8. Mohapatra, M., Biswal, S., Nayak, R. N., Panda M. K. and Dash S. K.2022. Effect of modified atmosphere packaging on physical, bio-chemical and functional properties of Jamun (Syzygium cumini) during storage, Indian Journal of Traditional Knowledge, 21(4), 865-875. 9. Rayaguru K, Pandey JP, Mishra UK, and Mohapatra M.2022. Age related histological and cooking characteristics of rice, ORYZA-An International J., 59(4), 463-469
2.	Number of book chapters: **Nos (1)** Mohapatra, S. D. Zaidi N. W., Mohapatra, M., Nagothu, U. S., Senapati, R., Mohapatra, M., Adhikari, B., Pradhan, S. S and Nayak A. K.2022. Integrated pest management in rice and the potential to contribute to climate-neutral and resilient farming systems, Chap 4., pp.69-86.
3.	Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (8)** 1. Sahoo N. R. Bakhara C. K., Mohapatra M., Nayak R. N., Pal U. S. Rayaguru K.2022. Booklet on "Mahula phula ra prakriyakaran sambandhia prasikhyana pustika", pp 1-38 2. Sahoo N. R. Bakhara C. K., Mohapatra M., Nayak R. N., Pal U. S. Leaflet on "Jamukoli Prakriyakarana", pp1-8 3. Mohapatra M.2022. Encapsulation of Bio-Active components for Food Applications, Technoscript, CAET, 4. Rayaguru K., Mohapatra M., Bakhara C. K., Pal U. S.2022. Training Manual on 5. Entrepreneurship development course on Agricultural Food Processing, Packaging and Marketing under NAHEP, CAET, OUAT, Bhubaneswar. 6. Mohapatra M. Newspaper article on "Lal Lanka Prakriyakaran o packaging" in daily Odia newspaper Prameya,7th June, 2022, pp.9 7. Mohapatra M. Newspaper article on "Ada Prakriyakarana" in daily Odia newspaper Prameya, 21st june 2022, pp.9 8. Sahoo N. R. and Pal U. S. Tentuli Prakriyakaran, Basudha, Daily Prameya Newspaper, 22nd September 2022. pp.9 9. Pal U. S. Akhu ru unnata guda, Basudha, Daily Prameya Newspaper, 27th September 2022. pp.9

Patents (Jan-Dec 2022): Nos (4)

1	Patent granted Miniaturised system for cost effective and small-scale vegetable oil refining (Patent granted for a miniaturised system for cost effective and small scale oil refining)
2	Number of design registration filed (**3**) 1. Mahua seed decorticator 2. Mahua stamen remover 3. Mobile two-way air flow reversible flat-bed paddy dryer

Agro-Processing Centre (APC) established (Jan-Dec 2022): Nos (1)

S. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1	Stree Shakti, Dhenkanal	17-12-2022	Dal milling	3 lakh

Entrepreneurship established (Jan-Dec 2022): Nos (3)

S. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1	Ayush Sharma, Rayagada	Processing of Jackfruit pieces	May 2022	10.0 lakh
2	SHG, Deogarh	Tamarind processing	November 2022	1 lakh
3	Renubala, Chandanpur, Puri	Mushroom processing	December 2022	1 lakh

Success stories (Jan-Dec 2022): Nos (2)

1.	Name of the **of success stories/ name of the beneficiary/ address**
	• Conducted technology transfer and training programme for 100 ST SHG women of Odisha on Mahua processing from 25th July to 4th Aug 2022 at CAET, OUAT, and Bhubaneswar in collaboration with SCST Research and Training Institute, Bhubaneswar. • Product development and value addition of mahua flower hands on training and exposure was given to representatives of Jilla Pachayata, Jashpur, Chhatisgarh and communicated for technical support for Mahua and tamarind post harvest technology and product development

1. Any other relevant information (Jan-Dec 2022):

One project proposal was submitted by AICRP on PHET to Mission Shakti Department, Govt. of Odisha for imparting training to SHG members

7. Centre Name: TANVASU, Chennai (Tamil Nadu)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	3	3
2.	Technical	4	4
3.	Administrative	1	1
4.	Supporting	0	0

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	70.00	60.00	86.62
2.	Recurring	8.50	6.10	11.91
3.	Non-recurring	2.00	2.00	0.00
4	Total	**80.50**	**68.10**	**98.53**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Surveillance and detection of meat for antimicrobial residues and its resistance to common food pathogens.	PI: R. Narendra Babu Co-PI: S. Ezhilvelan, R. Ramani, C. Vasanthi	April 2020	March 2023
2.	Value Chain on Pork	PI: R. Narendra Babu Co-PI: S. Ezhilvelan, R. Ramani, C. Vasanthi	April 2021	March 2023
3.	Development of a Manual cum Motorised Sausage Stuffer	PI: R. Narendra Babu Co-PI: S. Ezhilvelan, R. Ramani, C. Vasanthi	April 2021	March 2023

Machines/Gadgets tools/ instruments developed: Nos (1)

Name of machine	**Manual cum Motorised Sausage Stuffer**
Capacity	13 litres
Use	To stuff emulsion into casings to prepare sausages.
Details	The sausage stuffer consists of a barrel which is provided with a horn and a plunger. The emulsion is placed in the barrel while the sausage casings are placed on the horn and as the piston forces the emulsion through the horn and the casing are pulled synchronously, as the emulsion gushes out through the horn, to fill the casing with the
	emulsion. The unit consists of a three-phase asynchronous motor (750 W, 415 V, 1.88-amp, 50 Hz) that propels the plunger by means of a belt drive and the plunger is also operable manually by a steering wheel placed on its top. The entire structure is mounted on a table and is made of stainless steel.

Photographs	
Cost (₹)	₹ 2.00 lakhs.

Salient achievements (Jan-Dec 2022)

Publications (Jan-Dec 2022): Nos (7+2 +3+13+ 3 + 1 = 29)

1. Details of papers published in journals (Nass rating above 4): Nos (7)

Peer reviewed

1. Vimal Raj, E., Ramani, R., Appa Rao, Parthiban, M., Narendra Babu, R and Arulkumar, S.2022. Antidiabetic activity of peptides extracted from chicken skin hydrolysate. The Pharma Innovation Journal. SP-11(2): 1718-1721. (NAAS Rating 5.33)
2. Vimal Raj, E., Ramani, R., Appa Rao, Parthiban, M and Narendra Babu.2022. Antioxidant activity fo peptides extracted from chicken protein hydrolysate. The Pharma Innovation Journal. SP-11(2): 224-227 (NAAS Rating 5.33)
3. Vimal Raj, E., Ramani, R., Appa Rao and Narendra Babu, R.2022. Protein hydrolysate extraction from chicken intestine by enzymatic hydrolysis. The Pharma Innovation Journal. SP-11(2): 1718-1721 (NAAS Rating 5.33)
4. Govind, V., R. Narendra Babu, V. Appa Rao, P. Sriram, T. M. A. Senthilkumar and Robinson. J. J. Abraham.2022. Screening for Enrofloxacin and Ciprofloxacin residues in chicken liver by Liquid Chromatography Tandem Mass Spectrometry accompanied by Optimal Liquid-Liquid extraction with phosphoric acid. Asian Journal of Dairy and Food Research (NAAS Rating 5.75)
5. Narendra Babu, R., S. Ezhilvelan, A. Serma Saravana Pandian, A. Vanathi, C. Vasanthi and R. Ramani.2022. Effect of Covid-19 lock down on domestic meat trade and consumption of meat and meat products in India. Indian Journal of Veterinary and Animal Sciences Research.51(1), 57–66 (NAAS Rating 4.28)
6. Raziuddin, M., R. Narendra Babu and V. Appa Rao.2022. Impact of butter on quality of goat meat spread. International Journal of Agricultural Sciences. 14(11) 11815-817. (NAAS Rating 4.73)
7. Vanathi, A., V. Appa Rao, R. Narendra Babu, S. Ezhilvelan, R. Ramani and C. Vasanthi.2022. Effect of different cooking methods on the proximate composition of chicken products sold at different outlets in and around Chennai. International Journal of Genetics.14(3):847-849. (NAAS Rating 4.07)

Number of papers published in journals (Nass rating less than 4): Nos (2)

1. Nithinkumar, G. N., V. Appa Rao, R. Narendra Babu and T. A. Kannan.2022. Extraction and Physico-chemical properties of chondroitin sulphate from bovine trachea. Indian Veterinary Journal. 99(4): 7-9. (NAAS Rating -)
2. Narendra Babu, R., S. Ezhilvelan, A. Serma Saravana Pandian, A. Vanathi, C. Vasanthi and R. Ramani 2022 . Effect of COVID–19 Lock down on Export and Import Trade of Meat and Meat Products in India. Indian Veterinary Journal.99 (03): 21-26 (NAAS

Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET):

1. Vasanthi, C., R. Narendra Babu, S. Ezhilvelan and R. Ramani, 2022. Solid phase extraction and characterization of collagen from native chicken skin
2. Narendra Babu, R., C. Vasanthi, S. Ezhilvelan and R. Ramani, 2022. Slaughter and carcass characteristics of male Aseel birds reared in TANUVAS farm
3. Prabhavath, T. G., . R. Ramani, V. Appa Rao, R. Narendra Babu, S. Ezhilvelan and C. Vasanthi, 2022. Bioconversion of poultry waste into a valuable biowealth-keratin

Popular Articles– (3)

1. Narendra Babu, R., A. Vantahi and R. Ramani, 2022 Chennaiyil Suvaimigu sirundiyana Chicken 65. Kaalnadai Kathir, 42(5) 20 -23.
2. Ramani, R., R. Narendra Babu and S. Ezhilvelan, 2022. Sugatharamaana murayil Chicke 65 thayarippu Kaalnadai Kathir, 42(7) 20 -23.
3. Narendra Babu, R., C. Vasanthi and S. Ezhilvelan, 2022. Mathippu kootiya iraich porulagal-iraichi cutlet thodanguvatharkkana vazhimuraigal. Kaalnadai Kathir, 42(9) 29 -33.

Technical bulletins Nos (1)

Narendra Babu, R (2022) Abattoir By-Products-An Untapped Treasure, TANUVAS Technical Reporter

Awards received by the centres (Jan-Dec 2022): Nos (2)

1. Vasanthi, C., . R. Narendra Babu, R. Karunakaran, R. Ramani, S. Ezhilvelan and A. Vanathi. Seyalpaatu kozhi irachi koozhma thundugalil vuyirvaliyetra yedhirpi aadhaaramaaga varagarisi saerkai alavu nirnayithal. Beat Oral Prentation Prize in the 7 th National Conference on Agricultural Scientific Tamil - 02.09.2022 and 03.09.2022. Organisers and Awarding Organisation - Agricultural Scientific Tamil Society, New Delhi.
2. Vasanthi, C., R. Narendra Babu, S. Ezhilvelan and R. Ramani. Solid Phase extraction and characterization of collagen from Native Chicken. National Conference on Native Chicken on “Relevance of Climate Smart Traditional Farming Systems in the Era of Omics”- 22.09.2022 and 23.09.2022. Organisers and Awarding Organisation - Indian Poultry Science Association, Izat Nagar and Tamil Nadu Veterinary and Animal Science University

8. Centre Name: TNAU, Coimbatore (Tamil Nadu)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	8	8
2.	Technical	10	10
3.	Administrative	1	1
4.	Supporting	1	1

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	185.00	140.00	206.50
2.	Recurring	10.60	8.30	8.66
3.	Non-recurring	3.00	3.00	1.75
4	Total	198.60	151.30	216.91

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1	Development of Annatto seed separator cum cleaner machine	PI: P. Sudha Co-PIs: S. Parveen, T. Pandiarajan, K, Gurusamy	April 2021	Dec 2023
2	Development of process protocol for non –thermal processing of coconut neerafor enhancement of shelf life and to achieve food safety	PI: M. Balakrishnan (PI) Co-PIs: M. R. Manikantan, K. Gurusamy, R. Pandiselvam	April 2021	March 2023
3	Development of nonchemical disinfestation technique for storing dried turmeric rhizomes	PI: S. Parveen Co-PIs: M. Anand, K. Gurusamy	April 2021	March 2023
4	Improved postharvest handling of fruits and vegetables from production centre to urban markets in Coimbatore district	PI: G. Amuthaselvi Co-PIs: T. Pandiarajan, M. Anand	June 2021	March 2023
5	Postharvest management practices for mitigating aflatoxin incidence in groundnut	PI: G. Amuthaselvi Co-PIs: S. Parveen, M. Anand	April 2021	March 2023
6	SC beneficiaries on value added products from cereals, pulses, fruits and vegetables and establishing new agro processing center	PI: M. Balakrishnan Co-PIs: T. Pandiarajan, M. Anand	April 2021	March 2023

Machines/Gadgets tools/ instruments developed: 1 Nos

Name of the unit	On-farm Hermetic Storage System for Dehulled Millets
Capacity	1000 kg
Uses	• Increased the shelf life of dehulled millets to 180 days. • Chemical free storage system • Bin is made up of food grade stainless steel (SS304) • Can be dismantled and assembled • Prevent growth of insects and moulds during storage
Details	The storage bin with a capacity of 1000 kg was developed using stainless steel (SS 304). The engineering properties such as bulk density, true density, porosity, thousand- grain mass, coefficient of friction and angle of repose were studied for de-hulled millet to design a hermetic storage bin. For storing 1000 kg of de-hulled millet, the dimension of hermetic bin was made with certain initial assumption of height and diameter (H/D) ratio. It may be preferable to choose the H/D ratio to reduce lateral pressure over a larger height. The H/D ratio for storage bin was 1.8. The dimension of the cylindrical section of the bin was 1.80 m height, 0.96 m diameter and 0.48 m radius. The volume of cylindrical section, top frustum cone and bottom frustum cone was 1.303 m ^{3}, 0.3021 m^3 and 0.3021 m^3. The total volume of the hermetic storage bin was about 1.0972 m^3. Using the Digital universal (12 channel) USB paperless colour LCD recorder (MIK-9600), the temperature and RH inside the hermetic storage bin were monitored regularly at three different points inside the hermetic storage bin. Since it was a hermetic type storage system it is important to measure the gas concentration inside the bin. The gas concentration was measured using a silicon septum fixed inside brass check nut in the hermetic bin.
Photographs	
Cost of the unit	₹ 1,75,000/-

Extensions activities (Jan-Dec 2022): 21 Nos

Kisan melas /Agri-fairs: 4 Nos

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	AEC&RI, Coimbatore	Dean, AEC&RI, Coimbatore	17.03.2022	650
2.	Ag. College & Research Institute, Madurai	Tamil Nadu Agricultural University	14.10.2022 to 16.10.2022	9000
3.	CODISSIA, Coimbatore	CODISSIA	15.07.2022 to 18.07.2022	6500
4.	AEC&RI, Coimbatore	Dean, AEC&RI, Coimbatore	22.12.2022 to 23.12.2022	120

Technology demonstration: Nos (16)

S. No	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	Department of Food Process Engineering, AEC&RI, TNAU, Coimbatore	22.04.2022	1	2	120	123
2		23.04.2022	2	1	120	123
3		26.04.2022	1	1	70	72
4		27.04.2022	1	1	77	79
5		28.04.2022	1	1	70	72
6		29.04.2022	1	1	72	74
7		05.05.2022	1	1	68	70
8		23.09.2022	1	2	120	123
9		23.09.2022	1	2	120	123
10		11.10.2022	1	2	120	123
11		18.10.2022	1	1	80	82
12		20.10.2022	1	1	58	61
13		21.10.2022	1	1	58	58
14		28.10.2022	1	2	55	58
15		28.11.2022	1	1	20	22
16		23.12.2022	1	1	32	34

Training organized: 01

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	Puttur, Nagapattinam	28.12.2022	2	30	0	32

Salient achievements (Jan-Dec 2022)

Publications

S. No.	Details of Publications
1	**Peer reviewed** 1. Athira, VB, M Balakrishnan, S Karthikeyan, S Marimuthu, S Ganapathy.2022. Investigation on enzyme activity of lipase from papaya (Carica papaya) latex. The Pharma Innovation Journal.11(9): 838-841 2. Balakrishnan, M., G Jeevarathinam, S Aiswariya, RP Kingsly Ambrose, S Ganapathy, Ravi Pandiselvam.2022. Design, development, and evaluation of rotary drum dryer for turmeric rhizomes. (Curcuma longa L.). Journal of Food Process Engineering. e14052 3. Ganga Kishore, S., P Rajkumar, P Sudha, J Deepa, P Subramanian, Z John Kennedy.2022. Engineering properties of neem (Azadirachta indica) fruit and seed for the development of depulper and decorticator. Emergent Life Sciences Research.8: 207-233 4. Hari Pranesh, G., S Ganapathy, P Sudha, M Anand.2022. Modified atmospheric packaging of transported and stored tomatoes at cooling temperature. The Pharma Innovation Journal.11(9): 1310-1316 5. Hrishikesh Patil, I. P. Sudagar, P. Sudha and Boomiraj Kovilpillai .2022. Studies on Water Absorption Properties of Fiber- Board Prepared Using Sugarcane Bagasse with Natural Resins. International Journal of Environment and Climate Change.12(11): 377-382 6. Jeevarathinam, G., R Pandiselvam, T Pandiarajan, P Preetha, T Krishnakumar, M Balakrishnan, V Thirupathi, S Ganapathy, D Amirtham.2022. Design, development, and drying kinetics of infrared-assisted hot air dryer for turmeric slices. Journal of Food Process Engineering. e13876 7. Meenakshi, P. L. Amuthaselvi, G., Rajkumar and G. Gurumeenakshi.2022. Effect of Sulphite in Drying characteristics and Nutritional Aspects of Sun, Solar and Tray dried Tomato Slices. Biological Forum-An International Journal 8. Mythili, M., &Ramalakshmi, A. (2022). Unraveling the distribution of AMF communities and their metabolites associated with soils of minor millets. Rhizosphere, 21, 100473. NAAS:9.13; IF: 3.437 9. Nandavarman, P., M Balakrishnan, M Kavinoand G Amuthaselvi.2022. Variations in the physicochemical properties of guava var. ArkaKiran during storage. The Pharma Innovation Journal.11 (8).1391-1397 10. Parveen, S. and Kailappan, R. (2022). Development and performance evaluation of an eco friendly turmeric polisher. Agricultural Mechanization in Asia, Africa and Latin America, 524. 11. Pentala Mallesham, S. Parveen, P. Rajkumar, G. Gurumeenakshi and M. Balakrishnan. Investigation on the Suitability of Cake Batter for 3D Printing.2022. Biological Forum-An International Journal 14(3): 77-82 12. Preetha, P., N Varadharaju, G Jeevarathinam, J Deepa, AP Mohan Kumar, M Balakrishnan, P Rajkumar, R Pandiselvam.2022. Optimization of continuous flow pulsed light system process parameters for microbial inactivation in tender coconut water, pineapple and orange juice. Journal of Food Process Engineering. doi. org/10.1111/jfpe.14254

	13. Rajkumar, P., S Idhayavarman, J Deepa, P Sudha, R Arulmari, G Amuthaselvi.2022. Design and Development of a Belt Type Dryer for Drying Tamarind. Madras Agricultural Journal.109(1): 1-3 14. Ramalakshmi, A., Mon, V. H., Balachandar, D., Gomathi, V., &Sharmila, R. (2022). Synergistic action of rhizobacteria and mycorrhizal fungus against Meloidogyne incognita. Rhizosphere, 23, 100552. NAAS:9.13; IF: 3.437 15. Ramalakshmi, A., Udayasuriyan, V., &Balasubramani, V. (2022). Molecular cloning of a new cry2A-type gene from Bacillus thuringiensis strain Nn10 and its expression studies. Microbial Pathogenesis, 164, 105415. NAAS:9.74; IF: 3.848 16. Sathiamoorthy, V., P Geetha, M Balakrishnan.2022. Quantification of Bioactive Compounds in Piper Betle Leaf Extract by Gas Chromatography-Mass Spectrometry (GC-MS). Journal f Current Crop Science and Technology (Formerly Madras Agricultural Journal). doi. org/10.29321/MAJ.10.000650 17. Shelke, G. N., T. Pandiarajan. N, Indore and V. P. Kad 2022. Design Development and performance optimization of farm level blackgramdehuller Journal of Agricultural Engineering (India) 59(3):251-268 18. Sivaranjani, S., N. Karpoora Sundara Pandian, S. Parveen, D. Baskaran, V. Arun Prasath, V. Eyarkai Nambi and R. Pandiselvam.2022. Influence of Machine Parameters and Coagulant on the Textural Properties of Paneer (Indian Cottage Cheese. Journal of Food Quality. Article ID 6529064. 19. Sri priyaa Goalla, Janaki P., Ramalakshmi A., Karthikeyan R. &Meena S. (2022). Tembotrione combinations on enzyme activities and arbuscular mycorrhiza in maize planted soil. Egyptian Journal of Biological Pest Control. 30(1), 1-9. NAAS:7.44; IF: 1.437 20. Vidhya, D., K. Indumathi, K. Gurusamy, P. Paramaguru and S. Geethanjali (2022). Assessment of Genetic Variability for Growth and Yield Traits of Curry Leaf (Murraya koenigii L. Sperg) under Sodic Soil. Biological Forum –An International Journal, 14(2): 912-916. NAAS- 5.19. 21. Yuvasri D., K. Venkatesan, M. Anand, D. Selviand L. Pugalendhi.2022. Study on Nutrient Removal (NPK) from Different Parts of Chowghat Orange Dwarf (COD) and West Coast Tall (WCT) Cultivars of CoconutInternational Journal of Plant & Soil Science 34(21): 468-474
2	**Book Chapters**
	1. **Gurusamy, K.,** M. Anand, M. Balakrishnan and T. Pandiyarajan Advance in minimal processing of fresh fruits and vegetables in tamil. SCSP Book. 2. Iniyakumar, M., Ramanan, V. V., **Ramalakshmi, A**., Bobita, R., Tharunkumar, J., Jothibasu, K. and Rakesh, S., 2022. Overview on Advanced Microalgae-Based Sustainable Biofuel Generation and Its Life Cycle Assessment. In Micro-algae: Next-generation Feedstock for Biorefineries (pp.53-71). Springer, Singapore. 3. Kavitha, M., S. Gowsika, A. Sankari and **M. Anand.2022.** Screening of crossandra (Crossandrainfundibuliformis (L) (Nees.) Genotypes for root lesion Nematode. Transforming Agricultural Extension systems towards achieving food and Nutritional securityPublished by Royal publishing house. Page 24-34 ISbn9789391131326 4. Rajkumar, P., **P. Sudha** and Jikky Jayakumar.2021. Postharvest and Extraction Technology of Annatto. Interdisciplinary Approaches in Agriculture and Forestry: 213-220, ISBN: 978-93-92313-22-6. Taran Publication, New Delhi.

	5. Santhosh Kumar, S., **P. Sudha**, P. Rajkumar, I. P. Sudagar and R. Arulmari. Neem Processing Machinery and Value Addition. Interdisciplinary Approaches in Agriculture and Forestry: 221-230, ISBN: 978-93-92313-22-6. Taran Publication, New Delhi. 6. Sanuuja Bertini, J., Gurusamy, K., Anand, M. and M. Balakrishnan. Turmeric-bioactive Compounds and applications. **7. Sudha, P.,** Jikky Jayakumar and P. Rajkumar, 2022. Extraction of Natural Food Colourant from Roselle. Recent Innovative Updates in Agricultural-HorticulturalSciences. Volume-4. AkiNik Publications, New Delhi. **8. Sudha**, **P.,** Jikky Jayakumar and V. Manoja.2022. Extraction Methods for Phytochemicals from Annatto (Bixa Orellanaÿ L.: Natural Food Colorant). Frontiers in Food Science & Technology: Current scenario & future prospects. CRC press. Taylor & Francis. 9. **Sudha**, **P.,** P. Rajkumar, A. Astina Joice, I. P. Sudagar and R. Arulmari 2021. Postharvest Technology - Recent Advances, New Perspectives and Applications," 978-1-83969-924-5,Intechopen Publishers, UK. 10. **Sudha**, **P.,** P. Vinass Jamali and I. P. Sudagar.2021. Emerging improvements in the Characterisation and Advanced utilization of Woodland fibres and its Hybrid Composites Interdisciplinary Approaches in Agriculture and Forestry.:189-201, ISBN: 978-93-92313-22-6. Taran Publication, New Delhi.
3	**Books edited and compiled**
	• Balakrishnan, M., G. Jeevarathinam, P. Preetha.2022. Role of Artificial Intelligence in Food Processing. Lambert Academic Publishing. ISBN No.9786205517352 • Balakrishnan. M.2022. Velan Vilai Poruttkalukkana Aruvadai Pinsar Iyanthirangal matrum Thozhil nutpangal. Published by TNAU Press. ISBN No.978-819600122-3 • Balasubramanian, A., P. Sudha, C. N. Hari Prasath, M. Sangareswari, S. Radhakrishnan, K. K. Suresh.2021. Tamarind Science and Technology.2018. Scientific Publishers New Delhi.
4	**(Proceedings, Compendiums, Technical bulletins, Newspaper, other Magazine, Annual reports other than AICRP-PHET** 1. Anand, M., Kamalkumaran, P. R., Amuthaselvi, G., Gurusamy, K. and Balakrishnan, M.2022. Post Harvest Handling of Important Fruit Crops. VigyanVarta 3(11): 122-124 2. Anand. M, S. Velmurugan, M. Velmurugan, P. R. Kamalkumaran and K. Venkatesan.2022. Selection criteria for coconut mother palm. Vol.07 Pg:41-45 3. Gurusamy, K., D. Amirtham', M. Anand', M. Balakrishnan' and T. Pandiarajan' 2022. Enzyme Assisted Extraction of Dietary Fibre from Coconut Residue Meal. Paper presented in 50th ISAE annual convention and international symposium held during November 9-11 at TNAU Coimbatore. 4. Gurusamy, K., D. Amirtham, M. Anand, M. Balakrishnan and T. Pandiyarajan. (2022) Enzyme assisted extraction of dietary fiber from coconut residue meal.56th annual convention of Indian Society of Agricultural Engineers on "Agricultural Engineering innovation for global Food security and International symposium on India @2047: Agricultural Engineering perspective". 5. Pandiarajan, T., P. Krishnakumar, M. Anand', K. Gurusamy 2022 . Studies on Drying of Ivy Gourd (Cocciniagrandis) using Hot air assisted Infrared Dryer.

	Paper presented in 50th ISAE annual convention and international symposium held during November 9-11 at TNAU Coimbatore 6. Sudha, P., Jikky Jayakumar and V. Manoja.2022. "Extraction studies of bixin - a natural colorant from Annatto (Bixa orellana L.) Using organic solvents" presented for the poster in 3rd ANRCM International Web-Conference on 'Natural Resource Management for Global Food Security and Sustainable Development Goals. 7. Sudha, P., Jikky Jayakumar and V. Manoja.2022 "Annatto- natural colorant for butter, cheese and ice-cream" was presented in the International Conference on Indian Dairying - Sustainability and Nutritional Security. Organized by the Department of Food Science and Nutrition Nutrition Society of India, Coimbatore Chapter & Indian Dairy Association Tamil Nadu Chapter, Chennai. 8. Sudha, P., Jikky Jayakumar and V. Manoja.2022. "Process optimization for aqueous extraction of pigments from annatto (Bixa orellana L.)" was presented in the International Conference on "Advances in Agriculture and Food System towards Sustainable Development Goals" (AAFS2022) jointly organized by ICAR, AIASA, and UAS, Bangalore. 9. Sudha, P., Jikky Jayakumar and V. Manoja.2022. "Morphological Characteristics Analysis of Fresh and Dry Annatto (Bixa orellana L.) Fruits and Seeds" was presented in the 56th Annual Convention of Indian Society of Agricultural Engineers on Agricultural Engineering Innovation for Global Food Security and International Symposium on India @2047: Agricultural Engineering Perspective. 10. Sudha, P., Jikky Jayakumar and V. Manoja.2022. "Optimization of process parameters for extraction of bixin using different solvents" was presented in the International Conference on "Innovative Food System Transformations for Sustainable Development in Agro-Food and Nutrition" 11. Sudha, P., Jikky Jayakumar and V. Manoja.2022. "Studies on Degradation of Pigments in Aqueous Extracts of Annatto (Bixa orellana L.)" was presented in the 56th Annual Convention of Indian Society of Agricultural Engineers on Agricultural Engineering Innovation for Global Food Security and International Symposium on India @2047: Agricultural Engineering Perspective.

Awards (Jan-Dec 2022): 3

S. No.	Details of awards
1.	M. Balakrishnan - Best Oral Presentation award: 56th ISAE Convention
2.	T. Pandiarajan-Niche award
3.	M. Anand-Best Poster Presentation award:56th ISAE Convention

Agro-Processing Centre (APC) established (Jan-Dec 2022): 2 Nos

S. No.	Name and full address of APC established	Date of establishment	Working area of APC	Budget of APC (₹)
1.	Paulraj, 6/162, Mela colony PO: Marudanvalvoo, Ottapidaram 628303 Thoothukudi Dt.	2.8.22	Processing of cereals	91000
2.	Arul Vadivel, No.232 Main road, Melavavenmani, Thevur-611109 NagapattinamDt	24.9.22	Processing of cereals	91000

Success stories (Jan-Dec 2022): Sri Angalamman Flour Mill

An energetic young entrepreneur Mr. Sivakumar aged about 40 years from Happy Garden Colony, Rakkipalayam village, Narasimanaickenpalayam, Coimbatore, Tamil Nadu, established an Agro Processing Centre at Rakkipalayam, Narashimanaickenpalaym of Coimbatore district in the name of Sri Angalamman flour mill, which is located 15 kilometers away from Coimbatore city. With the financial support of the Department of Food Process Engineering, Agricultural Engineering College and Research Institute, TNAU, Coimbatore, agro processing complex was established under ICAR-AICRP-PHET Scheme during 2021.

Processed products like Wheat flour-4 tonnes/Year, Rice flour-4 -5 tonnes/year, Ragi flour 700-800 kg/Year, chilli powder 500 kg /year, coriander powder 500 kg/Year and Health mix 700-800 kg/year. He has earned approx. ₹ 1.50– 2.00 lakhs annually by selling his produce in the wholesale and retail markets.

9. Centre Name: HAU, Hisar (Haryana)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	3	2
2.	Technical	3	2
3.	Administrative	1	1
4.	Supporting	-	-

Financial Detail (Jan-Dec 2022)

S. No	Budget head	Budget Estimate, ₹ in lakh (as per EFC)	Fund released, (₹ in lakh)	Fund Utilized, (₹ in lakh)
1.	Salary Head	20.00	45.90	35.36
2.	Recurring	6.92	3.20	-
3.	Non-recurring	2.66	0	-
4	Total	**89.58**	**49.10**	**35.36**

Details of projects

S. No.	Title of the Sub-Project	Name of PI and Co-PI's	Duration	
			Start	End
On-going Projects (RPF-II)				
1.	Development and evaluation of continuous type of carrot grader	PI: Sunil Kumar Co-PIs: Anil Panghal, Ravi Gupta	Apr 22	Mar 24
2.	Agro Processing Activities	PI: Sunil Kumar Co-PIs: Anil Panghal, Nitin Kumar	-	-

Adaptive trails (Jan-Dec 2022): Nos (03)

S. No	Name of machine/ Technology	Name of the Trial place	Result/Inference
1	Hammer mill	Agro Processing Centre for Turmeric Grinding	Experiential Learning Program
2	Dryer	Agro Processing Centre for drying of methi	Experiential Learning Program
3	Maize Sheller	KVK, Jind CCS HAU Hisar	Drudgery reduction in maize shelling

Extensions activities (Jan-Dec 2022) Nos (03)

Kisan melas /Agri-fairs: Nos (03)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	University Mela ground	CCS HAU Hisar	March, 2022	60,000
2	ICAR-Technology and Machinery Demonstration Mela at Village Siswala, Hisar	CCS HAU Hisar	March, 2022	800
3	Industry Interface Fair on Agro-Processing (IIFA) and Kisan Mela	ICAR-CIPHET Ludhiana	October, 2022	>1000

Technology demonstration/FLD: Nos (01)

S. No.	Venue	Date	Number of articipants			
			Male	Female	Student	Total
1	KVK, Jind, Haryana	29/09/2022	18	12	0	30

Salient achievements of the centre (Jan-Dec 2022)

Publications (Jan-Dec 2022)

1.	Peer reviewed 1. Sapna B, Sunil K, Nitin K, Arun K. A., Anil P, Priyanka R, Ravi K (2022). Advances in development of biodegradable food packaging material from agricultural and agro-industry waste. Journal of Food Process Engineering,e13930. (NAAS: 8.36) 2. Birania, S., Attkan, A. K., Kumar, S., Kumar, N., & Singh, V. K. (2022). Mass modellingof strawberry (Fragaria× Ananasa)-based on selected physical attributes. Journal of Food Process Engineering, e14023.
2.	Number of book chapters: **Nos (02)** 1. Saini, P., Kumar, N., Kumar, S., & Panghal, A. (2022). Fluidized Bed Drying: Recent Developments and Applications. Thermal Food Engineering Operations, 197-219. 2. Anil, P., Nitin, K., Kumar, S., Kumari, A., & Chhikara, N. (2022). Food Function andHealth Benefits of Functional Foods. Functional Foods, 419-441.
3.	Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (01)** Sunil Kumar, AK Attkan and Anil Panghal (2022). Green Detopping Machine for Carrot. Haryana Kheti. 55(11). P 4.

Entrepreneurship established (Jan-Dec 2022): Nos (01)

Sr. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establish ment	Budget of Entrepreneurship
1	Sh Rituraj, Hisar, Haryana	Rose water and aloe-vera-based cosmetics	September, 2022	-

10. Centre Name: CAU, Imphal (Manipur)

Manpower Detail

S. No.	Categories	Sanctioned positions	Filled Positions
1.	Scientific	**03 ***	**02**
2.	Technical	**03**	**02**
3.	Administrative	**01**	**01**

Financial Detail

Sl. No.	Budget head	Budget Estimate, ₹ in lakh (as per EFC)	Fund released, ₹ (Lakh)	Fund Utilized, ₹ (lakh)
1.	Salary Head	80.00	78.91	56.70
2.	Recurring	13.13	13.65	9.60
3.	Non-recurring	5.00	6.22	5.40
	Total	**98.13**	**98.78**	**71.70**

Details of projects

Sl. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	On-going projects			
1	Development of low cost popped rice ball making machine	PI: Ng. Joykumar Singh Co-PIs: P. K. Sarangi, Th. Anand Singh	**April 2021**	**March 2023**
2	Traditional plant-based dyes for application of food colour and biological strain	PI: Th. Anand Singh Co-PIs: P. K. Sarangi, Ng. Joykumar Singh	**April 2022**	**March 2024**

Technology development and outreach activities

Machines/Gadgets tools/ instruments developed: Nos. (2)

Name of machine	Pineapple quarter
Capacity	50-60 fruits per hour
Use	Divides one pineapple fruit into 04 (four) quarters by peeling process
Details	Pineapple cutting machine into 4 quarter is made of SS. Cutting tool is mounted on the steel platform with round as well as cross grooves where the cutting blade will sit. The pineapple cut on both end is placed on the platform and the cutter blade is pressed with help of handle which is connected with spring. In this way the pineapple is cut into four cubes and simultaneously removes the peel and core.

Photographs	
Cost (₹)	**₹ 2000/-**

Name of machine	**Peeling machine of Perkia speciosa/burghii (local Yongchak)**
Capacity	It can peel about 60-70 beans per hour
Use	Peel about 60-70 beans/ hour.
Photographs	
Cost (₹)	**₹ 50,000/-**

Processes/products protocol developed Nos (3)

Name of the products	**Traditional plant-based dyes for application of food colour and biological strain**
Use	Novel biological stain and natural food colour.
Details of the process/ products	The cytogenetic is much dependent on the biological stains and advancement of the microscopic devices. Most important and oldest biological stain is carmine which is animal extract. Two of the most popular vegetative dyes are extracted from Bixa orellana and Strobilanthes cusia. The dye from seeds of annatto or achiote or Bixa orellana, L. locally known as Ureirom (UR) that is generally used to stain cotton towels, women dresses, hats, shirts, etc to prevent quick deterioration besides giving the saffron colouration to the clothes for religious purposes also. The leave and stem extracts of the Strobilanthes cusia known as Kum (KU) that is used to stain the loin loom phanek, a Meitei women's formal folk dress as kum dyed phanek. With these backgrounds the two plants were taken to study for the nuclear stainability on root tip cells of local shallot, Allium ascalonicum L. to test the feasibility of the dyes as the biological stain. The different stages of mitosis cell division in A. ascalonicum were stained with the dyes of KU and UR and compared with the standard stain Acetocarmine. The UR stain is nonspecific as it stains whole cytoplasm as well as the nuclear parts. The stages of mitosis could be

	seen but lacks contrast between the cytoplasm and nuclear parts. To the elongated cells the nuclear parts are properly stained. The KU stained the nuclear more properly than UR as good as Acetocarmine. The stainabibility of UR may be improve with some mordants in future. The nuclear stainability of KU or UR is appreciable in the sense that these are natural product and aged tested (particularly in Manipur) so there is no room for any allergic response as that of Carmine. Hence KU and UR are promising candidates for cytological/biological application in future. The drawback of these dyes is slow penetrating and takes much time as compared to Acetocarmine. **Bixa orellana** The pinkish young seeds were crushed to small pieces with mortar and pestle with water. To 100 ml of this dye 1.5 g of Allum was added and boiled for 5 min. Then it was filtered, was let dried in room temperature and test solubility in different solvent. This dye was also soluble in absolute Acetic acid glacial. **Plant material used to study the Mitosis**: the local shallot, Allium ascalonicum L. (Fig.4 A) were planted in our laboratory and after 24 hours, root tips of average 0.5 cm were fixed in fixative for 24 hours and preserve on 70% ethanol. Preserved root tips were proceeds for slide preparation. **Standard stain:** 1% acetocarmine stain: prepared by dissolving 1 gm of Carmine powder (Merck, India- C. I. No.75470, S. No.1381) in 100 ml of 45% Glacial acetic acid, boiled in a beaker for 1 hour and filtered, used as standard stain to compare the present dyes in the study.
Photograph	   Leaves of Strobilanthes cusia (A), flower pods of Bixia orallana, seeds and paste of seeds (B), coloured of the two dyes-indigo from S. cusia and deep red from B. orallana.
Cost	-

Name of the products	**Pectin from pineapple wastes viz, peel, core and pomace**
Use	Edible product
Details of the process/ products	Acid extraction followed by ethanol precipitation was used to extract pectin. Results revealed that yield of pectin were found to be 14.21%, 12.75% and 11.24% from pineapple pomace, core and peel respectively. Initial and final moisture content for all sources were also studied. Maximum yield of pectin was optimized at 1.5, 85^{o} C and 70 min for pH, extraction temperature and extraction time respectively.
Photographs	
Cost	-

Adaptive trails Nos

S. No	Name of machine/ technology	Name of the Trial place	Result/Inference
1	Mini oil expelling machine	Imphal west	
2	Pineapple products	Imphal west	
3	Ginger washer	Imphal west	

Mini oil expelling machine to the adopted farmers of Manipur

Extensions activities=a+b= 1+0=1

a	Kisan Melas/Agri fairs**Nos (1)** **Technology And Machinery Demonstration Mela**– 2022 on 8-10 March 2022 at Central Agricultural University, Imphal, Organized by AICRP-PHET Unit. No of participants: 250

Salient achievements of the centre

Publications

1	Peer Reviewed 1. Sarangi, P. K., Anand Singh, T., Joykumar Singh, N., Prasad Shadangi, K., Srivastava, R. K., Singh, A. K., Chandel, A. K., Pareek, N., Vivekanand, V (2022) Sustainable utilization of pineapple wastes for production of bioenergy, biochemicals and value-added products: A review, Bioresource Technology. https://doi. org/10.1016/j. biortech.2022.127085
2	Number of papers published in journals (NASS rating less than 4):Nos (4) 2. Singh T. A, Sarangi PK and Singh Ng. Joy (2021) Microencapsulation of curcumin by sodium alginate C-1 system. CAU Research Newsletter Vol 9(1) page-9. 3. Raleng A, Singh Joykumar Ng, Sarangi P K, Manojkumar Ph, Wahengbam A (2022) Standardization of frying time-temperature strategy for enhancing the quality and storability of chayote chips, Applied Food Research, 2 (2), 2022, 100167, https://doi. org/10.1016/j. afres.2022.100167. 4. Sarangi P K, Singh Joykumar Ng and Singh T A (2021) Isolation and process optimization of pectin from pineapple wastes. CAU Research Newsletter Vol 9(1) page-7-8. 5. Singh T. A, Sarangi PK and Singh Ng. Joykumar (2021) Formulation of Rajma Beans by bacillus sp PHT 4 remove Phytohemagluttin completely. CAU Research Newsletter Vol 9(1) page-12. 6. Singh T. A, Sarangi PK and Singh Ng. Joykumar (2021) Development and formulation of Chakaho-based noodles. CAU Research Newsletter Vol 9(1) 1-13. 7. Ng Joykumar Singh, R Angam, Dayanidhi H 2020 Processing technology packages for important crops of Manipur. College of Food Technology, CAU, Imphal-795004 8. Ng Joykumar Singh, R Angam, Dayanidhi H 2021, Food Atlas of Manipur, famous 108 dishes, College of Food Technology, CAU, Imphal-795004

3	**Number of book chapters: Nos (3)** 1. Singh TA, Sarangi PK, Singh Ng Joykumar (2021) Pineapple processing waste utilization for sustainable development in North-eastern states of India. Sarangi P K and Bhatia L (Eds.). Apple academic press (Taylor & Francis group) (In Press). 2. Ng Joykumar Singh, Sarangi P K, Sharma PT, Singh TA (2021), Innovative Techniques for Harvesting and Processing of Pineapple. Agri starts up and Agribusiness. Brillion Publishing house.

Agro-Processing Centre (APC) established Nos (3)

S. No.	Name and Full Address of APC established	Working Area of APC	Budget of APC
1	Demonstration and agro processing unit, Iroishemba, Imphal	• Processing of ginger, turmeric • Value addition of pineapple • Processing of local king chilly	6.0 Lakh
3	Dal Mill and spice grinding established at Leimram, Bishnupur Dist.	• Processing of ginger and turmeric	2.0 Lakh
2	Oil expelling machine established at Bhumdiar, Imphal West dist.	• Processing of mustard and other oilseeds	1.5 Lakh

Establishment of APC at Leimram, Bishnupur Dist, Manipur

Entrepreneurship established Nos (2)

S. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Budget of Entrepreneurship
1	Thoubal Athokpam Mayai, Leikai	Fermented Soybean	Investing ₹ 10,000 on the and earning 30,000/pm as net profit
2	Bhumdiar, Imphal West dist.	Mustard/Peanutoil processing	1.50 Lakh

11. Centre Name: JNKVV, Jabalpur (Madhya Pradesh)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	06	03
2.	Technical	02	01
3.	Administrative	00	00
4.	Supporting	00	00

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	75.00	60.00	93.75
2.	Recurring	5.20	3.20	5.36
3.	Non-recurring	2.00	00	1.43
4	Total	**82.20**	**63.20**	**100.54**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
	NIL	---	---	---

Adaptive trails (Jan-Dec 2022): Nos (02)

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1	Garlic Bulb Breaker	APC CAE JNKVV	
2	Garlic Peeler	APC CAE JNKVV	

Extensions activities (Jan-Dec 2022) Nos (29)

Kisan melas /Agri-fairs: Nos (02)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	**JNKVV jabalpur**	KVK Jabalpur	Feb 2022	812
2	**CAE, Jabalpur**	AICRP on FIM & AICRP on PHET	March 2022	402

Technology demonstration/FLD: Nos (08)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	APC CAE Jabalpur	08.03.2022	12	03		15
2	APC CAE Jabalpur	10.05.2022			24	4
3	APC CAE Jabalpur	14.06.2022			23	23
4	APC CAE Jabalpur	20.09.2022			21	21
5	APC CAE Jabalpur	25.01.2023			30	30
6	APC Krishi Nagar Jabalpur	10.10.2022	---	11		11
7	APC CAE Jabalpur	16.11.2022	09	05		14
8	APC CAE Jabalpur	23.01.2023	11			11

Training organized: Nos (19)

S. No	Venue	Date	Number of participants			
			Male	Female	Student	Total
1	दालों का प्रसंस्करण एवं दलिया निर्माण प्रक्रिया का व्यवहारिक प्रशिक्षण.	22.03.22	6	3	---	9
2	नवोदित उद्यमियों के लिए सब्जी प्रसंस्करण प्रशिक्षण कार्यक्रम	05.04.22	4	7	---	11
3	लहसुन का प्रसंस्करण	20.04.22	5	3	---	8
4	गाजर का प्रसंस्करण	05.05.22	2	5	---	7
5	कृषि उत्पादों के प्रसंस्करण द्वारा किसानों की आय वर्धन की संभावनायें	27.05.22	15	12	---	27
6	बेकरी समवर्धी उत्पाद	16.06.22	2	3	---	5
7	खाद्य प्रसंस्करण क्षेत्र में कम लागत में व्यवसाय की संभावनाएं	29.06.22	6	3	---	9
8	पैडल एवं शक्ति चलित अनाज की सफाई एवं ग्रेडिकरण का सैद्धांतिक एवं व्यवहारिक प्रशिक्षण	05.07.22	---	---	24	24
9	धान से अधिकतम साबूत चावल निकालने का सैद्धांतिक एवं व्यवहारिक प्रशिक्षण	28.07.22	---	---	26	24
10	हरे मटर का प्रसंस्करण	29.07.22	---	---	26	26
11	बहु अनाज के दलिया निर्माण का व्यवहार के प्रशिक्षण.	23.08.22	7	3		10
12	आधुनिक ग्रेडर मशीनों से बाज प्रसंस्करण का व्यवहारिक प्रशिक्षण	26.08.22	---	---	28	28
13	प्रसंस्करण यंत्रों के रखरखाव की विधियाँ	07.09.22	---	---	23	23
14	दलहनी एवं तिलहनी फसलों में नमी की मात्रा का निर्धारण की विधियों का प्रशिक्षण	28.09.22	---	---	46	46
15	सोयाबीन से दूध एवं पनीर बनाने की तकनीक का व्यवहारिक प्रशिक्षण	11.10.22	---	---	23	23
16	मसालों के प्रसंस्करण का व्यवहारिक प्रशिक्षण	10.11.22	---	---	26	26
17	कोदो एंव कुटकी की दराई का सैद्धांतिक एवं व्यवहारिक प्रशिक्षण	29.11.22	8	6		14
18	हल्दी प्रसंस्करण का व्यवहारिक प्रशिक्षण	02.12.22	---	---	21	21
19	प्रसंस्करण ईकाई स्थापना संबंधित आवश्यक जानकारियाँ	08.12.22	---	---	34	34

Salient achievements of the centre (Jan-Dec 2022)

Publications: Not provided

Agro-Processing Centre (APC) established (Jan-Dec 2022): Nos (01)

S. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC ₹
01	AVR Spices, Rampur Chaapar, Jabalpur (M. P.)	10.05.2022	Spice Processing,	35000.00

12. Centre Name: AAU, Jorhat (Assam)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	7	6
2.	Technical	7	5
3.	Administrative	1	1
4.	Supporting	-	-

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	-	97.00	128.54
2.	Recurring	-	10.64	6.13
3.	Non-recurring	-	5.06	-
4	Total		**112.7**	**134.67**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1	Design and development of a combined Roselle (Hibiscus Sabdariffa, L.) deseeding and Chilli stem removing machine	PI: A. Borah Co-PIs: K. Hazarika, R. Deka	April 2022	March 2024
2	Microbial deactivation of some minor fruits of NE India using Cold Plasma	PI: Dr. A Borah Co-PIs: R. Deka, K. Hazarika	2020	2023
3	Development of processing line for production of Spinach, Mustard greens and fermented Bamboo shoot-based curry powder	PI: A Borah Co-PI: K. Hazarika	2020	2023

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (2)

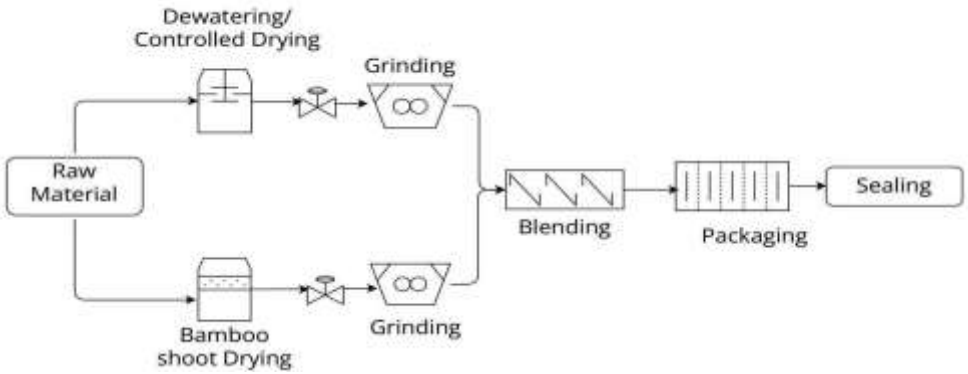
Name of machine	Pedal operated Roselle calyx removing machine
Capacity	5 kg/ hr.
Use	For removing calyx from Roselle seed
Details	The pedal operated Roselle deseeding machine consists of a rigid frame. The main components of machine are two numbers of cutting tips, roselle holding cup, drawbar, connecting rod and a pedal operated mechanism. Each end of the cutting tips is attached to the drawbar with help of a solid shaft whereas other end will act as cutting tool for Roselle deseeding. The drawbar is linked with a stationary structure by means of compression spring. From the center of the drawbar, a connecting rod is attached to the pedal. The Pedal can be operated by foot to give a vertical motion of about 7-8 cm.

	against the spring. A holding cup is equipped with a tray to keep the Roselle pod under the cutting tip. The cutting tools are given with a vertical movement from the pedal against the holding cup of the Roselle that will help deseed the bud. The calyx is then collected from tool tip and placed over the tray.
Photographs	 
Cost (₹)	₹ 2500.00

Name of machine	**Areca nut peeling machine**
Capacity	240 nos. areca nuts per batch
Use	Used to remove the adhered skin from de-husked areca nut
Details	An effort has been made to develop an appropriate gadget that can help to reduce human effort and save time for cleaning the areca nut. The design of the tool is-based on the concept that shears off the husk of the areca nut by shearing force. Then the nuts are subjected to a rotary motion around a sharp blade which helps to peel off the tightly adhered skin of the nut. The designed gadget has been fabricated which consists of an AC motor, solid shaft, rotating disc, cutting blades and rigid frame. This new technology will save time for the seller and avoid the drudgery of cleaning areca nut. It will also take less amount of time than manual operation for cleaning the same number of areca nuts. The developed tool is now equipped with brake assembly which can be used to stop the cutting blades instantly. MOU has been signed with a local entrepreneur for multiplication of the existing areca nut peeling tool.
Photographs	 
Cost of machine (₹)	₹ 2500.00

Processes/products /protocol developed (Jan-Dec 2022): Nos (10)

Name of the process /products	Curry mix from fermented bamboo shoot and mustard greens powder
Use	Preparation of ethnic cuisines
Details of the process/ products	Raw materials: Bamboo shoot, Mustard green leaves Equipment and machineries used: Food cleaning and disinfecting machine, Bamboo shoot grating machine, Industrial oven drier, Industrial grinder, Pestle grinder, Moisture analyser, Weighing balance, Stainless steel trays, Hand gloves, Spoon



Standardized process line for production ready to use curry powder

Photographs of the process/ products

Dried shoots

Dried mustard greens

Blended curry mix

Cost	₹ 40/- per 100 g

Details of extensions activities (Jan-Dec 2022) Nos (06)

Kisan melas /Agri-fairs: Nos (2)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	Farmers' fair Nov, 2022	Regional Agricultural Research Station (RARS), Titabar, Jorhat	9th Nov, 2022	1700
2.	Farmers' fair Nov, 2022	Sugarcane Research Station (SRS), Buralikson, Golaghat	14th Dec, 2022	1400

Technology demonstration/FLD: Nos (01)

S. No.	Technology and Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	Demonstration of Storage structure for grains and pulses after harvesting to the farmers in the Department of Agricultural Engineering, AAU, Jorhat-13	28/09/2022	14	20	4	38

Training organized: (03)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	A training programe on "Operation, Repair and Maintenance of Agricultural Machinery'' was held at Deptt. of Agril. Engg, AAU, Jorhat.	12-30 Sept, 2022	30			
2.	Conducted Farmers' training cum demonstration programme at Nalbari District	18 April 2022	32	8	-	40
3.	Skill Development training on Artificial Intelligence and Robotics in Agriculture at Deptt. Of Agril. Engg., AAU, Jorhat	27-29 June 2022			30	30

Salient achievements of the centre (Jan-Dec 2022)

a. Details of publications published during (Jan-Dec 2022): Nos (9)

1.	Peer reviewed: **Nos (4)** 1. Udangshree Borah, Rimki Baruah, Sweety Kalita, Francis Dutta, Abhijit Borah, Manashi Das Purkayastha (2022) Core-shell structured α-tocopherol acetate encapsulation using elephant apple mucilage-alginate matrix: In vitro digestion and thermal degradation kinetics, Food Bioscience, Volume 50, Part B, Article ID 102189, https://doi. org/10.1016/j. fbio.2022.102189. (NAAS Score:10.24) 2. Porinita Devi, Sweety Kalita, Mridula Saikia Barooah, Ananta Saikia, Abhijit Borah, Tobiul Hussain Ahmed, Manashi Das Purkayastha (2022) Instant rice-based

	composite pasta requiring no cooking, Food Science and Technology International 27(7):635-648, ttps://doi. org/10.1177/1082013220973. (NAAS Score:8.39) 3. Rejaul Hoque Bepary Wadikar, D. D. ; Vasudish, C. R. ; Semwal, A. D. and Sharma, G. K. (2022) Ranking-based formula optimization, quality investigation, and real-time shelf-life prediction of ready-to-eat ricebean (Vigna umbellata) curry. Journal of Food Science and Technology, 59(0): 4390-4404, DOI:10.1016/ifset.2022.103124 (NAAS Score:8.7) 4. Rejaul Hoque Bepary Wadikar, D. D. ; Semwal, A. D (2022) Optimization of temperate extrusion-assisted flaking process conditions for the production of ricebean (Vigna umbellata) flakes. Innovative Food Science and Emerging Technologies, Volume 81, Article ID 103124, DOI:10.1016/ifset.2022.103124. (NAAS Score:11.92)
2.	Number of papers published in journals (Nass rating less than 4): **Nos (1)** 1. Udangshree Borah, Rimki Boruah, Sahijul Islam, **Abhijit Borah**, Ananta Saikia, Robin Boro, Hemanta Saikia, Srikanth Mutnuri, Anasuya Ganguly, Rinku Baishya, Lakshi Saikia, Manashi Das Purkayastha (2022) Whey fortified ready-to-reconstitute elephant apple (Dillenia indica) juice powder: methodical optimization, micro-structural and in vitro digestion analyses, Journal of Food Technology Research 9(1) 18-45, http://dx. doi. org/10.18488/jftr. v9i1.2927
3.	Number of book chapters: **Nos (Nil)**
4.	Number of books edited and compiled: **Nos (Nil)**
5.	Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (4)** 1. An article on 'Ritu anuxari upolobdhyo fal mul aru xxak pasolir mulyo sanjujon''(Assamese) published in Ghore Pothare, an agricultural Journal published by DEE, AAU, Jorhat by Ranjana Deka, Jr. Scientist, AICRP,PHET. 2. Popular article named "Aantorjatic Bojarot Dehydrated Pasolir Bordhito sahidar uporot ek aalukpaat" (in Assamese language) published in Ghore pothare, an agricultural journal published by Department of Extension Education, AAU, Jorhat. (1st January 2023) by Ranjana Deka, Asst. Food Microbiologist, AICRP,PHET. 3. Prepared ODL course study materials for course on ODL certificate programme on 'Packaging Technology of Fruits and Vegetables' by Dr. Rejaul Hoque Bepary, Food Technologist, AICRP-PHET and MRS Ranjana Deka, Asst. Food Microbiologist, AICRP, PHET. 4. Prepared course study materials for 'Milling technician' course by Er. Kaushik Hazarika, Jr. Scientist AICRP-PHET.

Awards received by the centres (Jan-Dec 2022): Nos ()

1	Name and Awarding organisation name: a) Participated in Innovation Idea Competition on Technology Development for automated stem removal of King Chilli (Capsicum Chinese Jacq.) organized by DST funded Technology Enabling Centre, Tezpur University (TEC-TU) and qualified for final phase.

13. Centre Name: JAU, Junagadh (Gujrat)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	6	4
2.	Technical	2	2
3.	Administrative	0	0
4.	Supporting	5	4

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	96.00	81.19	53.03
2.	Recurring	9.50	12.79	0.87
3.	Non-recurring	2.71	5.86	0.00
4	Total	**108.21**	**99.84**	**53.91**

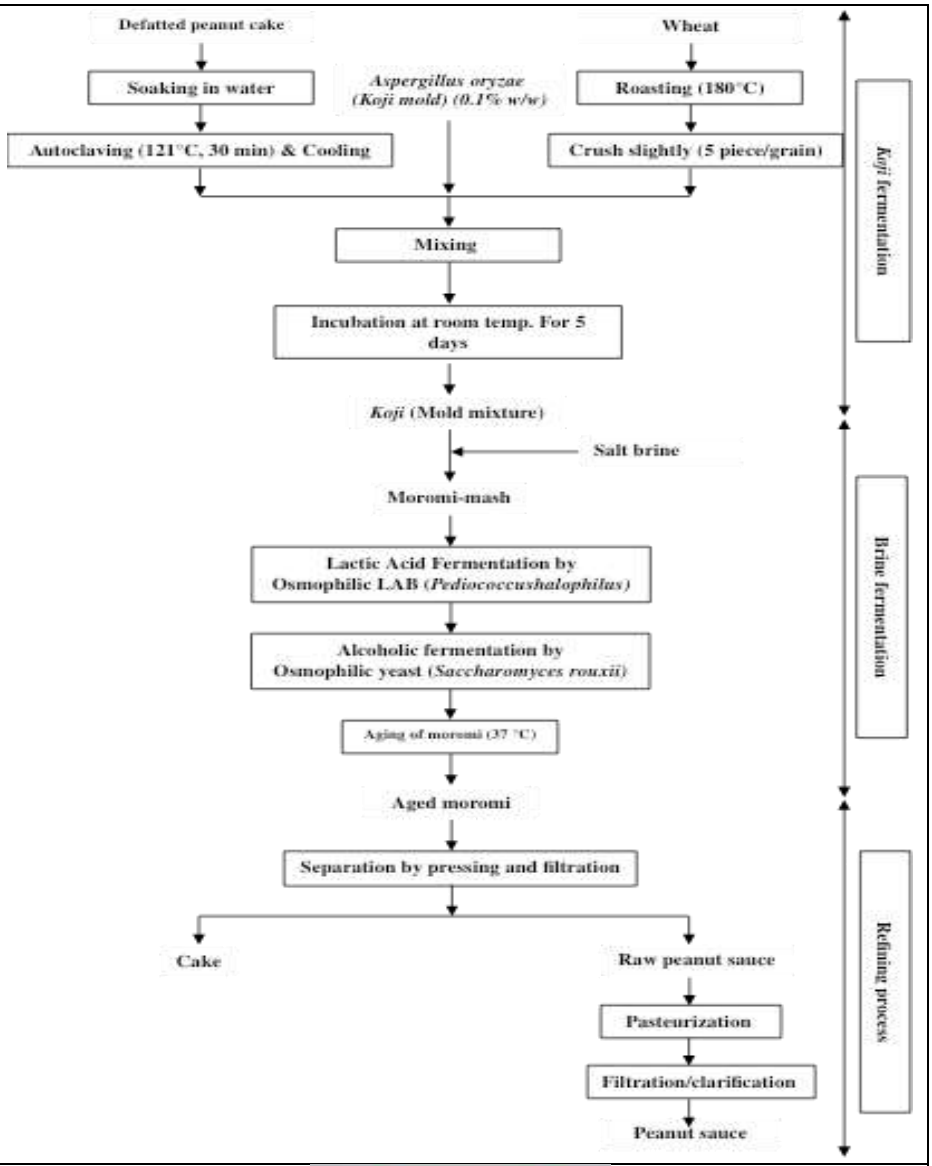
Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duraion	
			Start	End
	Ongoing projects			
1	Standardization of process technology for preparation of peanut sauce and peanut wadi (Chunks).	PI: P. R. Davara Co-PIs: A.M. Joshi, P.J. Rathod, M.N. Dabhi	01-02-2020	31-01-2023
2	Processing of green tender sorghum	PI: M. N. Dabhi CoPIs: P.R. Davara, P.S. Pandit, P.J. Rathod	01-04-2022	31-03-2025

Technology development and outreach activities (Jan-Dec 2022)

Processes/products /protocol developed (Jan-Dec 2022): Nos (1)

Name of the process	Process technology for preparation of peanut sauce
Use	• The process technology for production of nutrient rich peanut sauce is made available to the commercial players and food processors

Details of the process/ products	
Photographs of the process/ products	
Cost	₹ 125/liter excluding the initial cost of Aspergillus oryzae, Osmophilic LAB, Osmophilic yeast.

Technology demonstration/FLD: Nos (1)

S. No	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	Bhankhokhari, Jam Khambhaliya, Dist. Devbhumi Dwarka	22-03-2022	102	24	0	126

Training organized

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	Bhankhokhari, Ta. Jam Khambhaliya, Dist. Devbhumi Dwarka	22-03-2022	102	24	0	126

Salient achievements of the centre (Jan-Dec 2022)

Publications: Details not given

Awards received by the centres (Jan-Dec 2022): Nos (4)

1	1. Dr. P. R. Davara: Best Teacher Award in Agril. Higher Education-2020-21 (Received on 08-01-2022) JAU, Junagadh

Entrepreneurship established (Jan-Dec 2022): Nos (1)

S. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1	Shyam Pulse Industries Ivanagar, Junagadh	Pulse processing	August 2022	10.00 lakh

Success stories (Jan-Dec 2022): Nos (1)

1.	Name of the **of success stories/ name of the beneficiary/ address** **Pulse Processing** I, Shri Amritbhai Naranbhai Tank, resident of Ivannagar, Junagadh am self dependent on agriculture. Due to the lockdown during the corona period of 2020-21, an idea came to start a home industry to pass the time and earn extra income at home. In this regard, it has been decided to make dal from pigeon pea being the main crop in the area. Dal for home consumption is usually made with a stone hand-operated mill by giving treatment to the pigeon pea in water. There was no knowledge of machinery and method of dal making for further production. For this, information obtained from scientists working in the Department of Processing and Food Engineering, Junagadh Agricultural University Dr. M. N. Dabhi, Dr. V. P. Sangani and Dr. P. R. Davara about required machinery and its availability. First we purchased cleaner-graders, mortars and conveyors and in our own way started production by giving primary treatment (oil and water) to tubes after grading work. But we were not getting good quality and recovery of dal (approx.50-55%) and the quantity of husk on the dal was very high. After visiting the scientists of the AICRP on PHET again, we got the knowledge of the dry method provided at the commercial level and in the department they have also given face-to-face training on the scientific method of treatment of 50 kg pigeon pea. Treated pigeon pea found similar quality and recovery (approx.75%) of dal from our machine. At present we are producing dal using dry method. From the AICRP on PHET, Department of Processing and Food Engineering, we have been getting a lot of support from the scientists in person as well as over the phone and have got good results. The daily capacity of the plant is 500 kg. This venture of ours provides employment to 3 people and good compensation (price). Mr. Amrutbhai Naranbhai Tank, Ivnagar, Junagadh, Mo.9624171303

14. Centre Name: ICAR-CPCRI, Kasaragod (Kerala)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	**4**	**4**
2.	Technical	**2**	**2**
3.	Administrative	**1**	**1**
4.	Supporting	**1**	**1**

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Concurred, (₹ in Lakh)
1.	Salary Head	-		
2.	Recurring	7.20	7.20	5.97
3.	Non-recurring	1.00	1.00	0.98
4	Total	**8.20**	**8.20**	**6.95**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Hyper spectral Imaging-based Detection System for Identification of Adulteration in Desiccated Coconut Powder	PI: M R Manikantan Co-PIs: S.K. Chakraborty, R Pandiselvam, Beegum	April 2021	March 2023
2.	Development of Linear Actuator-based Tender Coconut Punching and Cutting Machine	PI: R Pandiselvam Co-PIs: M R Manikantan, A C Mathew, Shameena Beegum	April 2021	March 2023
3	Development of Process Technology for Coconut milk-based dairy analogues	PI: Shameena Beegum Co-PIs: Suresha K.B., M.R Manikantan, R Pandiselvam, Murali Gopal	April 2022	March 2024

Technology development and outreach activities (Jan-Dec 2022)

Details of machines/Gadgets tools/ instruments developed: Nos (2)

Name of machine	**Motorized Tender Coconut Punching Machine**
Capacity	650-700 nuts/h
Use	The developed machine could be useful to street vendors and tender coconut water processing industries.
Details	It is consisted of single phase 0.5 HP motor with 30:1 speed reduction ratio to achieve high torque during punching.
Photographs	
Cost of machine (₹)	**₹ 25,000**

Name of machine	**Solar Assisted Tender Coconut Cutting Machine**
Capacity	60 nuts/h
Use	The developed machine could be useful to street vendors and tender coconut water processing industries.
Details	The cutting knife (with bevel angle 45^{o}) has been connected with linear actuator to convert the rotary motion to linear. Solar energy used to operate the linear actuator.
Photographs	
Cost (₹)	**₹ 70,000**

Processes/products /protocol developed (Jan-Dec 2022): Nos (2)

Name of the process	**Neera Honey Infused Coconut Extrudate**
Use of the process/ products	Neera honey used as a bio fortifying compound for the production of nutritious ready-to-eat extrudates. Infusion of neera honey enhanced the nutritional properties, including vitamin C and minerals such as calcium, potassium and sodium, and also improved the antioxidant activity of the extrudates
Details of the process/ products	The combination of 60% rice flour+ 25% corn flour + 15% coconut milk residue samples infused with neera honey upto 16% feed moisture was found suitable for the preparation of nutritious extrudates
Photographs of the process/ products	
Cost	**₹ 3/25 g**

Name of the process /products	**Baked Coconut Chips**
Use	Alternative to fried snacks. Rich in fat, phenol and antioxidant activity.
Details	The experimental findings reveal that, baking temperature of 160 ^{o}C for 35 min baking time with osmotic treatment yield a nutritious chips.
Photographs of the process/ products	
Cost	**₹ 500/kg**

Adaptive trails (Jan-Dec 2022): Nos ()

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1.	Coconut milk residue and virgin coconut oil cake-based cookies and pasta	ICAR-KVK, Kasaragod	The faculty of ICAR-KVK, Kasaragod organized adoptive trial in the production of cookies and pasta using 10% coconut milk residue flour and 25% virgin coconut oil cake flour separately replacing refined wheat flour.
2.	Coconut Chips (Jaggery infused coconut chips)	M/s Distinct origins Pvt. Ltd, West Godavari, Andhra Pradesh	We demonstrated the production of coconut chips using jaggery as osmotic fluid in place of white sugar. The successful adaptive trial and demonstration led to the technology transfer.
3.	Coconut Chips (Pepper-based coconut chips)	M/s G J Enterprises, Perumpadappu, Malappuram, Kerala	We demonstrated the production of coconut chips using pepper powder solution as osmotic fluid in place of white sugar. The successful adaptive trial and demonstration led to the technology transfer.

Machine/Technology Transferred (Jan-Dec 2022): Nos ()

S. No	Name of machine/ technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of technology transferred	Total revenue generated
1.	Coconut Chips	7	1. Mr. Naveen Poojary, 11-18-6, Manikanta Nilaya, Kemmade, Mooru Kaveri, Menna Bettu, Kinnigoli, Dakshina Kannada, Karnataka-574150 2. Mr. Venkata Vikas Vepuri, Vepuri Agro Products Pvt. Ltd., F203, Gananada heights apartments, Yanamalakuduru lakulu road, near ayyappanagar arch, Paramata, Vijayawada, Krishna Dist, Andhra Pradesh-520007. Ph: 8978987044 3. Praveen Jacob, CEO, ALPHA NATURAL, Misgar Complex, Keregundi road, Sirsi, Uthara Kannada, Karnataka-581402, India 7760528278. 4. Mr. Abdul Gafoor Chalil, M/s GJ Enterprises, Ground 16/330, Palapetty, Perumpadappu-	12.01.2022 25.01.2022 08.03.2022 19.05.2022	1,75,000

			679579, Malappuram, Kerala, India 5. Raam Mohan N. U., 4/22, Umapathy coconut hybrid Nasuvanpalayam, Pollachi Road, Venkittapuram Post, Palladam (TK), Tirupur, Tamil Nadu 6. M/s Distinct origins Pvt. Ltd., Survey No.820-1, H No.10-34, Kamavarapukota Mandal, Tadikalapudi Village, West Godavari, Andhra Pradesh-534452 7. The Managing Partner, Green Valley Oils, Irumpakachola PO, Kanjirapuzha 678591, Palakkad, Kerala	20.05.2022 16.08.2022	
2.	Technical knowhow of production of virgin coconut oil (VCO)	1	South Canara Coconut Farmers Producer Company Limited,1-101, Near Mangala Mantama CPCRI, Vittal, Dakshina Kannada, Karnataka-574243 Prasad Shetty: 9591702541, 7338567763.	23.02.2022	40,000
3.	Knowhow for production of bean to bite chocolate	2	1. Mr. Bobby Mookanthottathil, Chairman, Hill Grown Farmers Producer Company Ltd., Chathangottunada P. O., Kavilumpara-673513, Kerala, India 2. Mrs Dhanalakshmi R, Proprietor, Unique Victuals, No.2938, 1st Floor, M. K. K Road, Opp. Mariyappanapalya Park Gate, 2nd Stage, Rajajinagar, Bengaluru-560010, Karnataka, India	28.04.2022 28.12.2022	20,000
4.	Preservation protocol for trimmed tender coconut	1	Mr. Shafeeque V., C/o. Wadi Zamzam Tender Coconut, Karoth Thazhath (H), Vaidyarangadi (PO), Ramanattukara, Calicut-673633, Kerala	16.06.2022	15,000
5.	Preservation of carbonated tender coconut water	2	Miss Jasmine P, D/o Abdul Rahiman P, Pavaratty house, Chemmalappadi, Kerala Estate P. O., Karuvarakundu, Malappuram-676523	15.09.2022 07.12.2022	50,000

			Mr. Ajas Parambath, Konolly Foods International, Kanoor, Vakkad P. O., Tirur, Malappuram, Kerala-676502, India		

Extensions activities (Jan-Dec 2022) Nos (37)

Kisan melas /Agri-fairs: Nos (06)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	HORT FAIR, Vittal, Karnataka	ICAR-CPCRI	March 2022	300
2.	Agri Fair, Palakkad, Kerala	Mathrubhumi	October 2022	5000
3.	Krishidarshan, Thrissur	KV&ASU and Department of Agriculture	October 2022	3000
4	Expansion of horticulture value chain in India-potential and opportunities at VAMNICOM, Pune	MANAGE, Ministry of Agriculture and Farmers Welfare	November 2022	1000
5.	Krishi Mela, Kuttiyadi	Hill Grown Farmers Producers Company	November 2022	1000
6	KRISHI-SIRI-2022, Moodbidri, Karnataka	Alva's Educational Foundation	December 2022	5000

Technology demonstration/FLD: Nos (16)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	ICAR-KVK, Kasaragod (Coconut milk residue-based cookies)	23.08.2022		10		10
2	ICAR-KVK, Kasaragod (Coconut milk residue-based pasta)	23.08.2022		10		10
3	ICAR-CPCRI, Kasaragod (Coconut water-based value added products and coconut milk-based ice cream)	07.01.2022	25			25
4	ICAR-CPCRI, Kasaragod (Coconut processing technologies and machineries)- UG and PG Botany students of CPA College of Global Studies, Malappuram	14.03.2022			25	25
5	ICAR-CPCRI, Kasaragod (Coconut processing technologies and machineries)-	12.05.2022			60 (30 Boys +	60

	Educational visit of B.Tech students of College of Agriculture, Hassan, Karnataka				30 Girls)	
6	ICAR-CPCRI, Kasaragod (Postharvest processing in coconut)-Farmers Training Program under NHM	25.05.2022	30	15		45
7	ICAR-CPCRI, Kasaragod (Coconut processing technologies and machineries)-Educational visit of B.Sc (Ag) students of College of Agriculture, Padannakkad, Kerala	22.06.2022			107	107
8	ICAR-CPCRI, Kasaragod (Coconut processing technologies and machineries)-Participants of Training Cum Workshop on Coconut-based enterprises	07.07.2022	36	10		46
9	ICAR-CPCRI, Kasaragod (Coconut-based food products)-RINK Demo day organized by Kerala Startup Mission	30.07.2022	120	50		170
10	ICAR-CPCRI, Kasaragod (Processing and value addition of coconut)-Webinar organized by Dr. YSRHU, Venkataramanagudem, Andhra	26.09.2022	70	30	100	200
11	ICAR-CPCRI, Kasaragod (Value addition in coconut)-Participants of NHM scheme Exposure Visit cum Training to Technical Officer (DHPC) from Erode District, Tamil Nadu	12.10.2022	5	5		10
12	ICAR-CPCRI, Kasaragod (Postharvest processing and value addition in coconut)-Educational visit of Diploma (Horticulture) students of Tamil Nadu Horticultural Management Institute, Chennai	14.10.2022			50 (20 Boys + 30 Girls)	50
13	ICAR-CPCRI, Kasaragod (Value addition in coconut)-Interstate Exposure Visit of Farmers under ATMA scheme	19.10.2022	15	5		20
14	ICAR-CPCRI, Kasaragod (Value addition in coconut)-Interstate Exposure Visit of Farmers under	04.11.2022	17	3		20

	ATMA scheme					
15	ICAR-CPCRI, Kasaragod (Coconut processing technologies and machineries)-Training Cum Exposure Visit of Coconut Farmers on "Technologies for value addition in coconut" in collaboration with Vedic Organic Certification Agency, Bengaluru	07.11.2022	40	13		53
16	ICAR-CPCRI, Kasaragod (Processing of coconut and machinery involved in processing)-Participants of Certificate Programme on Skill and Capacity Development in Coconut-Based Secondary Agriculture (Virtual)	14.11.2022	20	10		30

Training organized: (12)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	ICAR-CENDECT KVK, Theni, Tamil Nadu (Virtual)-Training on value addition in coconut	08.01.2022	80	20		100
2	ICAR-CPCRI, Kasaragod-One month internship training to KCAET Students	01.03.2022 to 31.03.2022			17	17
3	ICAR-CPCRI, Kasaragod in collaboration with District Industry Centre, Kasaragod-EDP/Training-Micro Enterprises on value added coconut products	02.03.2022 to 03.03.2022	15	10		25
4	Virtual-An entrepreneurship-oriented value addition in coconut-Faculty Development Program of Avinashilingam Institute of Home Science and Higher Education for Women, Coimbatore	24.03.2022		50 Faculty Members		50
5	ICAR-CPCRI, Kasaragod - Skill development training on coconut value added products to the employees of M/s Kerala Clays and Ceramic Products Ltd.	20.04.2022 to 26.04.2022 29.04.2022 to 11.05.2022	4	7		11

6	ICAR-CPCRI, Kasaragod-Four months internship training to B.Tech students of College of Horticultural Engineering and Food Technology, Devihosur, Karnataka	15.02.2022 to 15.06.2022			3 (2 Girls + 1 Boy)	3
7	ICAR-CPCRI, Kasaragod-In plant training to B.Tech (Agri Engg) students of KCAET, Tavanur, Kerala	01.08.2022 to 06.08.2022			17 (12 Girls + 5 Boys)	17
8	ICAR-CPCRI, Kasaragod-In plant training to B.Tech (Agri Engg) students of KCAET, Tavanur, Kerala	09.08.2022 to 19.08.2022			16 (13 Girls + 3 Boys)	16
9	ICAR-CPCRI, Kasaragod-In plant training to B. Tech (Agri Engg) students of KCAET, Tavanur, Kerala	22.08.2022 to 29.08.2022			16 (10 Girls + 6 Boys)	16
10	ICAR-KVK Lakshadweep-Training cum workshop on "Value addition and processing techniques in coconut"	17.10.2022 to 19.10.2022	70	30		100
11	ICAR-CPCRI, Kasaragod-Interstate Exposure visit of farmers of Morappur Block, Dharmapuri District of Tamil Nadu and training on "Agro Techniques and postharvest technologies in coconut"	28.11.2022 to 02.12.2022	15	5		20
12	ICAR-CPCRI, Kasaragod-Bean to Bar chocolate making training to the participants of "Cocoa Production and Processing Technology & Bean to Bar Chocolate Making" sponsored by The Directorate of Cashewnut and Cocoa Development (DCCD)	19.12.2022 to 20.12.2022	5	27		32

Salient achievements of the centre (Jan-Dec 2022)

Publications

Peer reviewed

1. Pandiselvam, R., Kaavya, R., Martinez Monteagudo, S. I., Divya, V., Jain, S., Khanashyam, A. C., & Cozzolino, D. (2022). Contemporary Developments and Emerging Trends in the Application of Spectroscopy Techniques: A Particular Reference to Coconut (Cocos nucifera L.). Molecules, 27(10), 3250.
2. Priya, R. B., Rashmitha, R., Preetham, G. S., Chandrasekar, V., Mohan, R. J., Sinija, V. R., & Pandiselvam, R. (2022). Detection of Adulteration in Coconut Oil and Virgin Coconut Oil Using Advanced Analytical Techniques: A Review. Food Analytical Methods, 1-14.
3. Shameena Beegum, P. P., Manikantan, M. R., Anju, K. B., Vinija, V., Pandiselvam, R., Jayashekhar, S., & Hebbar, K. B. (2022). Foam mat drying technique in coconut milk: Effect of additives on foaming and powder properties and its economic analysis. Journal of Food Processing and Preservation, e17122.
4. Beegum, P. S., Pandiselvam, R., Ramesh, S. V., Sugatha, P., Nooh, A., Neenu, S., . . . & Hebbar, K. B. (2022). Sensorial, textural and nutritional attributes of coconut sugar and cocoa solids-based 'bean to bar'dark chocolate. Journal of Texture Studies. DOI: 10.1111/jtxs.12698
5. Jacob, A., Sudagar, I. P., Pandiselvam, R., Rajkumar, P., & Rajavel, M. (2022). Optimization of ultrasound processing parameters for preservation of matured coconut water using a central composite design. Quality Assurance and Safety of Crops & Foods, 14(SP1), 33-41.
6. Pandiselvam, R., Prithviraj, V., Manikantan, M. R., Beegum, P. S., Ramesh, S. V., Kothakota, A., . . . & Socol, C. T. (2022). Dynamics of biochemical attributes and enzymatic activities of pasteurized and bio-preserved tender coconut water during storage. Frontiers in Nutrition, 9.
7. Preetha, P., Varadharaju, N., Jeevarathinam, G., Deepa, J., Kumar, A. M., Balakrishnan, M., . . . & Pandiselvam, R. Optimization of continuous flow pulsed light system process parameters for microbial inactivation in tender coconut water, pineapple and orange juice. Journal of Food Process Engineering, e14254.
8. Hebbar, K. B., Ramesh, S. V., Ghosh, D. K., Beegum, P. P., Pandiselvam, R., Manikantan, M. R., & Mathew, A. C. (2022). Coconut sugar-a potential storehouse of nutritive metabolites, novel bio-products and prospects. Sugar Tech, 1-16.
9. Pandiselvam, R., Mahanti, N. K., Manikantan, M. R., Kothakota, A., Chakraborty, S. K., Ramesh, S. V., & Beegum, P. S. (2022). Rapid detection of adulteration in desiccated coconut powder: Vis-NIR spectroscopy and chemometric approach. Food Control, 133, 108588.
10. Prithviraj, V., Pandiselvam, R., Manikantan, M. R., Ramesh, S. V., Shameena Beegum, P. P., Kothakota, A., & Mousavi Khaneghah, A. (2022). Transient computer simulation of the temperature profile in different packaging materials: an optimization of thermal treatment of tender coconut water. Journal of Food Process Engineering, e13958.
11. Pravitha, M., Manikantan, M. R., Kumar, V. A., Beegum, P. S., & Pandiselvam, R. (2022). Comparison of drying behavior and product quality of coconut chips treated with different osmotic agents. LWT, 162, 113432.
12. Beegum, P. S., Pandiselvam, R., Ramesh, S. V., Thube, S. H., Pandian, T. P., Khanashyam, A. C., . . . & Hebbar, K. B. (2022). A critical appraisal on the

antimicrobial, oral protective, and anti-diabetic functions of coconut and its derivatives. Quality Assurance and Safety of Crops & Foods, 14(2), 86-100.

13. Manikantan, M. R., Pandiselvam, R., Arumuganathan, T., Anandu Chandra Khanashyam and Varadharaju, N.2022. Biochemical, colour and sensory attributes of pasteurized sugarcane juice stored in high-density polyethylene-based nanocomposite films. Packaging Technology and Science, https://doi. org/10.1002/pts.2647.
14. Manikantan, M. R., Pandiselvam, R., Arumuganathan, T., Varadharaju, N., Sruthi, N. U. and Amin Mousavi Khaneghah.2022. Development of linear low-density polyethylene nanocomposite films for storage of sugarcane juice. Journal of Food Process Engineering, https://doi. org/10.1111/jfpe.13988.
15. Preethi, P., Shamsudheen, M., Thanushree, K., Reddy, S. V. R., Pandiselvam, R., Ramesh, S. V., Sachin, A. J., Manikantan, M. R. and Veena, G. L.2022. Synergistic effect of powdered cashew sprout cum cotyledon and cereals on improving the biochemical and physical properties of extrudates. Journal of Food Processing and Preservation. https://doi. org/10.1111/jfpp.16938
16. Ramesh, S. V., Rose Mary, Shameena Beegum, P. P., Pandiselvam, R., Sugatha Padmanabhan, Neenu Sathyan, Sandip Shil, Niral, V., Manikantan, M. R., Lokesha, A. N., Shivashankara, K. S. and Hebbar, K. B.2022. Physicochemical characterization and fatty acid profiles of testa oils from various coconut (Cocos nucifera L.) genotypes. Journal of the Science of Food and Agriculture, https://doi. org/10.1002/jsfa.12150.
17. Manikantan, M. R., Mridula, D., Monika Sharma, Anita Kochhar, Arun Prasath, V., Abhipriya Patra and Pandiselvam, R.2022. Investigation on thin-layer drying kinetics of sprouted wheat in a tray dryer. Quality Assurance and Safety of Crops & Foods, 2022; 14(SP1): 12–24.

Number of papers published in journals (Nass rating less than 4): **Nos (3)**

1. Hebbar, K. B., Pandiselvam, R., Shameena Beegum, P. P., Ramesh, S. V., Manikantan, M. R. and Mathew, A. C. Seventy five years of research in processing and product development in plantation crops - Coconut, arecanut and cocoa. International Journal of Innovative Horticulture, 11(1): 103-119.
2. Shetty, S. S., Roopashree, P. G., Ramesh, S. V., Ajeet Singh, Arivalagan, M., Manikantan, M. R., Devi, U. H., Sharmila, K. P., Hebbar, K. B. and Suchetha Kumari, N.2022. Virgin Coconut Oil (VCO) Ameliorates High Fat Diet (HFD)- Induced Obesity, Dyslipidemia and Bestows Cardiovascular Protection in Rats. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences, https://doi. org/10.1007/s40011-021-01318-y.
3. Manikantan, M. R., ShameenaBeegum, P., Pandiselvam, R. Ramesh, S. V. and Mathew, A. C.2022. Avenues of value addition in Coconut, Arecanut and Cocoa, Indian Horticulture, 67 (6): 78-83.

Number of book chapters: **Nos (3)**

1. SV, Ramesh, P. P. Shameena Beegum, R. Pandiselvam, M. R. Manikantan, and K. B. Hebbar. "Plant-Based Milk Alternatives: Nutritional Potential and Challenges. " In Conceptualizing Plant-Based Nutrition, pp.91-106. Springer, Singapore, 2022.
2. Khanashyam, A. C., Shanker, M. A., Kothakota, A., & Pandiselvam, R. (2022). Decontamination of Fruits. In Microbial Decontamination of Food (pp.47-70). Springer, Singapore.
3. Pandiselvam, R., Prithviraj, V., Kothakota, A., & Prabha, K. (2022). Ozone Processing of Foods: Methods and Procedures Related to Process Parameters In Emerging Food Processing Technologies (pp.59-75). Springer, Humana, New York, NY.

Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (2)**

1. M. R. Manikantan, A. C. Mathew, R. Pandiselvam, Shameena Beegum, S. V. Ramesh, K. Madhavan, T. Arumuganathan, M. Arivalagan, and K. B. Hebbar.2022. Coconut chips production technology (in Tamil). Technical Bulletin No.153, ICAR-CPCRI & AICRP on PHET, Kasaragod, 40pp.
2. M. R. Manikantan, A. C. Mathew, R. Pandiselvam, Shameena Beegum, S. V. Ramesh, K. Madhavan, T. Arumuganathan, M. Arivalagan, and K. B. Hebbar.2022. . Techno Economic Analysis of Virgin Coconut Oil Production by Hot and Fermentation Process Technology (in Tamil). Technical Bulletin No.152, ICAR-CPCRI & AICRP on PHET, Kasaragod, 44pp.

Awards received by the centres (Jan-Dec 2022): Nos ()

1	1. Dr. R. Pandiselvam, Scientist, ICAR-CPCRI received the NAAS Associateship. 2. Dr. R. Pandiselvam and M. R. Manikantan, and Shameena Beegum, Scientists, ICAR-CPCRI received "Best Paper Award" in category of Food Technology from Journal of Food Science and Technology for the research paper "Reaction kinetics of physico-chemical attributes in coconut inflorescence sap during fermentation" during 29th ICFoST at Trivandrum during 05.01.2023. 3. Dr. M R Manikantan, Principal Scientist received CDB Best Coconut Research Worker Award for his findings on coconut products during the world coconut day function organized by Coconut Development Board on 02.09.2022 4. Dr. M R Manikantan, Principal Scientist received Dr. J C Anand Award in Postharvest Management of Horticultural crops-2022 by Indian Academy of Horticultural Sciences, New Delhi for his outstanding contribution on Horticultural Crops on 02.12.2022 at IARI, New Delhi.

Entrepreneurship established (Jan-Dec 2022): Nos (03)

S. No	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1.	Mr. Abdul Gafoor Chalil, M/s GJ Enterprises, Ground 16/330, Palapetty, Perumpadappu-679579, Malappuram, Kerala, India	Coconut chips	19.08.2022	₹ 10 Lakhs
2	Miss. Chrysolite, M/s NIVAH, 3/432-A, Near Tekke Kanattu, Parambath Temple, Makkada Post, Badirur, Kozhikode-673611, Kerala.	Virgin Coconut Oil	May 2022	₹ 15 lakhs
3	M/s Distinct origins Pvt. Ltd., Survey No.820-1, H No.10-34, Kamavarapukota Mandal, Tadikalapudi Village, West Godavari, Andhra Pradesh - 534452	Coconut Chips	November 2022	₹ 10 Lakhs

15. Centre Name: AAU, Khanapara (Assam)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	4	4
2.	Technical	3	1
3.	Administrative	-	-
4.	Supporting	-	-

Financial Detail (April- Dec, 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	133.33	102.99	69.79
2.	Recurring	17.52	14.53	10.91
3.	Non-recurring	10.08	6.69	6.14
4	Total	**160.93**	**124.21**	**86.84**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
	Ongoing projects			
01	Surveillance and Detection of Meat for Antimicrobial Residues and its Resistance to Common Food Pathogens	PI: S. K. Laskar Co-PIs: S. Upadhyay, A. Das, P. Gogoi, D. Deuri	April, 2020	March, 2023
02	Improvement of shelf life of meat (chicken) by coating with chitosan-gelatin containing nano-encapsulated Thyme Essential Oil (TEO)	PI: D. Deuri Co-PIs: S. Upadhyay, P. Gogoi, S. K. Laskar, Ankur Das	April, 2021	March, 2023
03	Development of a Functional Pork Products using Probiotic Culture	PI: P. Gogoi Co-PIs: D. Deuri, S. Upadhyay, S. K. Laskar, Ankur Das	April, 2021	March, 2023
04	Development of a Low-cost Mobile Reinforced Clay Pot Smoker for Meat and Fish	PI: Ankur Das Co-PIs: S.K. Laskar, S. Upadhyay, P. Gogoi, D. Deuri	April, 2022	March, 2024
05	Development of a Bio-based Freshness Indicator for Refrigerated and Frozen Meat	PI: Ankur Das Co-PIs: S. Upadhyay, P. Gogoi, D. Deuri, S. K. Laskar	April, 2022	March, 2024

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (2)

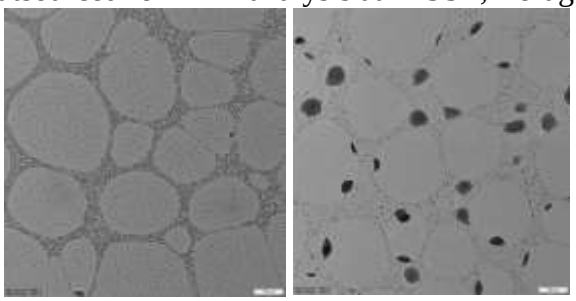
Name of machine	**Electrically operated portable barbeque**
Capacity	3.0 kg per hour
Use of machine	Used for preparation of barbequed meat product
Details of machine	The electrically operated revolving barbecue has been constructed locally with non-toxic stainless steel, toughened glass and other materials. The apparatus consists of 1000 W heating element and five synchronized motors for rotatory movement along with thermostat for temperature control. It has five stainless steel barbeque stick fitted with it. The product is found to be handy, economical, environment friendly and suitable for small families, hotels and restaurants and small vendors. **Dimension:** Length:17.1″Breadth: 11″Circumference: 33″Weight of machine: 6 kg, Capacity: 1.5 kg
Photographs	
Cost (₹)	**₹ 8,000.00 (approx.)**

Processes/products /protocol developed (Jan-Dec 2022):

Name of the process /products	**Development of a Functional Pork Products using Probiotic Culture**
Use of the process/ products	Addition of probiotics to meat product formulation helps in the addition of nutritional values, improves the sensory qualities and aids in the development of functional meat products with real human health beneficial. The lactic and acetic acid produced by the probiotic bacteria in the meat mass reduces the pH thereby making it less favorable for pathogen growth. Additionally, probiotics enhance resistance to intestinal pathogens via competitive colonization of intestinal adhesion sites and nutrients.
Details of the process/ products	Pork sausage and pork spread were prepared by the addition of probiotics (Lactobacillus acidophilus and Bifidobacterium animalis). The cooked meat was minced and mixed with all non-meat ingredients and the mix was divided into 4 groups. All the groups were then pasteurized separately and then stuffed into casings for the preparation of probiotic sausage: 1. Control, 2. Meat mixture with the addition of Lactobacillus acidophilus, 3. Meat mixture with the addition of Bifidobacterium animalis and 4. Meat mixture with the addition of both Lactobacillus acidophilus and Bifidobacterium animalis.

	For the preparation of meat spread, all the four groups were filled into sterile PET jars The probiotic added pork sausages and pork spread were then kept for ripening at 25^{o}C for 48 hours except the control group which was kept at refrigeration temperature. After the completion of ripening period, the sausages and spread are then kept at refrigeration temperature (4±1^{o}C) during which different physico-chemical, proximate, microbiological, sensory evaluation was carried out at fortnightly intervals to determine the shelf life of the products. The pH of the probiotic added sausages were within 4.3 to 5.7 whereas for the control group the pH was found to be 6.9 at the end of storage period. The Thiobarbituric Acid Reactive Substance (TBARS) value of the product were all found to be within the threshold level for all the probiotic added sausages except the control group at the end of storage period. The proximate composition of the products also revealed higher crude protein and less crude fat value during the entire storage period whereas for the control group the crude protein content was found to be less than the treated ones. As regards to microbiological quality, the treated sausages were found to be microbiologically safe for 42 days whereas for the control group the shelf life was found to be 28 days. Sensory evaluation also revealed that the sausages prepared with the combined addition of Lactobacillus acidophilus and Bifidobacterium animalis was best in terms of colour, flavour, texture and overall acceptability followed by L. acidophilus group, B. animalis group and lastly control group. Thus the probiotic added sausages/ spread was found to have a shelf life of 42 days at refrigeration temperature.
Photographs of the process/ products	 Probiotic enriched pork sausage  Probiotic enriched Pork spread
Cost	**₹ 7000.00/10 kg (approx.)**

Name of the process /products	**Improvement of shelf life of meat (chicken) by coating with chitosan-gelatin containing nano-encapsulated Thyme Essential Oil (TEO)**
Use of the process/ products	Nano-encapsulation can increase the oxidative stability by reducing the negative impact of light, moisture and high temperatures, and thus keeping their biological potential constant. Chitosan-gelatin nanoemulsions loading thyme essential oils could be used as a coating to preserve fresh meat decreasing bacteria-induced and oxidation-induced quality deterioration. Encapsulation of TEO enabled the controlled slow-release of the active compounds on the surface of meat that cause a prolonged acting time. Edible coatings retard the reduction of food quality by functioning as barrier materials to prevent moisture losses, oxygen and solute migration during

	short storage time. Nano-encapsulation help in controlled or targeted delivery and limited their possible interaction with food components.
Details of the process/ products	**Encapsulation of thyme essential oil by coating with Chitosan Nano particles:** **0.2 g Chitosan(CS) dissolving in 100 ml of acetic acid solution (1%)** ⇩ **Mixed at 60°C for 60 Minutes** ⇩ **Filtered through 1-µm pore size filter paper** ⇩ **pH adjusted to 4.7-4.8** ⇩ **Tween -80(0.240g) added to the solution and continuous agitation for 30 mins** ⇩ **Thyme essential oil (0.16g) will be dissolved in ethyl alcohol (8 ml) and added drop wise to chitosan mixture with steady stirring at 1200 rpm for 30 minutes (weight ratio of 1:0.8) respectively** ⇩ **20 ml of the STPP solution (0.08g/ml in 20 ml) with equal pH was added drop wise for 60 min using magnetic stirrer** ⇩ **Centrifuge at 10,000 rpm for 35 minutes at 4°C and collect the supernatant** ⇩ **Stored at 4°C until used** The Zeta potential and size of the prepared nano-particles were analyzed by Zeta sizer at IASST, Guwahati. The zeta potential and size of the developed nano-particle was found to be **31.6mV** and **106.8 nm** respectively. The samples were outsourced for TEM analysis at IASST, Boragaon, Guwahati.  Figure: Depiction of nano-emulsion of Thyme Essential Oil **<u>Preparation of coating solution and used on meat samples:</u>** The three groups of coating solution were formulated using nano-encapsulatecd thyme essential oil, 1% Chitosan and 3% Gelatin i. e **T1**(1% chitosan+ 1% TEO-NP), **T2** (3% Gelatin+1% TEO-NP) and **T3** (1% Chitosan+3% Gelatin+1% TEO-NP). The TEO-NPs with the highest EE%(CH to TEO ratio of 1:0.8) at the level of 1%(v/v) was added to the cooled coating solution and blended. The coating solution was adjusted its pH to 5.6 using 10% sodium bicarbonate. Chitosan gelatin coating incorporated with TEO-NPs effectively retarded the quality deterioration of fresh chicken by reducing pH changes, inhibiting lipid oxidation, and preventing microbial proliferation during cold storage at 4°C for 15 days.

Photographs of the process/ products	
Cost	Not yet determined

Technology Transferred (Jan-Dec 2022): Nos (02)

S. No	Name of machine/ Technology Transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of Technology transferred	Total revenue generated (₹)
1.	Chicken Powder	1	M/s. Saikia Engineering and Traders House no.6, Batahghuli, Panjabari, Kamrup (M), Guwahati-37, Assam	23.12.2022	20,000.00
2.	Pet food (Dog loaf)	1	M/s. S. H. Agrovet Clinics Kailashpur, Kachari Garigaon, Jalukbari, Guwahati-14, Kamrup (M), Assam	23.12.2022	20,000.00

Extensions activities (Jan-Dec 2022) Nos (10)

Kisan melas /Agri-fairs: Nos (3 nos.)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	"The Vibrant North East" from 25th-27th August,2022 in the play ground of College of Veterinary Science, AAU, Khanapara, Guwahati-22	Govt. of Assam	August, 2022	-
2.	The AICRP on PHET, Khanapara Centre participated in "Rangali Mela" organized by Govt. of Assam from 08- 10th April 2022 in the play ground of College of Veterinary Science, AAU, Khanapara, Guwahati-22. A total of around 20 different value added products from meat were displayed.	Govt. of Assam	08- 10th April 2022.	-
3.	The AICRP on PHET, Khanapara Centre participated in "International Agri-horti Show" organized by Govt. of Assam from 17-19th December 2022 in the play-ground of College of Veterinary Science, AAU, Khanapara, Guwahati-22. A total	Govt. of Assam	17-19th December 2022.	-

	of around 20 different value-added products from meat were displayed.			

Technology demonstration/FLD: Nos (3)

S. No	**Venue**	**Date**	**Number of participants (Farmers)**			
			Male	Female	Student	Total
1.	**"Technology & Machinery Demonstration Mela"** was organized by AICRP on Post Harvest Engineering and Technology, Khanapara Centre on 22nd March, 2022 in collaboration with the Department of Livestock Products Technology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-781 022. The Scientists of the AICRP on PHET, Khanapara Centre were demonstrated hands on training on "Processing and Value Addition of Processed Meat Products". The technologies were displayed under three sections machineries; value added meat products, and utilization of slaughterhouse by-products	22nd March, 2022		-		
2.	Practical Demontration on preparation of different value added pork products in a Five days training programme on " Empowering women through capacity building in good piggery farm management" sponsored by National commission for women, New Delhi.	23-25 May 2022	-	30	-	30
3.	A group of students from the Deptt. of Food Science and Technology, University of Science and Technology, Meghalaya visited the laboratory of AICRP on PHET, Khanapara Center on 25th November 2022. The PI and the Junior Scientist of the centre demonstrated the various machineries present in the laboratory and processing techniques of meat products to the students.	25th November 2022.	-	-	35	35

Training organized: Four (04) No.

S. No	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	"Skill Development Training Programme on Pig Production & Pork Processing for Entrepreneurship Development" sponsored by NAHEP, CVSc, Khanapara, Ghy-22 from 15th to 17th March, 2022	15-17 March, 2022			30	30
2.	Hands on training on "Production, Processing and Value addition of Meat and Meat Products" of two days duration was held in collaboration with Regional Agricultural Research Station, Gossaigaon, from 27.03.2022 to 28.03.2022. The training was attended by 41 meat entrepreneurs/ livestock farmers The technologies developed by the AICRP on PHET, Khanapara centre along with different value added products and by-products were displayed.	27-28 Mar 2022	8	33		41
3.	The PI, Co-PI and Junior Scientist were involved in the five days training programme entitled " Recent Advance in Post-Harvest and Value Addition of Piggery" from 7th to 11th November, at college of Veterinary Science, AAU, Guwahati-22, Organized by Directorate of Extension Education in collaboration with Extension Education institute(NE Region), Govt. of India.	7-11 Nov, 2022				
4.	One day training programme entitled "Processing and Value Addition of Geese Meat" on 3rd November, at Department of Livestock Products Technology, college of Veterinary Science, AAU, Guwahati-22, Organized by ASTEC funded project entitled " Technology generation for value added gees meat products and awareness for entrepreneurship development in geese farming in Assam: an approach towards upgrading underestimated noble sector of poultry.	3 Nov 2022	03	17		20

Salient achievements of the centre (Jan-Dec 2022)

Publications

1.	Peer reviewed 1. Moirangthem S., Laskar S. K, Das A., Upadhyay S., Hazarika R. A., Mahanta J. D., and Sangtam H. M. (2022) Effect of incorporation of soy protein isolate and inulin on quality characteristics and shelf-life of low–fat duck meat sausages. Anim Biosci Vol.35, No.8:1250-1257 2. Sangtam, H. M., Laskar, S. K., Thomas, R. and Das, A. (2022). Physico-chemical and Sensory Attributes of Traditional Pork Products Incorporated with Anishi at Refrigerated Storage (4±1^{o}C) Under Vacuum Packaging. J. Anim. Res., 12(05): 01-07. 3. Moirangthem, S., Laskar, S. K., Das, A., Upadhyay, S., Hazarika, M., Hazarika, R. A. and Mahanta, J. D. (2022). Effects of Soy Protein Isolate and Inulin on Physico-chemical and Organoleptic Qualities of Low-fat Duck Meat Sausages. Asian Journal of Dairy and Food Research. 41(3): 346-350. 4. Ahmed, S., Bordoloi, J. P., Saharia, J. and Laskar, S. K. (2022). Carcass Quality and Proximate Composition of Meat of Indigenous Sheep of Assam Raised on Different Rearing Systems. J. Anim. Res., 12(02): 263-267.
2.	Other publications (Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): Nos (two Hindi articles and two leaflets) **Hindi Articles:** 1. प्रसंस्करण प्रगति'-राजभाषा पत्रिका (अर्धवार्षिक) के अंक-1 (जनवरी-जून, 2022) वैज्ञानिक पशुवध और मांस का स्वच्छ उत्पादन. संतोष उपाध्याय, सौरभ कुमार लस्कर, प्रतिभा गोगोई, दीपशिखा देउरी, एवं अंकुर दास 2. प्रसंस्करण प्रगति' - राजभाषा पत्रिका (अर्धवार्षिक) के अंक -2 (जुलाई-दिसम्बर, 2022) बूचड़खाने के उप-उत्पादों का प्रसंस्करण एवं मूल्यवर्धन. सौरभ कुमार लस्कर, संतोष उपाध्याय, प्रतिभा गोगोई, दीपशिखा देउरी, एवं अंकुर दास **Leaflets:** 1. Electrically operated portable revolving barbeque for meat and fish 2. Utilization of feathers for upholstery

16. Centre Name: IIT Kharagpur, Kharagpur (West Bengal)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	6	4
2.	Technical	5	5
3.	Administrative	1	1
4.	Supporting	0	0

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	50.00	45.53	40.39
2.	Recurring	9.30	13.63	20.91
3.	Non-recurring	2.00	2.00	3.09
4	Total	**61.30**	**61.16**	**64.39**

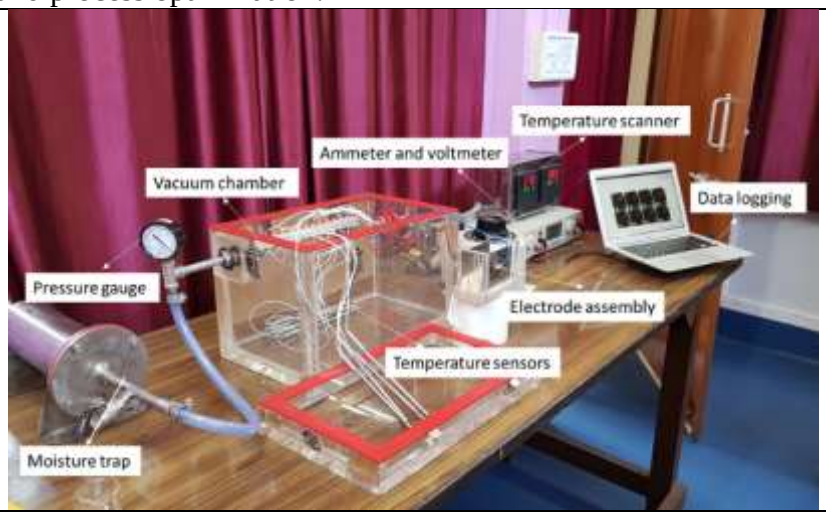
3. Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1	Development of Vacuum-assisted Ohmic heating oven for composite bread	PI: P. P. Tripathy Co-PI: T. K. Goswami	April, 2020	March, 2023
2	Development of a System for Continuous Production of Ornamental Pulse Nuggets (Gohona Bori)	PI: Kanishka Bhunia Co-PI: P.P. Srivastav	April, 2020	March, 2023
3	Grinding of turmeric at -30 ^{o}C with the help of vapour compression refrigeration system using hammer mill	PI: T. K. Goswami Co-PIs: P.P. Tripathy, G Venkatrathnam	April, 2022	March, 2024

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (02)

Name of machine	**Scraped Surface Heat Exchanger**
Capacity	240 lit/hr
Use of machine	Pre-freeze concentration of sugarcane juice in the jaggery making process
Details of machine	Specification: Length of the Heat Transfer Tube = 0.7 m Inside Diameter of the Heat Transfer Tube = 0.12 m Outside Diameter of the Heat Transfer Tube = 0.128 m Thickness of the Heat Transfer Tube = 0.004 m Rotor or Shaft Diameter = 0.05 m Inside Jacket Diameter = 0.168 m Outside Jacket Diameter = 0.180 m

Photographs	
Cost (₹)	-

Name of machine	Vacuum-assisted Ohmic heating oven for composite bread
Capacity	1 kg/hr
Use of machine	The machine is a prototype used for developing millet-based composite bread.
Details of machine	The machine is composed twwo main design parts 1. Electrode assembly. Base: 2cm thick polycarbonate Sides: 1.5 cm thick clear acrylic. Electrode dimensions: L=30 cm; H=15 cm 2. Vacuum chamber made with 2 cm thick acrylic sheet The electrode assembly is connected to an AC source of 150 V with a voltage regulator for controlling the heating rate. The system is also equipped with the temperature and electrical sensor for measurement and process optimization.
Photographs	
Cost (₹)	-

Processes/products /protocol developed (Jan-Dec 2022): Nos (03)

Name of the process /products	A novel grinding method for retaining pharmacological properties of turmeric powder and functional properties of turmeric residue
Use	
Details of the process/ products	Grinding of turmeric rhizome at different grinding temperatures to retain pharmacological properties and characterize turmeric residue.
Photographs of the process/ products	
Cost (₹)	-

Name of the process /products	3D printing of food/Rice starch-Peanut protein isolate (RS-PPI) blend
Use of the process/ products	• Customized food designs • Can able to print complex designs that are difficult to achieve by use of mould • Creating personalized food products for targeted consumers
Details of the process/ products	Initial 3D CAD model was prepared and G-codes were generated using Voxelizer software. Then, food material is printed accordingly by Zmorph multi tool 3D printer. Process parameters used are: Layer count = 3, Layer height = 1.5 mm, Nozzle diameter = 2 mm, Travel speed = 120 mm/s and Print speed = 10 mm/s.
Photographs of the process/ products	  3D printing of RS-PPI blend
Cost (₹)	-

Name of products	Millet-based bread using vacuum-assisted ohmic heating technology
Use of the process/ products	The breads develop are having goood quality in terms of texture and color and are comparable to market available multigrain bread.
Details of the process/ products	The millet-based composite dough was used to develop the composite bread in vacuum-assisted ohmic heating oven at different voltages and pressure

	levels. A combination of voltage time input resulted in better quality bread. The total time for proofing was reduced by 50% when compared with traditional proofing. Similarly baking was time was under 15 min for obtaining a good quality bread.
Photographs of the process/ products	
Cost (₹)	

Details of adaptive trails (Jan-Dec 2022): Nos (01)

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1	Cryogenic grinding	IIT Kharagpur	

Details of extensions activities (Jan-Dec 2022) Nos (01)
Kisan melas /Agri-fairs: Nos (01)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	Technology and Machinery Demonstration Mela at Agricultural and Food Engineering Department, IIT Kharagpur	AICRP on PHET, IIT Kharagpur	24 to 26 March, 2022	80

Salient achievements of the centre (Jan-Dec 2022)

Publications

Peer reviewed

1. Kadival, A., Mitra, J., & Kaushal, M. (2023). Influence of incorporation of peanut protein isolate on pasting, rheological and textural properties of rice starch. Journal of Food Engineering, 341, 111312.
2. Kadival, A., Kour, M., Meena, D., & Mitra, J. (2022). Extrusion-Based 3D Food Printing: Printability Assessment and Improvement Techniques. Food and Bioprocess Technology, 1-22.

Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (02)**

1. Presented poster on "Characterisation of peanut protein-based food ink for extrusion-based 3D printing" at 56th Annual Convention of Indian Society of Agricultural Engineers (ISAE) held in the Agricultural Engineering College and Research Institute Tamil Nadu Agricultural University. Coimbatore, Tamil Nadu (2022).
2. Presented poster on "Numerical Simulation of Extrusion-based 3D Printing of Food" at IFT FIRST: Annual Event and Expo held in Chicago and online July 10-13, 2022.

17. Centre Name: RS&JRS, Kolhapur (Maharashtra)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	**2**	**2**
2.	Technical	**1**	1
3.	Administrative	--	--
4.	Supporting	**2**	0

Financial Detail (ICAR share: 75%) (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	40.00	**34.52**	**31.24**
2.	Recurring	7.20	6.35	3.75
3.	Non-recurring	1.00	1.00	0
4	Total	**48.20**	**41.88**	**34.99**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
	Ongoing projects			
3.	Development of disposable food container by utilizing sugarcane bagasse	PI: G. B. Yenge Co-PI: B. G. Gaikawad	2020	2022 (Completed)
2.	Comparative quality assessment of the jaggery prepared by sugarcane cultivated through chemical pesticide (Chlora-ntraniliprole) and herbal formulation	PI: B. G. Gaikawad Co-PI: G. B. Yenge, V. B. Gedam	2020	2022 (Extended upto2023)

Technology development and outreach activities (Jan-Dec 2022)
Technology Transferred (Jan-Dec 2022): Nos (03)

S. No	Name of machine/ technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of technology transferred	Total revenue generated
1	Liquid jaggery production technology	05	Shri. Subrao Kulkarni At/ Post Soundalga, Tal: Nipani, Dist: Belgaon Mobile: 9371747399	05.03.2022	NA
			Prakash S. Salunkhe At. Post. Islampur, Dist: Sangli. Mobile: 9673382201	28.04.2022	NA
			Shri. Sunil Appaso Ligade At. Post. Uchagaon, Dist: Kolhapur. Mobile: 7774885022	23.06.2022	NA

			Shri. Shitaram Bapu Chougule At/post- Pohale Tarf Tal. Panhala Dist: Kolhapur. Mobile: 9922340515	27.12.2022 28.12.2022	NA
			Smt. Aanandi Chougule At/post- Pohale Tarf Tal. Panhala Dist: Kolhapur. Mobile: 9503354500	27.12.2022 28.12.2022	NA
2	Organic jaggery, solid and powder jaggery production technology	08	Shri. Himmat Ramrao Patil A/p. Kalamba, Tal. Karveer, Dist. Kolhapur Mobile: 9834288162	18.01.2022	NA
			Shri. Rajendra P. Gore At. Gokul Shirgaon, Tal: Karveer. Dist: Kolhapur Mobile: 9850513276	22.01.2022	NA
			Shri. Rohit Appaso Chaogule At. Post. Valiwade, Tal: Karveer, Dist: Kolhapur. Mobile:8605993071	30.03.2022	NA
			Shri. Kiran Rajendra Chougule 10th Lane, Jaysingpur, Tal: Shirol, Dist: Sangli. Mobile:8421449966	07.06.2022	NA
			Dr. Bhart Gangadhar Kardak At. Post. Nevasa Phata, Dist: Ahmednagar. Mobile:9503636999	29.06.2022	NA
			Mr. Ramchandra V Kulkarni At /Post- Nilpan, Tal: Bhudargad, Dist: Kolhapur. Mobile: 9850986137	29.09.2022	NA
			Mr. Atul Korane At /Post- Aknur, Tal: Radhanagari, Dist: Kolhapur. Mobile: 7045355051	03.10.2022	NA
			Shri. P. G. Kulkarni A/p Hingri (bk), Tal Dist: Beed Mobile: 9423731246	12.12.2022	NA
3	Improved jaggery processing plant	02	Shri Shubham Vikram Yadav Flat No.6 Bld No.3, Anchor Appartment, Wanwadi, Pune Mobile: 86610635	07.01.20222	NA
			Shri Tukaram Eraji Gawali At. Po. Rohina, Tal: Partur, Dist: Jalna. Mobile: 9422796314	07.03.2022	NA

Extensions activities (Jan-Dec 2022)
Kisan melas /Agri-fairs: Nos (0)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
01	(District level workshop on nutritional cereals and Carnival of food grains, rice and jaggery)	Dept. of Agriculture, Govt. of Maharashtra.	March, 2022.	500

2	One day training programme for the farmers **on** "Safe and Judiciuos use of pesticides"	AICRPs at RS&JRS in collaboration with, BASF, India	26th April, 2022	15
3.	One day training programme for the farmers on "Agrochemicals use for sugarcane crop"	AICRPs at RS&JRS in collaboration with, UPL, India	09th June, 2022	10

Technology demonstration/FLD: Nos (02)

S. No.	**Venue**	**Date**	**Number of participants (Farmers)**			
			Male	Female	Student	Total
1	AICRP on PHET, RS&JRS, Kolhapur	11.03.2022 to 16.03.2022	66	--	--	66
2	AICRP on PHET, RS&JRS, Kolhapur	23.03.2022 & 24.03.2022	60	--	--	60

A. **Training organized: Organizers name:** AICRP on PHET, RS&JRS, Kolhapur

S. No	**Venue**	**Date**	**Number of participants (Farmers)**			
			Male	Female	Student	Total
1	AICRP on PHET, RS&JRS, Kolhapur Shivshankar College of Agricultural Engineering, Mirajgaon (Affiliated to Mahatma Phule Krishi Vidyapeeth, Rahuri.)	18.07.22 To 05.12.22	05	--	05	05
2	AICRP on PHET, RS&JRS, Kolhapur "Two Days Workshop on Production of Export Quality Geographical Indications (GI) Certified Kolhapur Jaggery"	27.12.22 & 28.12.22	09	41	--	50

Salient achievements of the centre (Jan-Dec 2022)

Publications: Details not provided

18. Centre Name: ICAR- IISR, Lucknow (Uttar Pradesh)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions.	Filled positions
1.	Scientific	03	01
2.	Technical	04	02
3.	Administrative	01	--
4.	Supporting	--	--

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	0.00	0.00	0.00
2.	Recurring	9.30	5.20	1.61
3.	Non-recurring	3.00	1.00	0.00
4	Total	**12.30**	**6.20**	**1.61**

Details of projects

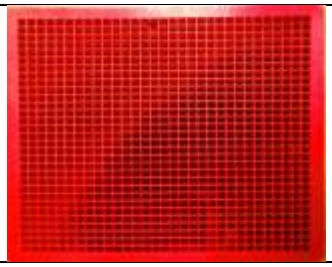
S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1.	Comparative quality assessment of the Jaggery prepared by sugarcane cultivated through chemical pesticide (Chlora-ntraniliprole) and herbal formulation.	PI: Dilip Kumar Co-PIs: V.P. Jaiswal, Arun Baitha	Sep 2021	Aug 2023
2.	Evaluation and transfer of sugarcane-based technologies/process developed by other centers	PI: Dilip Kumar Co-PI: M. K. Singh	April 2021	March 2022
3.	Development of home scale portable jaggery manufacturing unit.	PI: Dilip Kumar	Feb 2022	Jan 2024

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (01)

Name of machine	**Striking point temperature alarm**
Capacity	-
Use of machine	For detection of striking point temperature of the Jaggery.
Details of machine	It consists of Probe rod, Temperature sensor with alarm
Photographs	
Cost of machine (₹)	9000/-

Processes/products /protocol developed (Jan-Dec 2022): Nos (02)

Name of the product	**Jaggery-based Low Sugar Apple Jam**
Use	Jaggery-based low sugar apple jam with no added chemicals or preservatives.
Details	Fresh and mature apples were cleaned and peeled (1 kg). Peeled apples were cut into slices and weighed (827 g). Apple slices were grated and weighed (800 g). Grated pulp was taken in a pan and put on a low flame 400 g of Jaggery was added into the pulp and mixed thoroughly TSS (^{O} Brix) was measured and sheet/drop test was performed to check the doneness of the product. Once the jam is formed one tablespoon of lemon juice was added Jam was packed in sterilized glass jar and stored.
Photographs	
Cost	₹ 350-400/- Per Kg

Name of the process /products	**Silicon Moulds for Jaggery Cubes**
Use	Making Different Shapes Of Value Added Jaggery
Details	NIL
Photographs of the process/products	
Cost	₹ 2000/- Per Mould

Adaptive trails (Jan-Dec 2022): Nos (01)

S. No	**Name of machine/technology**	**Name of the Trial place**	**Result/Inference**
1.	Bottled Sugarcane Juice form Solan Centre, (H. P.)	IISR, Lucknow	**TSS:** 18.8 Brix, **Colour:** l*41.3, a*(-02), b* 5 **pH:** 4.23 **Microbial:** No Growth

Technology Transferred (Jan-Dec 2022): Nos (01)

S. No	Name of machine/technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of technology transferred	Total revenue generated
1.	Dr. Sandeep Kumar, Rohtak	01	Rohtak, Haryana	07/10/2022	30000.00

Extensions activities (Jan-Dec 2022)

Kisan melas /Agri-fairs: Nos (02)

S. No.	Name of the venue	Organizer name	Month/ Year	No. of Participants
1.	National Conference & Sugar Expo "MEETHA 2022" on the topic "Sugar and Health-Myth & Realities"	NSI & ISMA, Kanpur	03/2022	5000
2.	International Conference on Sugar and Integrated Industries (SUGARCON-2022)	ICAR-IISR, Lucknow	02/2022	10000

Technology demonstration/FLD: Nos (06)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	IISR, Lucknow (Ganna Kisan Sanghatan District-Gonda)	03/20220	21	09		30
2	IISR, Lucknow (People action for national interaction, Balrampur)	05/2022	30	11		41
3	IISR, Lucknow, (Indian Potash limited)	07/2022	17	03		20
4	IISR, Lucknow, (Kisan Shakti Sangathan Lakhimpur (U. P)	08/2022	18	12		30
5	IISR, Lucknow, (Atma, Balia(U. P)	10/2022	35	17		52
6	Prgya Gramothyan sewa samiti, District-Fatehpur (U. P)	11/2022	48	14		62

Training organized

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	IISR, Lucknow	23-24 April, 2022	300	200	50	550
2	IISR, Lucknow	15,Dec,2022	150	30	-	180
3	IISR, Lucknow	31, Dec,2022	65	15	03	83

Salient achievements of the centre (Jan-Dec 2022)

Publications (Jan-Dec 2022): Nos ()

Peer reviewed

1. Priyanka Singh, Anam, Saachi Chaurasia, Dilip Kumar, AK Singh and Pushpa Singh 2021. Sugarcane Blanching at Specific Temperature and Time Combination Preserves Juice Physio-biochemical, Microbial and Sensory Attributes. Institute of Food Science & Technology, 58(2): 586-594
2. Suraj Kumar, S. Patel, Dilip Kumar, Priyanka Singh 2022. Performance Evaluation of IISR Three Pan Furnace for Jaggery Making. The Pharma Innovation Journal,11(12): 331-335

Number of book chapters: **Nos (1)**

1. Singh, P., Anwar, S. I., Singh, M. M. and Sharma, B. L.2022. Organic jaggery production. In: Organic Crop Production Management. Eds. D. P. Singh, H. G. Prakash, M. Swapna and S. Solomon. Apple Academic Press and CRC Press.

Number of books edited and compiled: **Nos ()**

Other publications (Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (02)**

- Technical Bulletin on Jaggery by- Dr. A. D. Pathak, Dr. Dilip Kumar, Chaitanya Mishra, Sunny Kumar Mishra.
- अनवर, एस. आई., सिंह, आर. डी. एवं सिंह, प्रगति। प्रोटीन के प्राकृतिक श्रोत के प्रयोग द्वारा प्रोटीनयुक्ति गुड़ का उत्पादन। शुगर टाइम्स, जून २०२२।

Patents (Jan-Dec 2022): Nos (01)

1	Patent filed: **Nos (01)** • Freeze Dried Sugarcane Juice Crystal and The Process Thereof.

Agro-Processing Centre (APC) established (Jan-Dec 2022): Nos (05)

Sr. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1.	KVK, Meerut	March, 2022	Jaggery & Value Added Products	35.0 Lakhs
2.	KVK, Muzaffarnagar	May,2022	Jaggery & Value Added Products	35.0 Lakhs
3	KVK, Aizawl, Mizoram	May,2022	Jaggery & Value Added Products	46.0 Lakhs
4.	Mr. Sukhwinder, FAPRO Village- Kangmai, Block Bhunga, Hoshiarpur	June,2022	Jaggery & Value Added Products	7.0 Lakhs
5.	Mr. Tarsem Singh, Mother Tersa Women SHG Nila Niloye Block Bhunga, Hoshiarpur	July, 2022	Jaggery & Value Added Products	7.0 Lakhs

Entrepreneurship established (Jan-Dec 2022): Nos (04)

S. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1.	Prabhas Shukla, Village Mahawa, Bikapur Aayodhya 224206	Jaggery & Value Added Products	Nov, 2022	
2.	Akhilesh Yadav,, Dariyabad Road, Lucknow-Faizabad Highway Barabanki	Jaggery & Value Added Products	May, 2022	
3.	Mr. Sukhwinder FAPRO Village- Kangmai, Block Bhunga, Hoshiarpur	Jaggery & Value Added Products	June,2022	
4.	Mr. Tarsem Singh Mother Tersa Women Self Help Group Nila Niloye, Block Bhunga, Hoshiarpur	Jaggery & Value Added Products	July, 2022	

19. Centre Name: PAU, Ludhiana (Punjab)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	6	6
2.	Technical	9	8
3.	Administrative	1	1

Financial Detail (Jan-Dec 2022)

Sl. No.	Budget head	*Budget Estimate, ₹ in lakh (as per EFC)	*Fund released, ₹ in Lakh	Fund Utilized, ₹ in lakh
1.	Salary Head	152.86	110.0	140.20
2.	Recurring TA HRD	15.01 0.37 0.20	10.0 0.20 0.00	6.72 0.31 0.065
3.	Non-recurring	7.61	5.00	0.47
4.	SCSP (Capital)**	3.30	2.00	2.43
5.	SCSP(General)**	4.00	3.00	2.60
6.	Total	**183.35**	**130.20**	**152.79**

Details of Projects:

S. No.	Title of the Sub-Project	Name of PI and Co-PI's	Duration	
			Start	End
	On-going Projects			
1.	Process protocol for development of white crystalline powder from stevia leaves and extracted steviosides.	PI: Sandhya S. Co-PIs: M S Alam, S. Bhatia, Asrar A.	April 2020	July 2022
2.	Development of management protocol for metallic drum/retail pack stored chickpea against Pulse beetle (Callosobruchus chinensis) using essential oils.	PI: M. Kaur Saini Co-PIs: M S Alam, S. Bhatia	April 2021	March 2023
3.	Process protocol and pilot plant for development of Menthol crystals from Mint oil.	PI: Surekha Bhatia Co-PI: M S Alam	April 2021	March 2023
4.	Development of a vacuum assisted ohmic heating system for pasteurization and concentration of non-thermally stabilized fruit juices	PI: M S Alam Co-PIs: R. Sharma, Surekha Bhatia	2022	2024
	Status: Ongoing			

Technology development and outreach activities
Machines/Gadgets tools/ instruments developed: 2 No.

Name of machine	**Development of an automated MTS prototype for shelf life enhancement of kinnow and guava juices**
Capacity	50 litres of juice per batch

Use	The developed prototype will treat the juices for inactivation of enzymes as Manothermonication is a recognized and efficient method used for sterilization in food preservation.
Details of machine	The pilot scale plant (50 litres capacity) for pre-treatment of juices using manothermosonication (MTS) has been designed and fabricated. The tank 1 represents storage tank of capacity 70 litres for juices with sensors and mild steel stand. The tank 2 represents system for sonication treatment to juices. The tank 3 of capacity 70 litres is double jacketed chamber consisting of heater, temperature controller, nitrogen cylinder and pressure gauge for thermal and pressure treatments to juices. Food grade stainless steel is used for the fabrication of tanks. The pressure application is given using nitrogen gas cylinder. The whole set up is made portable using single Mild Steel stand. The tank 1 is filled with 50 litres of juice.2 litres of juice is transferred to sonication chamber at regular intervals for the sonication treatment. This step is repeated again and again. The treated juice is transferred to temperature pressure tank till it gets filled upto 50 litres capacity. The heater in the tank automatically starts after filling of the tank. The nitrogen gas is inserted once temperature achieved for the treatment of the juice. All the steps are directed automatically by the use of sensors, timers, controllers in the control panel. The optimization of different process parameters of manothermosonication was done for guava and kinnow juices.
Photographs	
Cost (₹)	Approx. ₹ 1.6 lakhs

Name of machine	**Development of ohmic heating assisted vacuum evaporation system for concentration of fruit juices.**
Capacity	Upto 5L/ batch
Use	Efficient volumetric thermal processing of fruit juices.
Details of machine	The conceptual design of ohmic heating assisted vacuum evaporation system was made in CREO 3.0 (Drawing tools) and the system was fabricated accordingly. The main components of the developed system were electrodes, vacuum chamber, electric control box, variable transformer, fresh and concentrated juice tanks, vacuum pump, piping & pumping systems and condensation assembly. The electrodes were insulated from the outer vacuum vessel with the help of high-quality silicone.

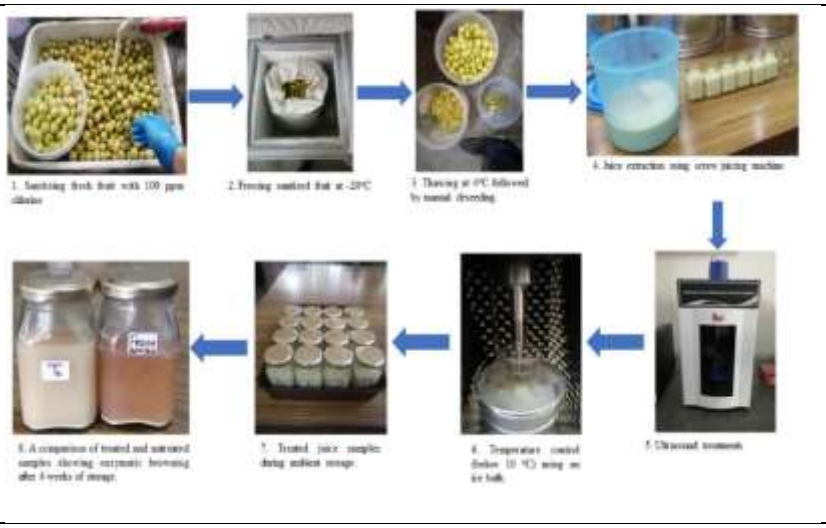
Photographs	
Cost of machine (₹)	₹ 90,000/

Processes/products protocol developed: 3 No.

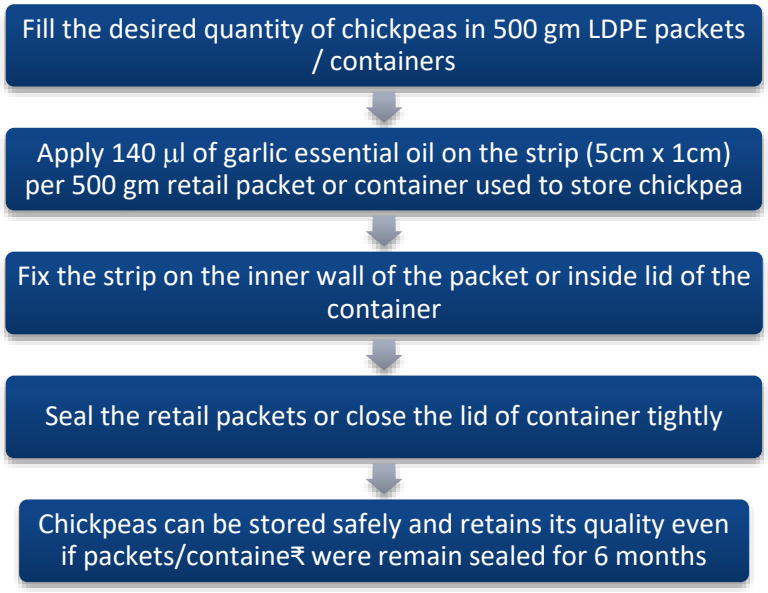
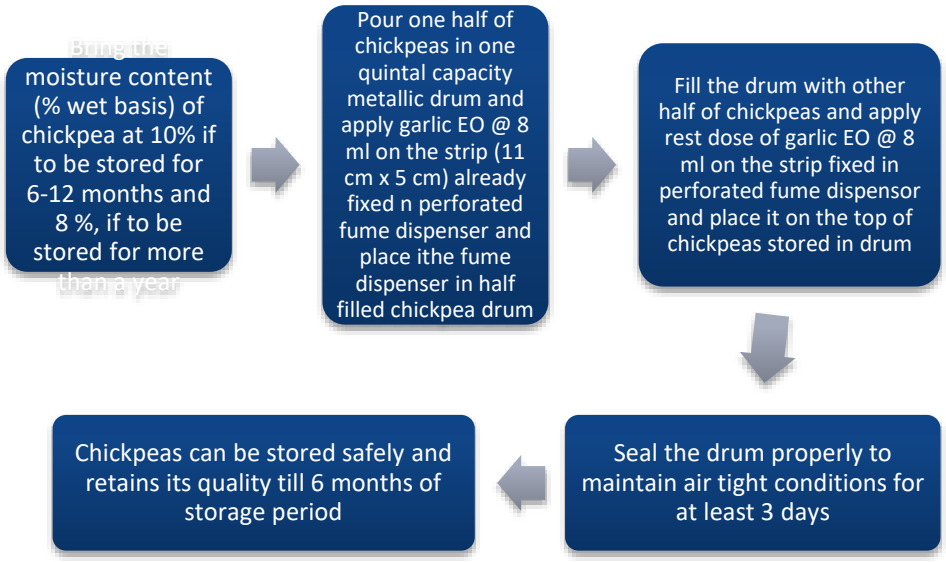
Name of the products	**White crystalline powder from stevia leaves and extracted steviosides**
Use	Developing white crystalline powder from stevia which will benefit food industry and society as suitable nutritional alternative to sucrose and artificial sweeteners
Details	Fresh leaves →Drying (Sun drying, polyhouse drying, convective drying and convective-microwave finishing drying) →Grinding of leaves → Mixing leave powder with water → Ohmic heating treatment → Decolourization → Filtration → Spray drying → White stevia powder In the process of developing white stevia powder, different processing operations were standardized/optimized. Among the drying methods tried, the hybrid drying method (convective drying at 60°C) upto 40% (wb) moisture content followed by microwave drying at 720 W) was found to be superior in terms of minimum (69 minutes 40 seconds) drying time with acceptable quality parameters Moreover the extraction of sweet component of stevia leaves was done using ohmic heating technology recording optimum condition for extraction of sweeter component as Heating temperature= 55.33^0C, holding time = 22.21 minutes and solvent-leaf ratio=7.25:1 at constant voltage gradient of 40 V/cm. The ohmic heated extract was decolourized and filtered followed by spray drying (hot air temperature 160°C and flow rate 12 mL/s) using Maltodextrin (2.0 g/100 mL of extract). After spray drying, white powder was obtained.

Photographs	
Cost	-

Name of the process	**Processing protocol for ultrasonication of amla juice**
Use	The enzymatic browning induced in amla juice due to the high activity of polyphenol oxidase (PPO) and peroxidase (POD) is one of the critical issues faced by the industry.
Details	The process involves the irradiation of food products with high-energy and low-frequency sound waves (20 kHz-1 MHz; intensity > 1 W/cm^2), causing agitation in the propagating medium. While the waves traverse through the medium, they cause alternate compressions and decompressions, which create, expand and implode micro bubbles in a process termed 'acoustic cavitation'. The implosion is associated with releasing high energy (up to 50 MPa; 5000 °C), shock waves and micro jets in a short period. In addition, the changes associated with ultrasound processing are brought about by several mechanisms, including agitation, rarefaction, compression, sponge effect, wave distortion, production of free radicals, etc. The numerical optimization technique using the 3-factor Box and Behnken design suggested that the optimized ultrasonication process in aonla juice can be carried out at an ultrasonic intensity of 70% (corresponding to an energy density of 1610 Wcm^{-2}) for an exposure time of 7 min 30 s and a pulse of around 50% (5 s on-5 s off) with an overall desirability of 0.72. At these experimental conditions, the optimized levels of biochemical attributes i. e., ascorbic acid (738.50 mg/100 mL), total phenols (17.10 mg/mL), DPPH antioxidant activity (58.47 %), tannins (7.11 µg/mL), colour change (ΔE = 9.04) and flavonoids (6.14 mg/mL) were achieved. The results suggested that ultrasound is a suitable processing technique for amla juice stabilisation compared to thermal treatments that result in the loss of quality.

Photographs	
Cost	-

Name of the process	**Process protocol for extraction of oil and development of menthol crystals from mint oil**
Use	Mentha oil is used in food, pharmaceutical and perfumery and flavoring industry. Menthol crystals are used in the manufacture of lozenges, toothpastes, pain balms, cold balms etc. Menthol has been identified as a chief antifungal agent in mint oil.
Details	Optimized conditions for extraction of oil was 69.08 °C temperature, 173.70 mins and1:10 sample/water ratio and the yield of 1.55 % oil and 42.40 % menthol content. **Collection of mentha** ⬇ **Drying and grinding of menthe** ⬇ **Extractionof oil by hydrodistillation under optimized conditions** ⬇ **Kept in cooling incubator at 13±1 ºC temperatures for 48 hrs** ⬇ **Separation of crystals** ⬇ **Drying of crystals by tapping with filter paper** ⬇ **Drying at 25±1 ºC**
Photographs	 
Cost	-

Name of the products	**Essential oil release kit to manage major storage insect-pests of chickpea**
Use	To manage major storage insect-pests of chickpea (For retail packets and household metallic drums)
Details	**Use of essential oil release kit in LDPE packets / containers** Prior to storage bring the moisture content (% wet basis) of chickpea at 10% if to be stored for 6-12 months and 8 %, if to be stored for more than a year  *If thermal treatment (60ºC in hot air oven) given to the chickpeas for an hour, then 50µlof garlic essential oil is to be applied on the strip (5cm x 1cm) per 500 gm capacity retail packet or container used to store chickpea
	The dose may be increased or decreased according to the capacity of storage unit. Check the stored chickpea at regular interval to avoid any kind of infestation caused by storage insects in between storage period. Once the drum will be opened then we have to re-apply the EO or check them at regular interval to avoid any kind of insect infestation till EO will be re-applied. EO may be repeated as and when required. **Use of essential oil release kit in metallic drum stored chickpea** 

Photographs	 
Cost	**To pack 60 retail packets @ 500 g/packet:** Vial of garlic EO (10 ml)- ₹ 60 Strips (60 pcs of 5cm x 1cm each)- ₹ 120 (Total treatment cost per unit of 500 gm- ₹ 3) **Total cost of kit for retail packets- ₹ 180** **To store 1 quintal in metallic drum:** Vial of garlic EO (30 ml)- ₹ 180 Strips (2 pcs of 11 cm x 5 cm each)- ₹ 40 Perforated fume dispenser (2 pcs with lid)- ₹ 10 **Total cost of kit for metallic drum (covers the application of EO twice)- ₹ 230** Note: Perforated fume dispensers are reusable; Any of the above item can also be availed separately

Extension activities:

Kisan melas/Agri fairs: 11 Nos

1. Attended Virtual Regional Kisan Mela on 14.03.2022 (Ballowal Saunkhri)
2. Attended Virtual Regional Kisan Mela on 14.03.2022 (Amritsar)
3. Attended Virtual Regional Kisan Mela on 16.03.2022 (Rauni, Patiala)
4. Attended Virtual Regional Kisan Mela on 21.03.2022 (Gurdaspur)
5. Attended Virtual Regional Kisan Mela on 21.03.2022 (Faridkot)
6. Attended Virtual Kisan Mela on 24-25.03.2022 at PAU Ludhiana
7. Regional Kisan Mela, Amritsar on 2nd September, 2022
8. Regional Kisan Mela, Gurdaspur on 9th September, 2022
9. Kisan Mela at PAU Ludhiana on 23-24 Sept., 2022.
10. CIPHET-IIFA and Kisan Mela on 3 Oct., 2022 at CIPHET, Ludhiana
11. Farmers Fair on September 30.9.2022 at village Raowal, Tehsil Jagraon, Distt. Ludhiana

Technology Demonstrations: 49 Nos

Name of the venue	Organizer name	Month/Year	No. of Participants
Honey heating-cum-filtration unit	PAU, Ludhiana	28.02.2022 to 21.12.2022	600
Honey heating-cum-filtration unit & Vegetable Washing Machine	KVK, Mansa	14.12.22	37
		14.12.22	37
Honey heating-cum-filtration unit & Vegetable Washing Machine	KVK, Moga	23.03.2022	25
		20.05.2022	31
		16.07.2022	35
		8.08.2022	19
		7.09.2022	11

		25.11.2022	53
		9.12.2022	46
Honey heating-cum-filtration unit & Vegetable washing machine	KVK, Bathinda	14.10.2022	45
		07.04.2022	62
		13.10.2022	58
Honey heating-cum-filtration unit & Vegetable Washing Machine	KVK, Ferozepur	05.05.2022	8
		04.06.2022	12
		10-18.10.2022	11
		30.11.2022	8
		5-9.12.2022	14
		13.12.2022	14
Honey heating-cum-filtration unit & Vegetable Washing Machine	KVK, Muktsar	04.02.2022	17
		14-21.02.2022	19
		09-18.05.2022	19
		18-24.05.2022	20
		02.09.2022	31
		05-09.12.2022	30
		05-09.12.2022	11
Honey heating-cum-filtration unit	KVK, Sangrur	07.03.2022	25
		23.03.2022	25

Training camps/ workshops organized at Departmental Level: 25

S. No.	Name of the programme	Dates
1.	Training on Entrepreneurship Development Programme in Agro processing for Livelihood" for SC/ST at DPFE, PAU, Ludhiana under AICRP on PHET, ICAR-43 (13)	09.03.2022
2.	Training course on "Entrepreneurship development programme in Food Processing for Livelihood development" for SC/ST at DPFE, PAU, Ludhiana under SCSP-7 Scheme	3.3.2022 9.3.2022 16.3.2022
3.	Training course on Entrepreneurship Development in Food processing for Livelihood" for SC/ST under Strengthening and Development of Higher Education in India	30.3.2022 31.3.2022
4.	Training cum awarenesss workshop on Prime Minister Formalization of Micro Food Processing Enterprises Scheme by Deptt. of Processing and Food Engineering and Punjab Agro Industries Corporation, Chandigarh	29.06.2022

Salient achievements of the centre

Publications

a	Peer reviewed 1. Panayampadan AS, Alam M S, Aslam R and Kaur J (2022). Vacuum impregnation process and its potential in modifying sensory, physicochemical and nutritive characteristics of food products. Food Engineering Reviews. https://doi. org. /10.1007/s12393-022-09312-4 Pp1-14. (NAAS rating: 11.76) 2. Kaur G and Bhatia S. (2022). Radish leaf protein concentrates: Optimization of Alkaline extraction for production and Characterization of an alternative plant protein Concentrate. J of Food Measurement and Characterization. DOI https://doi. org/10.1007/s11694-022-01411-4 (NAAS rating: 8.43)

3. Panayampadan AS, Alam MS., Aslam R., Kumar Gupta S and Kaur Sidhu G. (2022). Effects of alternating magnetic field on freezing of minimally processed guava, LWT- Food Science and Technology doi: https://doi. org/10.1016/j. lwt.2022.113544. (NAAS rating 10.95)
4. Tak Y, Kaur M, Kumar R, Gautam C, Singh P, Kaur H, Kaur A, Bhatia S, Jha N K, Gupta P K, Amarowicz R.2022. Repurposing Chia Seed Oil: A Versatile Novel Functional Food" J of Food Science, DOI: 10.1111/1750-3841.16211, 1-22 (NAAS rating: 9.17)
5. Sharma D K, Alam M S, Saini M K and Bhatia Surekha (2022). Evaluation of some botanicals, thermal treatment and packing materials against pulse beetle, Callosobrochus chinensis in chick pea. Ind J of Entomology (Online published) doi 10.5958/ije.2021.141 (NAAS rating: 5.08)
6. Saini Manpreet Kaur, Singh Subash and Sharma D K. (2022). A Review Paper on Alternatives to Phosphine Fumigation in managing Stored Grain Insect-Pests. International Journal of Agricultural Sciences 18(1): 517-529. (NAAS rating: 4.73)
7. Singh Subash, Saini Manpreet Kaur and Sharma D K. (2022). A Review Paper on Broad spectrum use of Essential Oils in Managing Stored Grain Insect-Pests. International Journal of Agricultural Sciences 18(1): 496-508. (NAAS rating: 4.73)
8. Singh Subash, Saini Manpreet Kaur and Sharma D K (2022) Compatibility of newer molecules with pest's natural enemiest. International Journal of Agricultural Sciences, DOI: 10.15740/HAS/IJAS/18.1, 501-513 (NAAS rating: 4.73)
9. Subash Singh and Manpreet Kaur Saini (2022) Broad spectrum activity of essential oils in managing stored grain pests. Indian Journal of Entomology. http. //DOI.10.55446/IJE.2021.361 (NAAS rating: 5.08, ISSN: 0367-8288).
10. Sahni T, Sharma S, Verma D, Kumar S, Sharma P and Bhatia S. (2022). Experimental validation of syringic Schiff bases with pyridine moiety as antibacterial and antioxidant agents along with in silico studies. The Pharma Innovation Journal. 11(4): 417-426. (NAAS rating: 5.23)
11. Alam M S and Saini Manpreet Kaur (2022) Optimal mechanical exclusion devices for management of Khapra beetle in stored wheat. Indian Journal of Entomology, DOI: 10.55446/IJE.2022.6611750,1-6(NAAS rating: 5.08)
12. Baldev Singh Kalsi, Sandhya Singh and Mohammed Shafiq Alam (2022) Influence of ultrasound processing on the quality of guava juice. J Food Process Engg; e14163, doi: 10.1111/jfpe.14163(NAAS rating: 8.36)
13. Saini Manpreet Kaur, Alam M S and Bhatia Surekha (2022) Integrated management of Callosobruchus maculatus (Fab.) in Mung bean stored as seed. Indian Journal of Ecology 49 (5): 1989-1995. doi. org/10.55362/IJE/2022/3772 (NAAS Rating: 5.79)
14. Kaur, G and Bhatia S. (2022). Alpha-amylase-assisted extraction of protein concentrates from Raphanus sativus L. leaves. Biomass Conversion and Biorefinery, 1-15. (NAAS rating **10.90)**
15. Kaur Amandeep, Saini Manpreet Kaur, Sharma Smriti and Kooner Rubaljot (2022) Novel molecules targeted control of brinjal shoot and fruit borer, Leucinodesorbonalis in subtropical conditions of Punjab (India). Pesticide Research Journal 34(1): 44-45 DOI: 10.5958/2249-524X.2022.00008.5 (NAAS rating: 5.49)
16. Aslam R, Alam M S, Kaur J, Panayampadan A S, Dar O I, Kothakota A, and Pandiselvam, R. (2022). Understanding the effects of ultrasound processing on

	texture and rheological properties of food. Journal of Texture Studies, **53**(6), 775–799. (NAAS rating: 9.22) 17. Sandhya, Kumar M and Singh D (2022) Estimating Volume and Mass of Tomato Fruits by Image Processing Technique. Indian Journal of Ecology 49 (6): 2179-2183. DOI: https://doi. org/10.55362/IJE/2022/3806 (NAAS Rating:5.79) 18. Aslam Raouf, Alam Mohammed Shafiq, Ali Asgar, Tao Yang, Manickam Sivakumar (2023) A chemometric approach to evaluate the effects of probe-type ultrasonication on the enzyme inactivation and quality attributes of fresh amla juice. Ultrasonics Sonochemistry, 92:106268. doi: 10.1016/j. ultsonch.2022.106268. Pp 1-11 (NAAS rating: 15.64) 19. Kaur M, Bhatia S, Gupta U, Decker, E, Tak Y, Bali M and Bala, S. (2023). Microalgae bioactive metabolites as promising implements in nutraceuticals and pharmaceuticals: inspiring therapy for health benefits. Phytochemistry Reviews, 1-31. (NAAS rating 13.70)
c	Number of book chapters: **3** 1. Singh Sandhya, Kalsi Baldev Singh and Alam Mohammed Shafiq (2022) 'Potential of Thermosonication in the Food Industry' in Book Volume "Advanced Research Methods in Food Processing Technologies" ISBN 9781774913482 under Book series: Innovation in Agricultural & Biological Engineering (Accepted) 2. Alam MS, Kaur Maninder and Kour Jasmeet (2023). An Overview of Various Nano Systems for Encapsulating Nutraceuticals. In Handbook of Nano encapsulation: Preparation, Characterization, Delivery, and Safety of Nutraceutical Nanocomposites, ISBN 9781032194387 (CRC Press) Pp 1-24 (Accepted) 3. Kaur M, Tak, Y**, Bhatia S** and Kaur, H (2023). Phenolics Biosynthesis, Targets, and Signaling Pathways in Ameliorating Oxidative Stress in Plants. In Plant Phenolics in Abiotic Stress Management (Pp.149-171). Springer, Singapore
d	Proceedings, compendiums, Technical bulletins, Newspaper, other Magazine, annual reports other than AICRP-PHET): **27** **Popular article (8)** 1. Sandhya, Kaur Maninder and Alam M S (2022). Quality standards and key considerations for agro-processing. Progressive Farming, 58 (2) Pp 6-7. 2. Sandhya, Kaur Maninder and Alam M S (2022). Agro processing layi kuch zaroori gallan ate gunwatta de myaar. Changi Kheti, 58(2) Pp 5. 3. Kaur Saini Manpreet and Randhawa H S (2022). Anaj bandhar de kedian di roktham kiwien kariey. Kheti Duniya 40 (18): 9. 4. Randhawa H S, Saini M K and Damanpreet (2022) Stored grain pests and their control. Indian Farmers Digest 55 (5): 17-19. 5. Gurveer Kaur and Sandhya (2022) Kharveanaaj: Ikk kadam tikau kheti badi ate bhojan pranali wal. Changi Kheti, 58(11) Pp 27. 6. Alam M S, Kumar Satish and Kaur M (2022) Primary processing of kinnow for better pricing. Progressive Farming, 58 (12) Pp 22-23. 7. Alam M S, Kumar Satish and Kaur M (2022) Behtar keemat laye kinnow di mudli processing. Chamgi Kheti, 58 (12) Pp 21-22. 8. Saini Manpreet Kaur and Randhawa Harpal Singh (2022) Anaj Bhandharan da kedian di roktham kiwien kariey. Modern Kheti, 46-47. **Abstract published in e-conference proceedings (13)** **Pamphlets (2)**

	1. Alam M S, Saini Manpreet Kaur and Sharma Rohit (2022). Developed Honey Extracting and Processing Equipments, Page 1-10 (PAU/CoAET/PFE/PHET/01/2022) 2. Saini Manpreet Kaur and Alam MS (2022). Integrated Approach for Management of Stored Grains Insect Pests, Page 1-10 (PAU/CoAET/PFE/PHET/02/2022) **Bulletins (1)** Sandhya, Maninder Kaur, Gurveer Kaur and Gagandeep Kaur (2022) Bulletin on Oilseed Processing: Extraction and Utilization (Bulletin No. PAU/COAET/PFE/03/2022)

Patents (2)

1. Computer software entitled "**Know your Data Trend**" was developed and Copyright was applied to the Office of the Registrar of Copyrights, New Delhi for the developed software - "**Know your Data Trend**", Diary Number: 13179/2022-CO/SW dated 21-06-2022.
2. Computer software entitled "**Material Estimator for Brick Wall**" was developed and Copyright was applied to the Office of the Registrar of Copyrights, New Delhi for the developed software- "M**aterial Estimator for Brick Wall**", Diary Number:21261/2022-CO/SW dated 26-10-2022.

Awards: (4 Nos)

- AICRP-PHET PAU scientists received appreciation letter from Director, CIPHET on organizing Kisan Mela at CIPHET, Ludhiana on the occasion of 34th foundation day of CIPHET on 3rd October, 2022.
- Dr. Sandhya received best oral paper presentation award for the paper entitled 'Millets: A solution to food and nutritional Security' in the International Conference on "Contribution of Agriculture for Challenges and Opportunity of Food Security till 2030" organized by Mangalayatan University, Jabalpur (MP) during October 15-16, 2022.
- Dr. Sandhya received Women Scientist Award 2022 in the International Conference on "Contribution of Agriculture for Challenges and Opportunity of Food Security till 2030" organized by Mangalayatan University, Jabalpur (MP) during October 15-16, 2022.
- Baldev Singh Kalsi, Sandhya and Mohammed Shafiq Alam received best poster presentation award for the paper entitled “Effect of microwave power levels on quality of stevia rebaudiana leaves during microwave drying” during VIIth International Conference on GRISAAS-2022 held during November 21-23, 2022 at Birsa Agricultural University, Ranchi, Jharkhand, India.

Agro-Processing Centre (APC) established: 5 Nos

Sr. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1	Sh. Harish Arora, S/O Sh Bhagwan Das, Saawan Atta Chakki,SCO-2, Near Shivalik Homes, Sector-127, Shivalik City,,Kharar (Mohali), Punjab	14.01.2022	1800 sqft - 2700 sqft	10-25 lakhs
2	S. Pritpal Singh Punia & Sh. Kuldeep Kumar Garg, Guru Kripa Flour Mill, Vill. Jalaaldiwal,	28.04.2022		
3	Distt. Ludhiana			

4 5	Vijay Food Industry, Sh. Pradeep Singh, S/o Sh. Vijat Kumar, Mansa City, District Mansa Punjab Flour Mills, S. Davinder Singh, S/o S. Harbans Singh, Barnala City District Barnala Sh. Madan Gopal s/o Sh. Harbilas, Rama Mandi, District Bhatinda	10.06.2022 Upgraded Upgraded		

Entrepreneurship established: 21 Nos

Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget (Rs, Lakhs)
1. Sh. Harish Arora, S/O Sh Bhagwan Das Saawan Atta Chakki, SCO-2, Near Shivalik Homes, Sector-127, Shivalik City,,Kharar (Mohali), Punjab 2. S. Pritpal Singh Punia & Sh. Kuldeep Kumar Garg, Guru Kripa Flour Mill, Vill. Jalaaldiwal, Distt. Ludhiana 3. Vijay Food Industry, Sh. Pradeep Singh S/o Sh. Vijat Kumar, Mansa City, District Mansa 4. Punjab Flour Mills, S. Davinder Singh S/o S. Harbans Singh, BarnalaCity District Barnala 5. Sh. Madan Gopal s/o Sh. Harbilas Rama Mandi, District Bhatinda	Agro Processing Complex	14.01.2022 28.04.2022 10.06.2022 Upgraded Upgraded	10-25
1. M/S Anivet Health Care Pvt Ltd 508 Krishna Nagar,Bharatpur (Rajasthan) PHONE: 07062540258 2. M/s IndoCan Honey Pvt. Ltd Plot No.1, Kami Gannaur Road, Village Kami, Distt. Sonepat,Haryana 131 001, INDIA Mobile: +91 97819 83901, 99919 00660 3. Mr. Nishar Qureshi Rajiv colony devdara Distt. Mandla MP-481661Mob.9131850153 4. M/S BlackNutAgriFood Machinery Pvt. Ltd. #354, Sector-2,Industrial Growth Centre, Saha Industrial Growth Center, Saha, Distt. - Ambala, Haryana 133104 Mobile: +91-94664 51450 5. Subject matter specialist Apiculture kangra munical committee building distt. Kangra H. P Mob: 7018889432 6. M/S The Dev Narayan VillBhatakral, Post Office Shirar Tehsil DistKullu: 175 128 Mobile: 91-98052 12682	Honey Heating cum Filtration Machine	2.2.2022 22.2.2022 26.3.2022 7.4.2022 18.4.2022 14.5.2022 14.6.2022 18.7.2022	0.90-1.60

7. MRS Edah kasarNagaram (A Block) KhumanLampak Imphal- 795008 Manipur Mobile: 09612085704, 97320-19970		28.7.2022	
8. M/S Vaishno apiery and farms #2485,gurudwara Singh Sabha Road Rajpura town Punjab 140401 Mobile: +91-94170-14664		6.8.2022	
9. M/S Rummanul Islam Khan VPORajgram/PS Murarai Dist Birbhum- 731222 Mobile: 97320-19970		24.8.2022	
10. M/S Bee Farms Products Dolatpura, Dist: Desar, Gujarat 391774 Mobile: 96012-72942		10.9.2022	
11. M/S Green Day Honey And Spices 8/376/B Oduvally, Chapparapadavu Post Kannur-670581, 96050 25153		22.9.2022	
12. M/S Shiv Enterprises Kherli Alwar 321606 Mobile: 89553 08494			
13. M/S Innovative Ehs Solution 1506, woodbine, everst world kolshet road, Dhokali, Thane West-400607. Mobile: +91-96191 33347		2.10.2022	
14. M/S KVK Ainthu Kalakankar Pratapgar-229408, 91-94151 43774		30.11.2022	
15. M/S Asha Groups BalasourKotdwar Pauri Garhwal Uttarakhand (246149) Mobile: +91-976077444		3.12.2022	
16. Mr. Shabir Ahmad Ganie S/O Mohd Yousuf Ganie, Genie Mohallah, Aung, Nanil Ang, Jammu & Kashmir-192-125 Mobile: +91-70065-60853			

Success stories: 5 Nos

1. S. Jaswant Singh S/o S Naurang Singh, VPO Mohi, Distt. Ludhiana
2. S. Parminder Singh, Dashmesh Agro Foods, Vill Dholan, Teh. Jagraon, Ludhiana
3. S. Gurmukh Singh, Vill Mundian Khurd, Chandigarh Road, Near Fortis Hospital, Ludhiana
4. S. Gurpreet Singh S/o Pirthi Singh, G. S. K Gharat, NM College Road, Vill Mansa Kanchian
5. Master Harbir Singh Virk, FT Food, Fateh Industries, Lohar Kheda Road, Sandha, Distt. Mansa

Any other relevant information:

- Associated with Revolving Fund Scheme on "Processing and sale of agricultural produce" sanctioned in 2019. Regular and fast sale of the produce was ensured in the department as well as at the university sale point. By efficiently and effectively running of departmental pilot plants especially with respect to revolving fund scheme on "Processing and Sale of Processed Produce".

20. Centre Name: MAFSU, Mumbai (Maharashtra)

Manpower Detail (Jan-Dec 2022): All staff positions filled is Purely Contractual/Temporary)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	6	2
2.	Technical	3	3
3.	Administrative	1	1
4.	Supporting	-	-

Financial Detail (Jan-Dec 2022)

Sr. No.	Budget Head	Revalidated Balance of 2021-22	Budget Estimate ₹ in Lakh (as per EFC)	Funds released (₹ in Lakh)	Funds Utilized (₹ in Lakh)
1	Salary	17.07	62.00	47.00	21.52
2	Recurring	05.62	12.40	10.15	06.85
3	Non-recurring	01.33	03.00	03.00	03.20
4	**Total**	**24.02**	**77.40**	**60.15**	**31.57**

Details of projects

S. No	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
	Completed projects			
1.	Surveillance and detection of meat for antimicrobial residue and its resistance to common food pathogens	PI: R. J. Zende Co-Pis: V. M. Vaidya, Vivek Shukla	April, 2021	March,2023
2.	Studies on quality improvement of preblended mutton kheema with antioxidant vitamins	PI: R. J. Zende Co-Pis: V. M. Vaidya, Vivek Shukla	April, 2021	March, 2023

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (02)

Name of machine	UV cabinet for studying antimicrobial residues deactivation in meat
Capacity	The capacity of UV cabinet meat exposure upto 5 kg.
Use	For deactivation of antimicrobial residues in meat by UV
Details	Fabricated UV cabinet for deactivation of antimicrobial residue in buffalo meats. The UV cabinet having the total of 8 number Tubes (Four each of 11 and 8 watts having wavelength of 365 and 254 nanometer, respectively). Automatic timer for setting of time. UV tube having individual switch for operating. The body of the cabinet is made of M. S., duly powder coated and adjustable tray with sliding window. The size of cabinet: Depth: 2 ft., Widht: 2.5 ft., Height: 3 ft.

Photographs	 
Cost (₹)	₹ 63,000/-

Name of machine	**Infrared cabinet for studying antimicrobial residues deactivation in meat**
Capacity	The Infrared cabinet having the total of 8 number of medium wavelength Quartz Infrared Tube heater placed on the top wall inside with separate switch. Infrared Tube (Length 300 MM, Diameter 12 MM, Watts 250 Watts, Voltage 240 V in horizontal position)
Use	For deactivation of antimicrobial residues into meat by Infrared
Details	Fabricated Infrared cabinet for deactivation of antimicrobial residue in buffalo meats. The Infrared cabinet comprised of 8 medium wave Quartz Infrared tubes (Length 300 MM, Diameter 12 MM, Watts 250 Watts, Voltage 240 V in horizontal position) Automatic timer for setting of time. Infrared tube having individual switch for operating. The body of the cabinet made of M. S., duly powder coated and adjustable tray with sliding window. The size of cabinet: Depth: 2 ft., Widht: 2.5 ft., Height: 3 ft.
Photographs	 
Cost (₹)	₹ 57,750/-

Extensions activities (Jan-Dec 2022):
Kisan melas /Agri-fairs: Nos (2)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	"one day training program for farmers and entrepreneurs on hygienic chicken, sheep and goat meat production" for scheduled category" under SCSP category	Department of Veterinary Public Health and Epidemiology, Mumbai	22 March, 2022	44

	(scheduled cast sub plan) at Kasarputale, Kolhapur-416212.	Veterinary College, Mumbai		
2	"Farmers training and exhibition 2022-2023" at Cherpoli, Shahapur, Dist. Thane - 421601. The MAFSU, Mumbai centre demonstrated the different technologies developed under AICRP on Post Harvest Engineering and Technology to Hon'ble Shri. Kapil Patil, Minister of state for Panchayati Raj of Government of India, Dr. Samir Todankar, Department of Animal Husbandry and dairying and Mr. Sanjay Nimse, District Corporation, Member, Thane and Cattle farmers	Department of Animal Husbandry and Dairying, District Corporation, Thane, Maharashtra	8th January, 2023	89

Training organized Nos (2)

S. No.	Venue	Date	Number of participants			
			Male	Female	Student	Total
1.	Hygienic Chicken, Sheep and Goat Meat Production and distribution of butcher kit" for scheduled category fisheries" under SCSP category (Scheduled cast sub plan) at Argoan, Ratnagiri-415643.	07th January2022	36	4	-	40
2.	Animal Husbandry and Dairy Producers, and free distribution of milk kettle, milk measure and milk strainer for farmers" under SCSP category at Nagaon, Saralgaon, Murbad, Dist. Thane-421401.	01st August 2022	45	01	-	46

Salient achievements of the centre (Jan-Dec 2022):

Publications

Peer reviewed: **Nil**

Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (06)**

1. "Effect of different thawing methods on quality attributes of frozen chicken meat", R. A. Mankar, **R. J. Zende**, V. M. Vaidya, R. S. Khillare, and S. Rindhe, International Symposium on Zoonotic Transboundary Diseases: Breaking the chain through Multidiscplinary Appoach during during 1-2 Dec., 2022 at Meghalaya, Pg. No.132
2. "Quality evaluation of modified atmosphere packaged raw chevon treated with electron beam irradiation stored at refrigeration temperature", Kurat Ul Ann, **R. J. Zende**, K. P. Rawat, V. M. Vaidya, R. S. Khillare, S. A. Khader, A. H. Shirke and S. M. Tambe,

International Symposium on Zoonotic Transboundary Diseases: Breaking the chain through Multidisciplinary Approach during during 1-2 Dec., 2022 at Meghalaya, 126.

3. "Detection of selected antibiotic residues in chicken meat samples using Liquid Chromatography- Tandem Mass Spectrometry (LC-MS/MS)", Neha V, **R. J. Zende**, V. M. Vaidya, R. S. Khillare, A. H. Nehete and S. P. Kamble, International Symposium on Zoonotic Transboundary Diseases: Breaking the chain through Multidiscplinary Appoach during during 1-2 Dec., 2022 at Meghalaya 124
4. "Assessment of Microflora of different species of meat obtained from retail shops and slaughterhouses in Mumbai City", **R. J. Zende**, V. M. Vaidya, R. S. Khillare, A. S. Nair, Magri Bagang, R. R. Malkar, B. K. Zade and S. U. Surwase, International Symposium on Zoonotic Transboundry Diseases: Breaking the chain through Multidisciplinary Approach during during 1-2 Dec., 2022 at Meghalaya 123
5. "Detection of Leptospira spp. in animals and environmental contaminnats by Real Time PCR assay, A. H. Nehete, V. M. Vaidya, R. J. Zende, R. S. Gandge, R. S. Khillare, and Neha V. - presented in the International Symposium on Zoonotic and Transboundary Diseases: Breaking the chain through Multidisciplinary Approach and XVIIIth Annual Conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) during during 1-2 Dec., 2022 at Meghalaya.

Technical Bulletin: **Nos (7)**

1. Different technologies developed under ICAR sponsored AICRP Project on PHE&T at MAFSU Mumbai centre.
2. Technology for Preparation of Collagen from Pig skin
3. Technology for Preparation chondroitin sulphate from Buffalo Cartilage.
4. Development of Neat's Foot Oil from buffalo hooves
5. Ekkls dk<. kh] gkrkG. kh o foØh O;oLFkkiu
6. Assessment on efficiency of non-thermal technologies on antimicrobial residues in buffalo meat.
7. Quality improvement of preblended mutton kheema with antioxidant vitamins.

Awards (Jan-Dec 2022): Nos (3)

1	1. Best Oral Presentation Award "Detection of leptospira spp. in animals and environmental contaminant by Real-Time PCR assay in the International symposium on zoonotic and Transboundary Diseases: Breaking the chain through multidisciplinary approach and XVIIIth annual conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) during 1-2 Dec., 2022 at Meghalaya. 2. Dr. A. T. Sherikar Outstanding Public Health Veterinarian Award-2022: International symposium on zoonotic and Transboundary Diseases: Breaking the chain through Multidisciplinary Approach and XVIIIth Annual conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) during 1-2 Dec., 2022 at Meghalaya. 3. Dr. P. D. Deshpande Best Reseach paper on Epidemiology Award 2020: R. J. Zende, A. M. Paturkar, C. K. Raut, P. M. Jadhav, N. V. Nikale and S. G. Panchal received for "Sero epidemiological study of Hydatidosis, cysticercosis, Trichenellosis in high-risk human group of Maharashtra State in the International symposium on zoonotic and Transboundary Diseases: Braeking the chain through Multidisciplinary Apporach and XVIIIth Annual conference of Indian Association of veterinary Public Health Specialists (IAVPHS) during 1st & 2nd December, 2022 at Meghalaya.

21. Centre Name: Dr. RPCAU, Pusa (Bihar)

Manpower Detail

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	03	02
2.	Technical	04	01
3.	Administrative	0	-
	Total	07	3

Financial Detail: Expenditure statement during the financial year 2022-23

Sl. No.	Budget head	Budget Estimate, ₹ In lakh (as per EFC)	Fund released, ₹ In Lakh	Fund Utilized, ₹ In lakh
1.	Salary Head	NIL*	NIL	NIL
2.	Recurring	4.00	3.00	3.96
3	TA	0.20	0.20	0.33
4	HRD	0.00	0.00	0.00
5	Non-recurring	0.00	0.00	0.74
6	SCSP	0.00	0.00	0.00
	Total	**4.20**	**3.20**	**5.00**

Details of Projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration	
			Start	End
	Ongoing projects			
1	Development of low cost portable corn roaster-cum-boiler for street vendors	PI: Vishal Kumar Co-PI: A. Amitabh	April 2021	March 2023
	Status: Need extension			
2	Development of watermelon seed decorticator and seed-based value added products	PI: D. Kumar Co-PI: V. Kumar	April 2020	March 2023
	Status: Need extension			
3	Development of value added products from Kadam (Neolamarckia cadamba) including its by-product utilization	PI: Vishal Kumar Co-PI: A. Amitabh	April 2019	March 2024
	Status: ongoing			

Technology development and outreach activities
Machines/Gadgets tools/ instruments developed:

Name of machine	**Low cost portable corn roaster-cum-boiler for street vendors (gas operated)**
Capacity	5 corns roasted and 12 boiled in one lot
Use	The process of corn roasting and boiling will be done in a single portable unit
Details of machine: A gas operated portable corn roaster-cum-boiler was developed. It has three units- roasting unit, boiling unit and corn holders Stainless steel was used as fabrication material and proper insulation may be provided to reduce heat loss Roasting chambers: Roasting of 5 corns in one lot and the roasting was controlled through rotatable corn holder.5 parallel perforated SS flat pipes feeds the LPG gas longitudinally	

which roasts the corn. The unit is equipped with two gas regulators which controls the gas. The setup is so designed to operate at lower capacity (either, two or three corns being roasted as required per lot using the gas regulators) or at full capacity (five cobs being roasted). A glass viewer is also provided to monitor the roasting operation. Corn cob holders: The corn holders were rotated manually using five pinions attached with the unit. One of the pinion is attached with handle which when rotated will rotate all the five pinions. The rotations of all the five corns are made as per the roosting done Boiling chamber: Boiling of 10-12 corns can be done in one lot. The unutilized heat from roasting chamber was used for boiling water in this chamber. Besides, the unit is mounted on a stand and for carrying/lifting the unit, holders were provided at the top of the lid of boiling chamber. The average heat utilization factor obtained in loaded condition was 0.68 and thermal efficiency was 74.00%. The mean roasting efficiency of the developed maize roaster cum boiler was found to be 90.37%.	
Photographs	 **Gas operated corn roaster cum boiler**
Cost of machine (₹)	8000.00

Name of machine	**Watermelon seed decorticator (Horizontal Type- multi-crops)**
Capacity machine	25 kg/h
Use of machine	For seed decortication of watermelon
Details of machine	Rotating disc wall and rotating rolls will be made of correlative /rubbery materials to provide abrasive force. Rotating disc and rotating rolls having different velocity will create the abrasive force to wear away the shell and create crack on it. The adjustable clearance between the disc wall and rolls mill will detach the shell of watermelon seeds. Angular speed will be varied for getting the best shelling efficiency
Photographs	
Cost of machine (₹)	42000.00

Processes/products protocol developed:

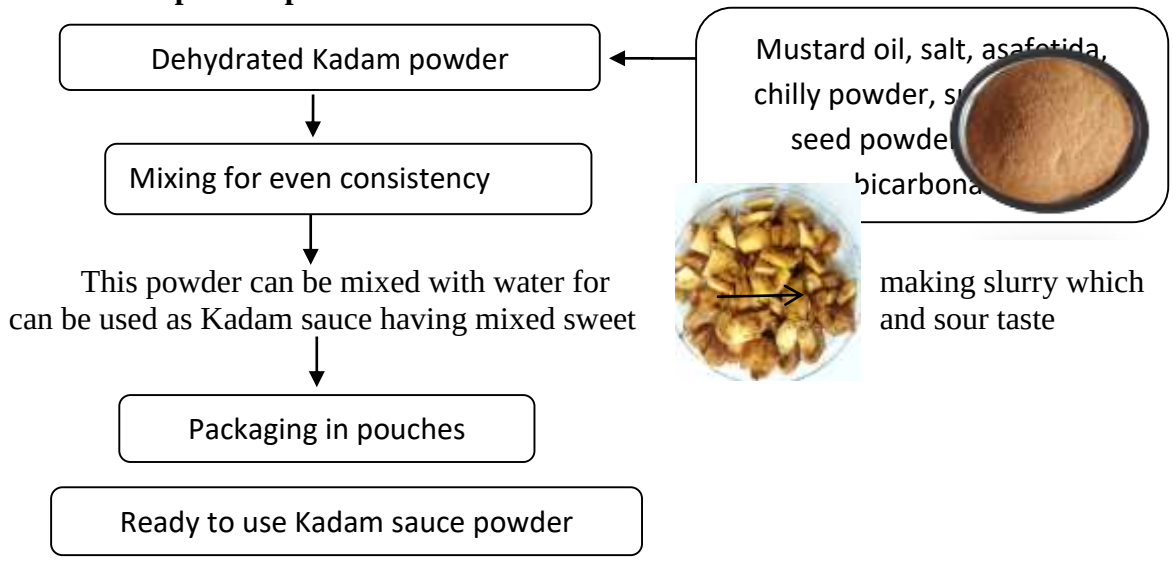
Name of the process /products	**Petha from Mesocarp of Pomelo**
Use of the process/products	Snack item
Details of the process/products Numerical optimization solution emerged out from Response surface methodology as blanching time - 11.52 min and initial TSS of syrup solution- 40 ^{O}Brix, cooking time - 20 min in order to obtain optimized yield as moisture content - 41.759 per cent, colour index- 42.431, hardness– 1.647 kg, final TSS of syrup solution– 65.00, water activity-0.452 and overall acceptability-7.648 with desirability of 0.768	

Photographs of the process/products	 
Cost	2.15 kg of Petha was prepared from 1.04 kg of mesocarp used. Cost: ₹ 110/Kg

Name of the process /products	**Candy from Mesocarp of Pomelo**
Use of the process/products	Snack item
Details of the process/products: Response surface methodology at three levels of Box-Behnken design was used to optimize process variables using Design expert 11.1 software was used to optimize the multiple responses. Numerical optimization solution for process variables for preparation of watermelon rind Petha from the Design expert software emerged out as blanching time-12.25 min and initial, cooking time - 26 min, Drying temperature 64.5 oC in order to obtain optimized yield as moisture content-17.22 per cent, colour index-45.54, hardness– 2.76 kg, final TSS of syrup solution– 52.00, water activity-0.411 and overall acceptability-7.23 with desirability of 0.761	
Photographs of the process/products	 
Cost of the process/products	1.85 kg of candy was prepared from 1.0 kg of mesocarp used. **Cost: ₹ 125/Kg**

Name of the process /products	**Kadam sauce powder**
Use	Curry purpose

Details of the process/products



Photographs of the process/products	  Ready to use Kadam sauce powder
Cost of the process/products	The cost for production of 500 g of Kadam sauce powder (excluding the packaging cost) is ₹ 120.00.

Adaptive trails (Jan 2022 to Jan 23): 4 Nos

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1.	Corn roaster cum boiler	CAET, RPCAU, Pusa	Satisfactory
2	Turmeric boiler	CAET, RPCAU, Pusa	Satisfactory
3	Turmeric Polisher	CAET, RPCAU, Pusa	Satisfactory

Extensions activities (Jan 2022 to Jan 23) Nos (14)

Kisan melas /Agri-fairs: Nos (1)

From 12 to 14.03.2022, the scheme along with the department put its stall in Kisan Mela 2022 held at Pusa.

Other extension activities

1. Er. Anupam Amitabh organized a three days training programme from 6-8th December, 2022 on "Entrepreneurship development through sugarcane production and processing" for extension personals, Govt. of Bihar.
2. Er. Anupam Amitabh delivered lecture on "value added products of jaggery- scope and opportunities" on 16.11.2022 in winter school organized by SAB&RM, RPCAU, Pusa.
3. Er. Anupam Amitabh delivered lecture on "medicinal jaggery processing at SRI" on 26.11.2022 in three days training organized by Directorate of extension education, RPCAU, Pusa.

4. Er. Anupam Amitabh delivered lecture on " Business prospectsinjaggery's value added products" on 30.11.2022 in three days training organized by SAB&RM, RPCAU, Pusa
5. Lecture titled धान एवं गेहूं उत्पादन के लिए कृषि यंत्रों की जानकारी एवं सुरक्षा delivered by Dr. Devendra Kumar on 05.07.2022 in 5 days training program on Food Processing sponsored by ATMA, Begusarai, Bihar, and organized by Directorate of extension education, DrPCAU, Pusa.
6. More than 30 lectures delivered by Dr. Vishal Kumar and Er Anupam Amitabh in year under report during training program on 'Service and Maintenance technician' - Farm Machinery' organized by FMPE

Technology demonstration/FLD: Nos (13)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	Kalyanpur village in Samastipur district	CSACSVs project and AICRP on PHET	22.01.2022	12
2	Ladaura village in Samastipur district	CSACSVs project and AICRP on PHET	25.01.2022	15
3	Gopalpur village in Samastipur district	CSACSVs project and AICRP on PHET	07.02.2022	21
4	Birsinghpur village in Samastipur district	CSACSVs project and AICRP on PHET	09.02.2022	18
5	Dhruvgama village in Samastipur district	CSACSVs project and AICRP on PHET	24.03.2022	22
6	Basudeopur village in Samastipur district	CSACSVs project and AICRP on PHET	25.03.2022	15
7	Partapur village in Samastipur district	CSACSVs project and AICRP on PHET	28.03.2022	22
8	Phulhara village in Samastipur district	CSACSVs project and AICRP on PHET	20.04.2022	21
9	Laduara village in Samastipur district	CSACSVs project and AICRP on PHET	21.04.2022	17
10	Birsinghpur village in Samastipur district	CSACSVs project and AICRP on PHET	25.05.2022	15
11	Rampura village in Samastipur district	CSACSVs project and AICRP on PHET	30.05.2022	16
12	Akbarpur village in Samastipur district	CSACSVs project and AICRP on PHET	27.06.2022	17
13	Kalyanpur village in Samastipur district	CSACSVs project and AICRP on PHET	28.06.2022	11

Salient achievements of the centre (Jan 2022 to Jan 23)

Publications:

1	Peer reviewed 1. Kumar, V; Sagar, S M; Anupam amitabh 2022. Design and Development of a single drum pulper for Watermelon. Environmental and ecology. (Naas rating 5.25)
2	**Number of book chapters:** • Accepted book chapter on "**Conventional and Advanced Methods in Small Millet Processing" in** the book "Genetic Improvement of Small Millets" being published by Springer Nature. - Dr. Vishal Kumar and Er. Anupam Amitabh and Ankit Kumar • Released training manual on "मोटे अनाज के प्रसंस्करण में उपयोगी यंत्र" for the trainer's uner the training programme under Small Millets program of RPCAU, Pusa by Dr. Vishal Kumar and Er. Anupam Amitabh. • Scaling up of Climate Smart Agriculture through Mainstreaming Climate Smart Villages in Samastipur- written by Dr. Ambrish Kumar, Dr. R. K. Jha, Project Director, Dr. R. K. Tiwari, Dr. Vishal Kumar, Er Dinesh Rajak.

Awards received by the centres:

1. Dr. Vishal Kumar received "Excellence in Research Award' by Society for Agricultural innovation and development, Ranchi in National conference on Food and Nutritional security and sustainable agriculture held during 15-16 April, 2022 at Hyderabad.
2. Dr. Vishal Kumar, Assistant Professor, CAET was awarded with Best Research paper award for Year 2021-22 on 15 August 2022 for his paper published in journal 'Sugartech' entitled 'Optimization of Ready to Use Bio-Clarificant Mixture for Production of Quality Jaggery Optimization of Ready to Use Bio-Clarificant Mixture for Production of Quality Jaggery'
3. Dr. Vishal Kumar as mentor won 2nd Prize in Calendar Conceptathon on 'Engineering Innovations for Millet' organized by ISAE, New Delhi at 56th Annual convention of ISAE AT TNAU, Coimbatore during 9-11 Nov, 2022

22. Centre Name: UAS, Raichur (Karnataka)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	03	03
2.	Technical	06	05
3.	Administrative	01	01

Financial Detail (Jan-Dec 2021) (ICAR Share)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	90.00	70.00	59.50
2.	Recurring	8.50	7.20	8.65
3.	Non-recurring	3.00	0.0	1.37
4	SCSP	5.00	4.00	**0.00**
Grand Total		**106.50**	**81.20**	**69.31**

Details of projects

S. No.	Title of the Sub-Project	Name of PI and Co-PI's	Duration	
			Start	End
	On-going Projects			
1.	Development of pneumatic aspiration system for safe handling of husk in rice mills	PI: Udaykumar Nidoni Co-PIs: Mathad P.F., Sudhadevi, Swapna **Collaboration**: Radhe Agro-industry (Rice Mill), Raichur	April-2020	March-2023
	Status: Concluded and RPP-3 will be submitted during workshop			
2.	Development of sensor for detection and quantification of selected heavy metals in food matrix	PI: Mathad P. F. Co-PIs: Udaykumar. N, Sudhadevi, Swapna, Lakshmikant **Collaboration**: Dr. Smitha, 5W Ventures Pvt. Ltd, Bangalore	April-2021	March-2023
	Status: Ongoing - Need Extension for 6 months year			
3.	Standardization of process technology for production of Juice and immunity boosting foods from Nannari (Hemidesmus indicus)	PI: Sudhadevi Co-Pis: Udaykumar N, Mathad P.F., Swapna, Lakshmikant	April-2021	March-2023
	Status: Ongoing - Need Extension for 3 months			
4.	Development of Processing, Value addition and by product utilization technologies for dragon fruit	PI: P. F. Mathad Co-PIs: Udaykumar N, Sudhadevi, Swapna, Roopabai R.S., Geeta H.P., A.R. Kurubar	April-2022	March-2024
	Status: Ongoing			

Technology development and outreach activities (Jan-Dec 2022)
Details of machines/Gadgets tools/ instruments developed: Nos (01)

Name of machine	**Pneumatic aspiration system for husk handling in rice mills**
Capacity	5-6 tonnes per hour
Use	The developed rice husk handling system is used for **safe loading of rice husk in to truck** without creating dust
Details	The developed rice husk handling system consists of pneumatic husk conveying system of 6.0 meter horizontal length and 10 meter vertical. The diameter of pipe is 35 cm; a cyclone was fitted on the platform 10.0 meter above the ground, air lock system and blower. The airflow rate was 56-60 m3 /min, air velocity measuring 3040-3050 m3/min. The husk collected in husk shed was sucked by the inlet hose pipe and conveyed to the cyclone separator fitted on the platform. The air lock system provided at the bottom of the cyclone allows the husk to fall in truck and air was blown out by the blower. The capacity of the conveying system is around 5-6 tonnes per hour. The system helps to load the husk in to truck without creating much dust surrounding the shed. It reduces the pollution around the rice mill, reduces the handling cost of rice husk. The same equipment can be modified to handle similar products in industry
Cost of machine (₹)	**₹ 6.0 lakhs**

Processes/products /protocol developed (Jan-Dec 2022): Nos. (01)

Name of the process	**Ready to Cook Dal Analogue Tadaka Mix**
Use	Used in preparation of various dishes and eaten with chapatti and rice
Details of the process/ products	Dal analogues were developed through cold extrusion process by optimizing composite flour comprising of pigeonpea brokens flour and wheat flour. The pigeonpea brokens flour at different levels viz., 90, 85 and 80 per cent were blended with remaining proportion of wheat flour and extruded with three different sizes (4, 5 and 6 mm) of diameter to standardized size of dal. Dal tadka is a popular Indian dish where cooked dal is finished with a tempering made of ghee/oil and spices. Dried ingredients i. e onion cubes, tomato slices, curry leaves with garlic, ginger, cumin, mustard, salt, chilli powder are added and mixed uniformly with dal analogue. Ready to cook dal analogue tadaka mix of known quantity can be transferred to pressure cooker and water (1:5) . Cook the mixture for 6 minutes (3 whistles), then wait for remove pressure cooker from pressure release naturally for 5 minutes and open the lid. Dal tadaka is ready and serve with hot chapathi, naan or rice. The cost involved in production of dal analogues tadaka mix was found to be ₹ 45.00 per kg with the benefit cost ratio of 2:1.
Cost	₹ 45 per 100g tadak mix

Adaptive trails (Jan-Dec 2022): Nos. (01)

S. No	Name of machine/ technology	Name of the Trial place	Result/Inference
1.	Rice Puffing Machine developed by IGKV, Raipur	Performance evaluation of rice puffing machine for varieties grown in Karnataka	-

Machine/Technology transferred (Jan-Dec 2022): Nos. (02)

S. No	Name of the technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of technology transferred	Total revenue generated
1.	Development of millet-based ready to eat extruded snacks	01	Mr. Udaykiran Propriter. M/s. Farm Bandi, No. 9, C/o Dhanajjaya Compound, Goshala Road, Raichur.	August, 2022	25,000
2.	Development of Millet-based Bread and Cookies	01	Mr. Balaji H Muniswamy 1-4-1343/494, IDSMT, Layout, Raichur	September 2022	25,000

Extensions activities (Jan-Dec 2022).8Nos.

Kisan melas /Agri-Fairs: Nos (06)

S. No.	Name of the event and venue	Organizer name	Month/Year	No. of Participants
1	Technology and Demonstration Mela	AICRP schemes of CAE, UAS Raichur	24th March, 2022	600-800
2	State Level Lime Festival at Vijayapura	Karnataka State Lime Development Board, Vijayapura	23rd April, 2022	400-500
3	Kharif Seed Mela at UAS, Raichur	Seed Unit, UAS Raichur	25th May, 2022	1000-1200
4	Millet Conclave-2022 at Raichur	UAS, Raichur and NABARD, Karnataka	23 -24 August, 2022	2000-2500
5	Rabi Seed Mela at UAS, Raichur	Seed Unit, UAS Raichur	26th September,2022	800-1000
6	Soura Siri-Millet Fair at Chitradurga	SELCO Foundation, Bengalore	2nd November, 2022	500-800
7	Krishi Mela at UAS GKVK, Bengalore	UAS GKVK, Bengalore	2nd to 6th November, 2022	3-5 lakhs
8	Foundation day of UAS Raichur	Directorate of Research, UAS Raichur	22nd November, 2022	300-400
	Krishi Mela-2022 at UAS Raichur	UAS Raichur	10-12th January,2023	1-2 lakhs

Salient achievements of the centre (Jan-Dec 2022)

Publications

Peer reviewed

1. Ambrish Ganachari, Police Patil AS, Mallikarjun Reddy, Mathad P F, Hasan Khan and Sharan Bhoopal Reddy (2022) Physical properties of Chia (Salvia hispanica L.) seeds required for the design of equipment. The Pharma Innovation Journal 2022; 11(3): 2253-2256
2. Ambrish Ganachari, Udaykumar Nidoni, Sharangouda H, Ramappa KT, NagarajNaik, and P. F. Mathad (2022) Development of rice analogues using by-products of rice and dhal mills. J. Food Sci. Technology. https://doi. org/10.1007/s13197-022-05405-4
3. Ambrish Ganachari, Udaykumar Nidoni, Mathad PF And Nagaraj Naik (2022) Development and performance evaluation of hybrid solar tunnel dryer for production of quality raisins. Scientist.2022;1(3): 6100-6112
4. Swapna, Mahadevaswamy, Udaykumar Nidoni, Amrutha G and PF Mathad (2022) Coating fruits and vegetables with probiotic bacteria (LAB) to enhance food safety. The Pharma Innovation Journal 2022; SP-11(12): 12-15
5. C Madhusudan Nayak, C T Ramachandra, Udaykumar Nidoni, Sharanagouda Hiregoudar, Jagjivan Ram, Nagaraj M Naik. Influence of processing conditions on quality of Indian small grey donkey milk powder by spray drying. Journal of Food Science Technology., 2022
6. Ambrish Ganachari, Udaykumar Nidoni, Sharanagouda Hiregoudar, KT Ramappa, Nagaraj Naik, S Vanishree, P F Mathad. Development of Rice analogues fortified with iron, folic acid and Vitamin A. Journal of Food Science and Technology., 2022
7. C Madhusudan Nayak, CT Ramachandra, Udaykumar Nidoni, Sharanagouda Hiregoudar, Jagjivan Ram, Nagaraj M Naik (2022). Moisture sorption isotherms and estimation of iso steric heat of sorption of donkey milk powder., Journal of Food Processing and Preservation

Number of book chapters: **2 Nos**

1. P. F. Mathad, Ambrish Ganachari, Udaykumar Nidoni, and Sudha Devi. G 2022, Millet Industries Scenario, Handbook of Millets –Processing, Quality and Nutrition Status, Springer Nature Singapore Pte. Ltd.2022
2. Udaykumar Nidoni, Sudha Devi G, Ramappa K T, P. F Mathad, Swapna, Sharangouda H, Roopabai and Geetha 2022, gÉÆÃUÀ¤gÉÆÃzsÀPÀ ±ÀQÛ ºÉaÑ¸ÀÄªÀ DgÉÆÃUÀåªÀzsÀðPÀ DºÁgÀ ¥ÀzÁxÀðUÀ¼À£ÀÄß vÀAiÀiÁj¸ÀÄªÀ PÉÊ¦r (Kannada Book)

Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (7)**

1. Ambrish Ganachari, Udaykumar Nidoni, Sharangouda H, Ramappa KT, NagarajNaik, and P. F. Mathad (2022) Development and performance Evaluation of hybrid solar Tunnel dryer for production of Quality raisins. National Conference on Food & Nutritional Security and Sustainable Agriculture (NFSA-2022) held during 15-16 April, 2022
2. Ambrish Ganachari, Anand Police Patil, Udaykumar Nidoni, Mathad P F and Mallikarjun (2022) Selected physical properties of chia (salvia hispanica l.) seeds required for the design of equipment. National Conference on Food & Nutritional Security and Sustainable Agriculture (NFSA-2022) held during 15-16 April, 2022
3. Sudha Devi. G, Udaykumar Nidoni, Veena T and P. F. Mathad (2022) Enhancing socioeconomic status of the farming community through the waster of acid lime peel

powder National Conference on comprehensive transformation of in Agricultural Education-Initiatives, Challenges, and way forward

4. Swapna, Udaykumar Nidoni, P F Mathad and Sudha Devi G (2022) Effect of blue LED system for inactivation of food pathogens in chilli and groundnut.56th Annual convention of ISAE, Agricultural Engineering Innovation for global food security held during Nov 9th to 11th 2022.
5. Gouthami, P F Mathad, Udaykumar Nidoni and Sharangouda Hiregouder (2022) Edible spoons- A step forward to replace single use plastics.56th Annual convention of ISAE, Agricultural Engineering Innovation for global food security held during Nov 9th to 11th 2022.
6. Sudha Devi G, Udaykumar Nidoni, P F Mathad and A R Kurubar (2022). Standardization of process technology for acid lime juice powder.56th Annual convention of ISAE, Agricultural Engineering Innovation for global food security held during Nov 9th to 11th 2022.
7. P F Mathad, Udaykumar Nidoni, Sudha Devi G, Ambrish G and Divya (2022). Studies on drying characteristics of Moringa leave (Moringa oleifera).56th Annual convention of ISAE, Agricultural Engineering Innovation for global food security held during Nov 9th to 11th 2022.

Patents (Jan-Dec 2022): (01)

Patent Granted: **Nos (01)**

Pedal Operated Flour Mill" with patent No.408661. Dt.22.10.2022, UAS Raichur, Yallappa D, P. F. Mathad, Udaykumar Nidoni and others

Awards and recognition Received by the Centres (Jan-Dec 2022): Nos (01)

1	**Dr. P. F. Mathad Scientist (PE**), and Er. Sudha Devi, G Awarded National Level Qualified Master Trainer in Bakery training domain under **PM FME Scheme.**

Entrepreneurship/ start-ups Established (Jan-Dec 2022): Nos (02)

Sr. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship ₹ in Lakhs
1.	**Mr. Anand Patil** Proprietor M/s. Natural Foods of Address: Dept. of Processing and Food Engg. CAE, UAS Raichur Phone: 9008190763	Primary processing and packaging of different millets in bulk and retail selling	April-2022	8.00
2.	**Mr. Mohan** Propriter of Tasty Budzz Address: Dept. of Processing and Food Engg. CAE, UAS Raichur Phone: 9886740765	Processing of wheat and millets in to semolina, flour and other products	July-2022	10.00

23. Centre Name: IGKV, Raipur (Chhattisgarh)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	**05**	**05**
2.	Technical	**05**	**04**
3.	Administrative	**01**	**00**
4.	Supporting	**00**	**00**

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	110.00	85.00	104.11
2.	Recurring	8.50	5.20	2.40
3.	Non-recurring	3.00	0.00	0.00
4	Total	**121.50**	**90.20**	**106.51**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
	Ongoing projects			
1	Study on ripening and storage of potential fruits of Chhattisgarh (banana, papaya)	PI: P. S. Pisalkar Co-PIs: S. Patel, D. Khokhar, N. K Mishra	April 2021	March 2024
2	Development of process technology for shelf-life extension and packaging of major leafy vegetables of Chhattisgarh (Lal Bhaji, Chaulai Bhaji & Chech Bhaji)	PI: N. K Mishra Co-PIs: D. Khokhar, O. P. Suryawanshi	April 2021	March 2023
3	Development of process technology for the utilization of broken rice for the preparation of biodegradable polymer.	PI: S. Patel Co-PIs: D. Khokhar, P. S. Pisalkar, O. P. Suryawanshi	April 2021	March 2024
4	Development of value chain & equipment for the complete utilisation of moringa produce including fruits leaves and moringa gum	PI S. Patel Co-PIs: D. Khokhar, N. K Mishra, O. P. Suryawanshi, P. S. Pisalkar	April 2020	March 2023
	Activity			
5	Creation of essential oil extraction facility and development of value chain**.**	PI S. Patel Co-PIs: D. Khokhar, N. K Mishra, O. P. Suryawanshi	April 2021	March 2023

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (01)

Name of machine:	Grain puffing cum roasting machine
Capacity:	50-80 kg/h
Use of machine:	Puffing of corn, rice, millet, sorghum etc. and roasting of gram, groundnut, wheat etc. The machine can also be used for puffing or roasting of different grains like gram, paddy etc.
Details of machine:	It is a compact machine developed to puff and roast grains and extruded products. It is operated by 1 hp electrical motor whereas for heating the LPG is used. It is continuous type with temperature and RPM control. It is easy to transport from one place to another.
	
Grain puffing cum roasting machine	
Cost of machine (₹):	Approximately ₹ 2.0 lakh

Adaptive trails (Jan-Dec 2022): Nos (04)

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1.	IIPR, Dal Mill	BRSM College of Agicultural Engineering Technology & Research Station, Mungeli	Dal recovery - 70-75%
2.	PDKV, Dal Mill		Dal recovery - 72-75%
3.	Rice Puffing Machine	KVK, Raipur and Jagdalpur	Puffing efficiency -97 %
4.	Kodo dehusker (double stage - CIAE, Coimbatore)	KVK, Raipur	Pearling efficiency- 95%

Extensions activities (Jan-Dec 2022) Nos (19)
Kisan melas /Agri-fairs: Nos (05)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	Demonstration of technologies to the farmers and students	Govt. of CG and IGKV, Raipur	1 January, 2022.	1000
2	Demonstration of rice puffing machine at state level mela during	Govt. of Chhattisgarh	3-5 January, 2022.	1800
3	Participated in Agri Carnival 2022, International Agriculture Fest, CG.	IGKV, Raipur	14-18 October, 2022.	10000

4	Participated in Chhattisgarh RajyaUtsav 2022.	Govt. of CG and IGKV, Raipur	1-6 November, 2022.	20000
5	Organized technology and machine demonstration mela-2022 at IGKV, Raipur	IGKV, Raipur	16th March, 2022	700

Technology demonstration/FLD: Nos (Regular activity)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	Training and Demonstration of Agricultural Machines and Technology to farmers and students.	Regular activity of center				

Training organized

S. No	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	Trainings on Processing and Value addition of Millets at Balod.	14.03.2022	13	22	-	35
2.	Trainings on Processing and Value addition of Millets at Krishi Vigyan Kendra, Dhamtari.	15.03.2022	21	7	-	28
3.	Webinar on "Post-Harvest and Value Addition of Farmers' Produce" at College of Food Technology, FAE, IGKV, Raipur.	2-3 June 2022	189	143	103	435
4.	Krishi Vigyan Kendra, Ambagarh Chowki, Dist. Rajnadgaon (Village: Sonsaytola)	Feb 17, 2022	29	16	-	45
5.	Krishi Vigyan Kendra, Ambagarh Chowki, Dist. Rajnadgaon (Village: Koudutola)	Feb 18, 2022	15	32	-	47
6.	Krishi Vigyan Kendra, Rajnandgaon	22.02.2022	4	26	-	30
7.	Krishi Vigyan Kendra, Kanker	24.02.2022	20	21	-	41
8.	Krishi Vigyan Kendra, Balod	28.02.2022	11	19	-	30
9.	Krishi Vigyan Kendra, Dhamtari	04.03.2022	23	25	-	48
10.	Krishi Vigyan Kendra, Bilaspur	09.03.2022	9	35	-	44
11.	Krishi Vigyan Kendra, Bemetara	11.03.2022	10	31	-	41
12.	Krishi Vigyan Kendra, Rajnandgaon	24.03.2022	0	30	-	30
13.	Krishi Vigyan Kendra, Mahasamund	25.03.2022	11	31	-	42
	Total		**355**	**438**	**103**	**896**

Salient achievements of the centre (Jan-Dec 2022)

Publications (Jan-Dec 2022)

1.	Peer reviewed 1. Eswaran, A., Patel, S., Sahu, T., and Sahu, S., (2022). Development, computation of performance and economic evaluation of SPV assisted evaporative cooling vegetable vending cart. The Pharma Innovation Journal.11(7): 429-435 2. Sahu, C., Patel, S., Khokhar, D. and Naik, R. K. (2022) Effect of feed and process variables on nutritional quality of maize-millet-based soy fortified extruded product using response surface methodology. Applied food research.2 (2). https://doi. org/10.1016/j. afres.2022.100139 3. Sahu, C., Patel, S., and Tripathi, A. K. (2022) Effect of extrusion parameters on physical and functional quality of soy protein enriched maize-based extruded snack. Applied Food Research. https://doi. org/10.1016/j. afres.2022.100072. 4. Parganiha, D. Patel, S. Naik, R. K., Khokhar, D., Mishra, N. K., and Pisalkar, P. S. (2022) Puffing characteristics of three test varieties of parboiled milled rice. The Pharma Innovation Journal. 11(3): 1027-1032. 5. Parganiha, D., Patel, S., Naik, R. K., Khokhar, D., Bhandarkar, S. and Sahu, C., (2022). Puffing characteristics of different variety of parboiled rice by using domestic microwave oven. Environment and Ecology.40 (2): 272-278. 6. Nishad, P., Singh, J., Naik, R. K., Patel, S., Mangaraj, S., Mishra, N. and Thakur, R. R. (2022) Design and development of a circular disc type efficient automatic decorticator for Charoli (Buchanania lanzan). J Food Process Preserv. DOI: 10.1111/jfpp.16634 7. Bhagat, A., Pisalkar, P. S., Patel, S., Khokhar, D. and Mishra N. K (2022) Physical properties of coriander (Coriandrum sativum L.) seeds. The Pharma Innovation. 11(9):2447-2449. 8. Saraugi, S. S., Patel, S., Sahu, C., Pisalkar, P. S., Sahu. P. and Khokhar, D. (2022) Moisture sorption characteristics and modelling of babool (Acacia nilotica) gum. Bulletin of the national research centre.46:238. https://doi. org/10.1186/s42269-022-00928-4 9. Saraugi, S. S., Patel, S., Sahu, C., and Khokhar, D. (2022) Study on equilibrium moisture sorption characteristics and modeling of Karaya (Sterculiaurens Roxb.) gum. Bulletin of the national research centre.46:237. https://doi. org/10.1186/s42269-022-00930-w 10. Sahu, S. and Patel, S. (2022) Optimization of extrusion process parameter for development of maize-finger millet-based soy fortified extruded product. Annals of Forest Research. 65(1): 7404-7421. 11. Farzana, W., Patel, S. and Palanimuthu, V. (2022) Effect of processing parameters on puffing quality of Kodo millet (Paspalum scrobiculatum). The Pharma Innovation Journal. 11(3): 1009-1018. 12. Singh, N., Katiyar, P., Ghritlahare, M. K., Pisalkar, P. S., Sahu, P. and Patel, S. (2022). Characterization of three biopolymers extracted from Dhawara (Anogeissus latifolia), Salai (Boswellia serrata Roxb.) and Chironji (Buchanania lanzan Spreng) from Balrampur (North Chhattisgarh Region). The Pharma Innovation Journal Vol. 11(2): 2425-2428. 13. Ghritlahare, M. K., Katiyar, P., Singh, N. and Pisalkar, P. S. (2022). Characterization of physicochemical properties and thermal analysis of Saja (Terminalia tomentosa Roxb. DC) tree gum extracted traditionally and via gum

	enhancers at Mungeli region of Chhattisgarh. The Pharma Innovation Journal Vol. 11(3): 125-128.
2.	**Number of papers published in journals (Nass rating less than 4): 08** 1. Sharma, K. Patel, S. Vishwakarma, R. K., Devi, M. and Jha, S. N. (2022) "Effect of Different Packaging Materials on Storage Period and Popping Behavior of Roasted Makhana Seeds".56th Annual Convention of Indian Society of Agricultural Engineers on Agricultural Engineering Innovation for Global Food Security and International Symposium on India @2047: Agricultural Engineering Perspective.9-11, Nov., at TNAU, Coimbatore, Tamil Nadu. pp-413-414. 2. Suryawanshi O. P., Kahsyap, J., and Sahu P. (2022) "Development of bio-polymer: A substitute of petro-polymer" paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela. 3. Jaiswal A., Suryawanshi, O. P. and S. Patel. (2022) Novel packaging technologies in food industry: an Overview" paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela. 4. Bhagat, A. Pisalkar, P. S. and Patel, S. (2022) "Grinding Characteristics of Coriander (Coriandrum Sativum L.) Seeds" paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela. 5. Khare, N., Khokhar, D., Patel. S. and Mishra, N. K. (2022) "Effect of fermentation on oil extraction from patchouli" paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela. 6. Sahu,P., Pisalkar, P. S. and S. Patel. (2022) "Fortification of Babool (Acacia nilotica) gum" paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela. 7. Sahu, S. and Patel, S. (2022) "Effect of moisture levels on characteristics of Charota (Cassia tora) seeds" paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela. 8. Gosh, S. and Patel, S. Moisture dependent physical properties and nutritional characteristics of little millet (Panicum sumaerense) paper presented in International Conference on Key Enabling Technologies for Sustainable Agri-Food Chain (KETSAC-2022) during Dec 9-11, 2022 at NIIT, Rourkela.
3.	**Number of book chapters: 02** 1. Sharma, K., Vishwakarma, R. K., Patel, S., Jha, S. N. and Devi, M. (2022) Transforming Organic Agri-Produce into Processed Food ProductsPost-COVID-19 Challenges and Opportunities, Organic Production, Postharvest Processing, and Value-Added Intervention of Fox Nuts (Euryale ferox), for Export, CRC press, Taylor and Francis Group, ISBN: 9781774911921 2. Sahu, C., Patel, S. and Khokhar, D. (2022) Moisture Sorption Characteristics with Net-Isosteric Heat Value of Maize-based Soy Protein Fortified Extruded Product. Research Developments in Science and Technology Vol.10
4.	Number of books edited and compiled: **Nil**
5.	Other publications (Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nil**

Awards received by the centres (Jan-Dec 2022): Nos (04)

1	Name and Awarding organisation name:
i.	**Best poster award** to the abstract entitled "A comparative storage study of dried mahua flowers stored in different packaging materials" authored by Sahu, R., **Khokhar, D., Patel, S**. and Soni, R. on occasion of National Science Day-2022 on 28th February, 2022 at College of Agriculture, IGKV, Raipur (Chhattisgarh).
ii.	**Best poster award** to the abstract entitled "Sustainable storage of mahua resource to uplift the socio-economic status of tribals" authored by Sahu, R., **Patel, S. Khokhar, D. and Mishra, N. K.** on occasion of 10th National Seminar on Agriculture and More: Beyond 4.0 and organised by Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar during 26-28 May, 2022.
iii.	**Best poster award** to the abstract entitled "Effect of Different Packaging Materials on Storage Period and Popping Behavior of Roasted Makhana Seeds. " authored by Sharma, K., **Patel, S.,** Vishwakarma, R. K., Devi, M. and Jha, S. N. in the 56th Annual Convention of Indian Society of Agricultural Engineers on Agricultural Engineering Innovation for Global Food Security and International Symposium on India @2047: Agricultural Engineering Perspective.9th-11th, November, 2022 at Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu.

Any other relevant information (Jan-Dec 2022):

- Facility Created-For processing of agricultural commodities at KVK, Raipur, Jagdalpur, Bemetara and BRSMCAET&RS, Mungeli.
- Active participation in Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) scheme in the state.

24. Centre Name: BAU, Ranchi (Jharkhand)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	3	1
2.	Technical	3	3
3.	Administrative	-	-
4.	Supporting	-	-

2. Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	10	8	32.6
2.	Recurring	5.2	3	1.56
3.	Non-recurring	-	-	
	Total		**11**	**34.16**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
1.	Development of car Polish from Karanj oil	PI: Md. I. A. Ansari Co-PI: D. Rajak	April 2022	March 2024
2.	Feasibility Testing of Pea Podder developed by Jabalpur centre	PI: Md. I. A. Ansari Co-PI: D. Rajak	April 2019	March 2024

Details of extensions activities (Jan-Dec 2022)

Kisan melas /Agri-fairs: 1

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	Technology and Machinery Demonstration Mela	PHET, PEASEM, FIM and RES	March 24, 2022	600

Technology demonstration/FLD: 3

S. No.	Venue	Date	Number of participants			
			Male	Female	Student	Total
1.	APC, Department of Agricultural Engineering, BAU, Ranchi	9-9-22	15	13	-	28
2	APC, Department of Agricultural Engineering, BAU, Ranchi	22-9-22	-	-	52	52
3	APC, Department of Agricultural Engineering, BAU, Ranchi	22-10-22	-	-	48	48

Salient achievements of the centre (Jan-Dec 2022): Nil

25. Centre Name: YSPUH&F, Nauni, Solan (Himachal Pradesh)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	4	4
2.	Technical	4	4
3.	Administrative	0	0
4.	Supporting	1	1

Financial Detail (March- Dec, 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	90.0	70.00	72.70
2.	Recurring	9.95	8.30	7.72
3.	Non-recurring	3.00	2.00	2.00
4	Total	**102.95**	**80.30**	**82.42**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
1.	Pilot study on unraveling the functional potential of bioactive ingredients of underutilized Hill Lemon (Citrus pseudo. Limon) to transform the functional value of food	PI: Manisha Kaushal Co-PIs: A. Sharma, R. Sharma, A. Dhiman,A. Gupta	April 2022	March 2024
2	Development of process protocol for extraction of starch from corn by-products	PI: Devina Vaidya Co-PIs: Manisha Kaushal, Anil Gupta	April 2022	March 2024
3.	Utilization of corn silk as a potential substrate for functional enrichment of food	PI: Devina Vaidya Co-PIs: Manisha Kaushal, Anil Gupta	April 2021	March 2023

Technology development and outreach activities (Jan-Dec 2022)

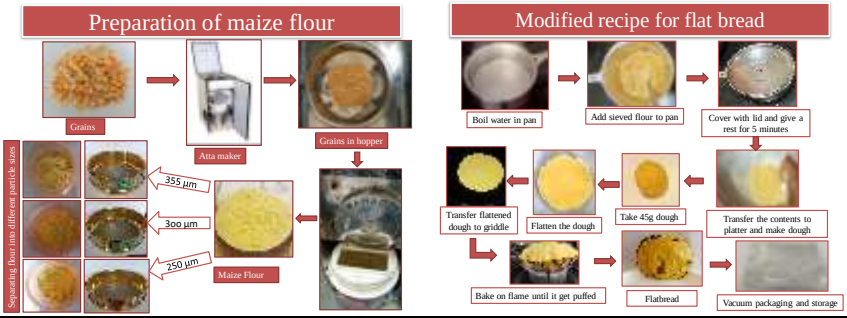
Processes/products /protocol developed (Jan-Dec 2022): Nos ()

Name of the process /products	**Immunity boosting powdersand tablets using fruit powder-herbal ingredients** Fruits powders--- guava and kiwi Herbal ingredients--- mulethi, gloe, pippli Sweetening agents--- sugar, jaggery
Use of the products	Increasing the human immunity especially during these times when people are inclined to more natural alternative to improve their health.
Details of the process/ products	The kiwifruit and guava powder were prepared from their fruit pulps using foam-mat drying technique. Appetizing powderswere developed with two sweetening agents viz sugar and jaggery along with common salt, black salt and green mango powder (amchoor) in different proportions. The appetizing powder combination was then mixed with different proportion of fruit

	powderskiwifruit powder (40-60g) and guava powder (40-65g) individually and was selected on the basis of sensory characteristics. Then herbal powdersLong pepper (38-50 %), Giloy (38-34%) and Mulethi (24-16%) were combined with the selected combination of kiwifruit appetizing powder with sugar and jaggery and guava appetizing powder with sugar and jaggery in different ratio (50-80%). The mixture was then passed through 14 mesh size sieve and oven dried to from granules. The dried granules were compressed using tablet making machine (Khera KI-350) to form tablets weighing 1g each by wet granulation method.
Photographs of the process/ products	
Cost	₹ 55 for plastic bottle containing 6 tablets of 1g each (Empty plastic container cost = ₹ 12.5/piece) ₹ 70 for glass bottles containing 6 tablets of 1g each (Empty glass container cost = ₹ 30/piece)

Name of the products	**Immunity boosting powdersand tablets using vegetable powder-herbal ingredients** vegetable powders--- bittergourd and tomato Herbal ingredients--- mulethi, gloe, pippli Sweetening agents--- sugar, jaggery, stevia
Use of the process/ products	Human consumption as health product
Details of the process/ products	The treatment for tomato appetizing powder with sugar T_6SR_2 containing tomato powder (65%), sugar (15.00%), common salt (7.00%), black salt (6.50%) and green mango powder (amchoor) (6.50%) was selected by the sensory panel. The treatment selected for tomato appetizing powder and jaggery T_5JR_2 containing tomato powder (60.00%), jaggery (26.00%), common salt (5.50%), black salt (3.00%) and green mango powder (amchoor) (5.50%) was selected with highest sensory scores. The treatment for bitter gourd appetizing powder with sugar B_3SR_2 containing bitter gourd powder (50%), sugar (30.00%), common salt (5.50%), black salt (5.50%) and green mango powder (9.90%) was most liked by the sensory panel. The treatment selected for bitter gourd appetizing powder and jaggery B_3JR_2 containing guava powder (50.00%), jaggery (30.00%), common salt (5.07%), black salt (5.07%) and green mango powder (8.60%) was selected with highest sensory scores. Similarly, the treatment for bitter gourd appetizing powder with stevia B_3StR_2 containing guava powder (70%), stevia (0.10%), common salt (8.75%), black salt (8.75%) and green mango powder (amchoor) (12.40%) was most liked by the sensory panel. The treatment consisting of 60.00 per cent tomato appetizing powder with sugar and or jaggery and 40.00 per cent herbal ingredients.

	The bitter gourd appetizing powder with sugar/jaggery/stevia and herbal ingredient consisted of 50.00 per cent bitter gourd appetizing powder and 50.00 per cent herbal ingredients
Cost of the process/ products	Tomato immunity boosting powder with sugar/jaggery -₹ 59 (plastic) and ₹ 82 (glass container) bitter gourd immunity boosting powderswith sugar/ jaggery -₹ 33(plastic) and ₹ 48 (glass containers) With stevia -₹ 27(plastic) and ₹ 42 (glass container).

Name	**Refinement of traditional technology for RTE maize flour Indian bread**
Use of the products	Maize flour-based Indian flatbread that can be easy to prepare at home and using vacuum packaging to give roti/flatbread a reasonable shelf life.
Details of the process/ products	The modified method involved kneading of maize flour by using boiling water (100^{o}C) resulted in ease with which the flatbread can be prepared at home due to increased viscoelastic properties of dough with soft texture, good puffing and pliability of flatbread with minimum cracking. The results thus showed that adding boiling water boosted dough's stability by increasing its amylopectin content, which further increased its capacity to retain water in the dough prepared from modified method than that prepared from conventional method where luke warm water (40^{o}C) was added to knead the dough. Further, vacuum packaging of flatbread provided a reasonable shelf life with minimal changes in flatbread stored under refrigerated conditions for 42 days under vacuum and for 21 days under accelerated storage conditions under vacuum.
Photographs of the process/ products	
Cost of the process/ products	The cost of production of plain flatbread from both varieties (Kanchan and Local) was calculated to be ₹ 4.00 and ₹ 1.00 in vacuum and LDPE pouches respectively.

Adaptive trails (Jan-Dec 2022): Nos (1)

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
1	Pilot Plant for Osmotic Dehydration	SKAUST, Srinagar	The osmotic dehydration pilot plant designed and fabricated by the Solan Centre has been handed over to SKAUST (K) under adaptive trial and the results are awaited.

Machine/Technology Transferred (Jan-Dec 2022): Nos (1)

S. No	Name of machine/technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of technology transferred	Total revenue generated
	Technology for the preservation of Sugarcane Juice	1	Mr Vinod Kumar, 131/1. Village Jatoli, Kankerkhera, Meerut-250 001 (UP)	24-9-2022	₹ 2.0 Lakh

Extensions activities (Jan-Dec 2022) (Nos)

Kisan melas /Agri-fairs: (01)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	**Technology & Machinery Demonstration Mela-2022,** Deptt. of Food Science and Technology	Solan Centre	March 2022 (17/3/2022)	64 + 54=118

Technology demonstration/FLD/ Training organized: Nos (14)

S. No	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	Karganoo, Sirmour	23-2 2022	24	28	-	52
2.	Jangeshu, Kasauli	4-3- 2022	21	31	-	52
3.	Kotinaam, Kasauli	8-3-2022	15	37	-	52
4.	Manjhed, Solan	10-3-2022	17	35	-	52
5.	Salga, Solan	15-3-2022	19	33		52
6.	Bani, Hamirpur	21-22 March, 2022	15	36		51
7.	Pathliar, Hamirpur	23-24 March, 2022	6	47	-	53
8.	Knoh, Hamirpur	25-26 March, 2022	12	39	-	51
9.	Karsai, Hamirpur	28-29 March, 2022	11	39	-	50
10.	Bhomti Panchayat	16 March 2022	42	10	-	52
11.	Sai Panchayat	17 March 2022	7	45	-	52
12.	Man Panchayat	22 March 2022	37	15	-	52
13.	Seri Panchayat	24 March 2022	34	18	-	52
14.	Shamti Panchayat	26 March 2022	32	20	-	52

Salient achievements of the centre (Jan-Dec 2022)

Publications

1.	Peer reviewed 1. Anand A, Kaushal M, Vaidya D, Gupta A, Saini H K, Thakur C, Sharma R, Gautam A, Dileep KC, Rashi, Sharma A and Basnett S.2022. Supercritical fluid extraction as a novel technology for extraction of bioactive compounds: A review. The Pharma Innovation Journal.11(6): 2253-2262 (NAAS rating: 5.23) 2. Patidar S, Vaidya D, Kaushal M, Gupta1 A, Ansari F, Arya P, Chauhan P, Saini H K, Anand A, Sharma R, Gautam A, Thakur C, Dileep KC.2022. A comparative study on nutritional and functional composition of fresh apple pomace and dried apple pomace powder. Agriculture Mechanization in Asia, Africa and Latin America.53(7): 9025-9036 (NAAS rating: 6.17)

	3. Rana, A., Kaushal, M., Vaidya, D., Gupta, A., Verma, A., Gautam, A., & Sharma, R.2022. Nutritional enhancement of fruit bars with omega rich food source fortification. Journal of Food Processing and Preservation, 00, e17258. https://doi. org/10.1111/jfpp.17258 (NAAS Rating: 8.19) 4. Sharma A, Sharma R, Sharma M, Kumar M, Barbhai MD, Lorenzo JM et al. 2022. Carica papaya L. Leaves: Deciphering its antioxidant bioactives, biological activities, innovative products and safety aspects. Oxidative Medicine and Cellular Longevity, 2022 (6): 1-20. (NAAS Rating: 12.54) 5. Suhag R. and Dhiman A.2022. α-tending emulsifiers, microencapsulated improver powder and bakery applications. Journal of Food Science and Technology, pp.1-14. https://doi. org/10.1007/s13197-022-05644-5 (NAAS Score: 8.70) 6. Kaur, S., Samota, M. K., Choudhary, M., Choudhary, M., Pandey, A. K., Sharma, A., & Thakur, J.2022. How do plants defend themselves against pathogens-biochemical mechanisms and genetic interventions. Physiology and Molecular Biology of Plants, 1-20. (NAAS rating: 8.01) 7. Singh, S., Sharma, A., Reddy, R., & Samota, M. K. (2022). Eco-Friendly Processing of Momordica Charantia L. -based Chemical Free Functionally Enriched Nectar and Evaluation of its Nutritional Profile. Bangladesh Journal of Botany, 51(3), 445-453. (NAAS Rating: 6.31) 8. Sharma, S., Shree, B., Sharma, D., Kumar, S., Kumar, V., Sharma, R., & Saini, R. (2022). Vegetable microgreens: The gleam of next generation super foods, their genetic enhancement, health benefits and processing approaches. Food Research International, 111038. (NAAS: 12.48) 9. Sharma, R., Burang, G., Kumar, S., Sharma, Y. P., & Kumar, V. (2022). Optimization of apricot (Prunus armeniaca L.) blended Aloe vera (Aloe barbadensis M.)-based low-calorie beverage functionally enriched with aonla juice (Phyllanthus emblica L.). Journal of Food Science and Technology, 59(5), 2013-2024 (NAAS:8.70) 10. Kumari, M., Kumar, V., Kaur, R., Kumar, S., & Sharma, R. (2022). Process Optimization for the Development of Nutritionally Enhanced Nuggets using Ficus geniculata: A Nutritional Approach. Plant Foods for Human Nutrition, 1-9. (NAAS:9.92) 11. Banga, S., Kumar, V., Kumar, S., Sharma, R., Kaur, R., & Grover, K. (2022). Process optimization for the development of fruit-based diet drink: A low-calorie approach. Journal of Food Processing and Preservation. (NAAS: 8.19) 12. Hamid, Thakur, N. S., Sharma, R., & Thakur, A. (2022). Optimization of lyophilized microencapsulated phenolic extract concentration for enrichment of yoghurt and effect on chemical parameters, bioactive compounds, antioxidant activity and sensory quality under storage. South African Journal of Botany. (NAAS: 8.32) 13. Sharma, R., Thakur, A., Kumar, S., & Kumar, V. (2022). Product Optimization, Storage Quality and Sensory Acceptance of Low Calorie Beverage Developed from Bitter Gourd and Kiwifruit. Brazilian Archives of Biology and Technology, 65. (NAAS:6.80) 14. Hamid, Thakur, N. S., Sharma, R., Sharma, Y. P., Gupta, R. K., Rana, N., & Thakur, A. (2022). Phenolics from underutilized wild pomegranate fruit flavedo: Extraction, quantification, hierarchical clustering, antibacterial properties, HPLC, SEM analysis and FT-IR characterization. South African Journal of Botany, 145, 85-94. (NAAS: 8.32)

	15. Hamid Thakur, N. S., Sharma, R., & Thakur, A. (2021). Stability of mango drink enriched with micro-encapsulated pomegranate peel extract. Indian Journal of Horticulture, 78(03), 330-337. (NAAS: 6.16) 16. Sharma R., Gautam, S., & Hamid, H. (2021). Effect of MAP on shelf-life of broccoli and cabbage grown under natural farming. Indian Journal of Agricultural Sciences 91 (9): 1353-7 (NAAS:6.37)
2.	Number of papers published in journals (Nass rating less than 4): **Nos (01)** 1. Arya P, Devi S, Vaidya D, Kaushal M, Chand S, Sharma R, Devi Diksha.2022. Nutritional and microbial aspect of traditionally fermented milk. Agriculture Letters 3 (2): 35-38
3.	Number of book chapters: **Nos (04)** 1. Thakur C, Kaushal M, Vaidya D, Verma AK and Gupta A.2022. Nanotechnology-based specific and senstitive sensors for food pesticides, pathogens and microbes. In: Advanced Innovative Technologies in Agricultural Engineering for Sustainable Agriculture Volume 4. Akinik Publications, N Delhi, India. 2. Vaidya D, Kaushal M, Gupta A and Anand A.2022. Ozonation of cereals: Impact on nutritional, functional and biological parameters In: Cereal Processing Technologies: impact on nutritional, functional and biological properties. CRC press. Taylor and Francis (In press). 3. Sharma A, Sharma A, Baurai M, Loria N, Dubey N and Tokala VY.2022. Implications of nanotechnology in food packaging. In: Nanotechnology horizons in food process engineering Vol.3: pp.161-206, CRC, Apple Academic Press, USA. 4. Dubey N, Chitranshi S, Dwivedi SK and Sharma A.2022. Post harvest physiology, value chain advancement and nanotechnology in fresh cut fruits and vegetables. In: Nanotechnology horizons in food process engineering Vol.3: pp.99-132, CRC, Apple Academic Press, USA.

Patents

1	Patent filed: Nutrition rich and gluten free pasta and methods of preparation thereof. Devina Vaidya, Manisha Kaushal Anil Gupta and Faruk Ansari. 16/9/22. Patent filing number: **202211052893.** Temp/E-1/60744/2022-DEL

Awards received by the centres (Jan-Dec 2022): Nos (01)

1	**Best Centre Award-** AICRP on PHET Solan Centre bagged the Third Best Centre award of the Year 2021-22 in 37th Annual Workshop of AICRP on PHET during 27-29th Jan 2022 in recognition of outstanding contribution in development of Technologies in Postharvest Engineering and Technology. The team constitutes of Dr. Devina Vaidya (PI), Dr. Manisha Kaushal (Co PI) and Mr Anil Gupta.

Details of Agro-Processing Centre (APC) established (Jan-Dec 2022): Nos (01)

S. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
1.	Mr Vinod Kumar, 131/1. Village Jatoli, Kankerkhera, Meerut-250 001 (UP)	December 2022	Processing of Sugarcane juice	Under establishment

26. Centre Name: SKUAS&T, Srinagar (Jammu & Kashmir)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	03	03
2.	Technical	04	04
3.	Administrative	-	-
4.	Supporting	-	-

Financial Detail (April- Dec, 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	85.00	65.15	65.16
2.	Recurring	10.05	8.02	8.02
3.	Non-recurring	3.00	0.50	0.50
4	Total	**98.08**	**73.68**	**73.68**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
1	Value Chain for Saffron processing	PI: Syed Zameer Hussain Co-PIs: I.A. Zargar, M. Reshi, A. Rouf	March, 2021	March, 2024
2	Value chain for cherry	PI: Syed Zameer Hussain Co-PIs: S.M. Wani, A. Rouf, I.A. Zargar	April, 2021	March, 2024
3	Packaging interventions for quality improvement and shelf-life enhancement of apple	PI: Mushtaq A. Beigh Co-PIs: I.A. Zargar, S.Z. Hussain, S.M. Wani	April, 2021	March, 2024
4	Development of active biodegradable packaging films with oxygen scavenging system for shelf life enhancement of walnut kernels	PI: Sajad M. Wani Co-PI: Syed Zameer Hussain	March, 2021	March, 2023

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (01)

Name of machine	Cherry Grader
Capacity of machine	600 kg/hour
Use of machine	For grading of cherries
Details of machine	**Overall dimensions: Front view**: 3730 × 1700 mm, **Side view (L)**: 1065 × 1700 mm **Weight:** 100 kg, **Power**: 2 HP Motor single phase **Land requirement**: can be operated with a space of (16 × 8) feet **Capacity:** 600 kg/hour **Efficiency:** 96.70%

Photographs	
Cost of machine (₹)	₹ 2.30 Lakh

Processes/products /protocol developed (Jan-Dec 2022): Nos (1)

Name of products	Oxygen scavenging active biodegradable film
Use	For shelf-life extension of walnut kernels
Details	Cherries coated with chitosan containing 1.50% pomegranate peel extract (PPE) demonstrated excellent microbiological qualities in terms of yeast and mould counts. The incorporation of 1.50% PPE into edible chitosan coatings delayed ripening process; physiological weight loss maintained TSS and acidity. Results further indicate edible chitosan with 1.50% PPE can extend shelf-life up to 24 days under refrigerated storage conditions.
Photographs	 **Walnut kernels packed in chitosan films**  **Walnut kernels packed in chitosan and ascorbic films**
Cost	₹ 5 per 100 g package

Adaptive trails (Jan-Dec 2022): Nos (03)

S. No	Name of machine/technology	Name of the Trial place	Result/Inference
01.	Performance evaluation of osmotic dehydration unit developed by Solan Centre for Apricots	Solan Centre	**Proximate composition of final product:** Moisture: 12%; Ash content: 2.86%; Crude fibre: 3.66%; Crude protein: 1.90%; Rehydration ratio: 1.32; Shrinkage: 72.70%; Sensory score: 8

	  		
02.	Performance evaluation of apricot decorticator developed by Solan Centre	Solan Centre	Total quantity of stones crushed: 15 Kg. Total shell weight: 9.90 kg Total kernel weight: 4.88 kg Capacity of decorticator: 100 kg/hr Efficiency of decorticator: 32%
	  **Apricot Stone Decorticator**		
03.	Performance evaluation of the oil expeller developed by Solan Centre for extraction of oil from Apricot Kernels	Solan Centre	Kernel weight: 4.88 kg, oil extraction time: 25 min, oil wt.: 1.750 kg, oil cake wt: 2 kg, Capacity: 9.75 kg/h, Efficiency: 35.41%
	 **Oil Cake**  **Apricot kernel oil**		

Extensions activities (Jan-Dec 2022) Nos (19)
Kisan melas /Agri-fairs: Nos (01)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
01	SKUAST-Kashmir, Shalimar Campus Srinagar J&K	SKUAST-Kashmir	March/2022	3000

Training organized (18)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	Zirhama	7 -11th September, 2022	20	10	-	30
2	Lolab	14-18th September, 2022	0	30	-	30
3	Zirhama	21-25 September, 2022	0	30	-	30
4	Zirhama	21-25 September, 2022	15	15	-	30
5	Lolab	28 September-2nd October, 2022	5	25	-	30
6	Lolab	6-10 October, 2022	5	25	-	30
7	Lolab	11-15 October, 2022	3	27	-	30
8	Zirhama	24-28 October, 2022	7	23	-	30
9	Zirhama	5-12 November, 2022	20	10	-	30
10	Lolab	5-12 November, 2022	0	30	-	30
11	Zirhama	14-21 November, 2022	0	30	-	30
12	Lolab	14-21 November, 2022	5	25	-	30
13	Zirhama	24 Nov. -1st December, 2022	15	15	-	30
14	Lolab	24 Nov. -1st December, 2022	5	25	-	30
15	Zirhama	26 Nov. - 3rd December, 2022	7	23	-	30
16	Lolab	26 Nov. - 3rd December, 2022	3	27	-	30
17	Zirhama	05 -12th December, 2022	0	30	-	30
18	Lolab	05 -12th December, 2022	0	30	-	30

Salient achievements of the centre (Jan-Dec 2022)

Publications

1	Peer reviewed 1. Naseer, B., Naik, H. R., Hussain, S. Z., Qadri, T., Dar, B. N., Amin, T. & Fatima, T. (2022). Development of low glycemic index instant Phirni (pudding) mix-its visco-thermal, morphological and rheological characterization. Scientific Reports, 12(1), 1-15. 2. Bhat, T. A., Hussain, S. Z., Wani, S. M., Rather, M. A., Reshi, M., Naseer, B. & Khalil, A. (2022). The impact of different drying methods on antioxidant activity, polyphenols, vitamin C and rehydration characteristics of Kiwifruit. Food Bioscience, 101821. 3. Hussain, S. Z., Naseer, B., Qadri, T., Reshi, M., Amin, T., & Kanojia, V. (2022). Development and evaluation of continuous inshelled walnut processing system. Journal of Food Process Engineering, e13986. 4. Jan, N., Anjum, S., Wani, S. M., Mir, S. A., Malik, A. R., Wani, S. A., et al. (2022). Influence of Canning and Storage on Physicochemical Properties, Antioxidant Properties, and Bioactive Compounds of Apricot (Prunus armeniaca L.) Wholes, Halves, and Pulp. Frontiers in Nutrition, 9. 5. Rashid, R., Masoodi, F. A., Wani, S. M., Manzoor, S., & Gull, A. (2022). Ultrasound assisted extraction of bioactive compounds from pomegranate peel, their nanoencapsulation and application for improvement in shelf life extension of edible oils. Food Chemistry, 385, 132608. 6. Hussain, S. Z., Naseer, B., Qadri, T., Reshi, M., Amin, T., & Kanojia, V. (2022). Development and evaluation of continuous inshelled walnut processing system. Journal of Food Process Engineering, e13986.
3	Number of book chapters: **Nos (02)**

4	Number of books edited and compiled: **Nos (01)**
5	Other publications (Proceedings, compendiums, Technical bulletins, Newspaper, other Magazine, annual reports other than ACIRP-PHET): **Nos (04)**

Awards received by the centres (Jan-Dec 2022): Nos (02)

1. Dr. Syed Zameer Hussain: High Impact Factor Award by Honourable Vice-Chancellor, SKUAST-Kashmir, Shalimar Srinagar J&K India
2. Dr. Sajad M. Wani: High Impact Factor Award by Honourable Vice-Chancellor, SKUAST-Kashmir, Shalimar Srinagar J&K India
3. Dr. Bazila Naseer: Research Associate, ICMR under mentorship of Dr. Syed Zameer Hussain, PI AICRP on PHET Srinagar Centre
4. Dr. Tashooq Ahmad Bhat: Research Associate, ICMR under mentorship of Dr. Syed Zameer Hussain, PI AICRP on PHET Srinagar Centre
5. Dr. Nusrat Jan: Research Associate, ICMR under mentorship of Dr. Syed Zameer Hussain, PI AICRP on PHET Srinagar Centre

Agro-Processing Centre (APC) Established (Jan-Dec 2022): Nos (02)

S. No.	Name and Full Address of APC established	Date of establishment	Working Area of APC	Budget of APC
01	Nai Disha, Vill Chak Aslam PO Dablehar, Chak Aslam, R. S. Pura Jammu and Kashmir 181111	28-12-2022	16 feet × 16 feet	250000
02	Khushali, Kutub Nizam PO Dablehar, Kutum Nizam, R. S. Pura, Jammu and Kashmir 181111	02-01-2022	14 feet × 14 feet	220000

Entrepreneurship established (Jan-Dec 2022): Nos (01)

Sr. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
01	Syed Mudasir Waltree Foods ADV Road, Moominabad, Anantnag Jammu & Kashmir, 192101	2000 Sq. feet	03-01-2022	2500000

27. Centre Name: KAU, Tavanur (Kerala)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	3	3
2.	Technical	4	4
3.	Administrative	1	1
4.	Supporting	-	-

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	124.27	54.37	51.99
2.	Recurring	12.41	3.09	2.93
3.	Non-recurring	2.67	-	-
4	Total	**139.35**	**57.46**	**54.92**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
1	Development and performance evaluation of cocoa butter extractor	PI: Rajesh G K Co-PIs: Sreeja R, Anjaly M.G.	April-2021	Jan. 2023
2.	Development and performance evaluation of cocoa conching cum tempering machine	PI: Rajesh G K Co-PIs: Sreeja R, Anjaly M.G.	April-2021	Jan. 2023

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (2)

Name of machine	**Cocoa Butter Extractor (screw press)**
Capacity	4 kg/h
Use of machine	To extract high quality cocoa butter from roasted cocoa nibs
Details	The machine consists of feed hopper, barrel, and screw/worm shaft, heating coil, temperature controller, oil outlet and cake outlet. It is operated by 2 hp motor. A heating coil of 2 kWh is inserted inside the barrel to enhance the butter extraction efficiency.
Photographs	  Cocoa butter extractor Control unit
Cost (₹)	₹ 2,03,500/-

Name of machine	**Cocoa conching cum tempering machine**
Capacity	30 kg/Batch
Use of machine	To produce good quality chocolates from cocoa mass (Roasted cocoa nibs, sugar, milk powder, cocoa butter and vanilla essence)
Details of machine	The machine consists of jacketed chamber with stone base, stone rollers, spring loaded scraper assembly, refrigeration system, heating coils, motor and gear box, and variable frequency drive (VFD), water tank, water pump, control panel and vibrating platform. The material selected for the fabrication was stainless steel 304 grade and mild steel. The total volume of grinding chamber is 50 liters which will grind cocoa mass up to 30 kg. The conching as well as the tempering process are performed in the single chamber. The conching and tempering process is performed using two stone grinders at a temperature of 70℃ and 28℃, respectively. The speed of rotation of conching as well as tempering chamber is controlled by Variable Frequency Drive (VFD).
Photographs	 Cocoa conching cum tempering machine
Cost (₹)	₹ 2,24,176/-

Extensions activities (Jan-Dec 2022) Nos (16)

Kisan melas /Agri-fairs: Nos (3)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	KCAET Tavanur	KVK, Tavanur	28th February 2022	100
2.	KCAET Tavanur	AICRP on FIM, Tavanur	17 -18March	150
3.	Tirur	Kerala State Government Action Plan	10th to 16th May 2022	300

Technology demonstration/FLD: Nos (2)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1	KCAET Tavanur	29/06/2022	10	15	10	35
2	Dept. of Olericulture, Thrissur	02/12/2022	-	-	15	15

Training organized: Nos (11)

S. No.	Venue	Date	Number of participants (Farmers)			
			Male	Female	Student	Total
1.	KCAET Tavanur	10-03-2022	12	13	0	25
2.	KCAET Tavanur	29-06-2022	19	7	0	26
3.	KCAET Tavanur	21-07-2022	10	18	0	28

4.	KCAET Tavanur	25-30-07-2022	0	0	25	25
5.	KCAET Tavanur	11-08-2022	3	15		28
6.	KCAET Tavanur	17-29-08-2022	0	0	15	15
7.	KCAET Tavanur	28-09-2022	22	4	0	26
8	KCAET Tavanur	27-10-2022	17	7	0	24
9.	KCAET Tavanur	24-11-2022	15	8	0	23
10	KCAET Tavanur	23-12-2022	9	11	0	20
11	KCAET Tavanur	29-12-2022	0	35	0	35

Salient achievements of the centre (Jan-Dec 2022)

Publications: Details not provided

Entrepreneurship established (Jan-Dec 2022): Nos (3)

Sr. No.	Name and Full Address of Entrepreneur	Date of establishment	Budget of Entrepreneurship
1.	Sindu Thankachan Ashariparambil (H) Sukapuram PO Naduvattam, Malappuram DT, Kerala-679576	07-09-2022	2 Lakh
2.	Mumthas Naushad Maliyekkal house, Annakkanbad, dappal Malappuram DT, Kerala-679576	12-11-2022	3 Lakh
3.	Deepa P V Poomthottathil Sukapuram PO Malappuram DT, Kerala-679576	15-07-2022	5 Lakh

Success stories (Jan-Dec 2022): Nos (1)

	Name of the **of success stories/ name of the beneficiary/ address**
1	A Model Agro-Processing Center was established under AICRP on PHET- SCSP subplan, Tavanur centre. The operational power of the processing unit was handed over to two SHG's- M/s. Swadh Food Products and M/s. Oryza Food Products. Value added products such as steamed rice puttupodi, steamed wheat puttupodi and pathiri podi are produced in this centre and the same has been marketed in nearby shops. Products of this centre gained immense consumer acceptance.   Model Agro Processing Centre, KCAET Tavanur

28. Centre Name: ICAR-CTCRI, Thiruvananthapuram (Kerala)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	2	2
2.	Technical	7	2
3.	Administrative	1	0
4.	Supporting	1	1

Financial Detail (Jan-Dec 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	00	00	00
2.	Recurring	5.20	5.20	4.39
3.	Non-recurring	1.00	1.00	00
	Total	**6.20**	**6.20**	**4.39**

Details of projects

S. No.	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
1.	Development of biodegradable single use plastic sheet and disposable type products from thermoplastic cassava starch	PI: Sajeev M S Co-PI: Krishnakumar T	April 2020	March 2023
2.	Development of Continuous Type Cassava Peeling Machine for Small Scale Processing	PI: T. Krishnakumar Co-PI: M. S. Sajeev	April 2021	March 2023
3.	Development of eco-friendly strategies for the management of stored-product pests of important food crops using CIPHET and CTCRI developed biopesticides	PI: Jayaprakas C A Co-PIs: Harish E.R., Krishnakumar T	April 2020	March 2023

Technology development and outreach activities (Jan-Dec 2022)
Machines/Gadgets tools/ instruments developed: Nos (01)

Name of machine	**Continuous Type Cassava Peeling Machine for Small Scale Processing**
Capacity of machine	**200 kg per hour**
Use of machine	To remove the peel of fresh cassava tubers completely before further processing
Details of machine	The mechanism of peeling of cassava tubers is takes place through a complex system of circular blades, which are self-adjusting and flexible. The developed continuous type cassava peeler has the capacity of peeling completely 500 to 750 cassava tubers per hour (200-250 kg per hour), these roots varying in weight and are 2cm to 10 cm thick. It is easy and safe to operate and requires less power (1HP) only. The spacing between top feeding rollers to bottom receiving roller is around 17 cm. For

	operating the peeler, the minimum length of cassava tuber should be 17 cm. This peeling equipment has the capacity to process cassava tubers ranging from 35 mm to 110 mm diameter. In India, cassava tubers have the average diameter range of 30 to 70 mm only. The overall dimensions of the developed cassava peeler is 0.95 (H) x 0.69 (W) x 0.65 (L) m and total weight of the unit is 75 Kg and requires operating area of 7 m^2.
Photographs	
Cost of machine (₹)	₹ 1 Lakh

Processes/products /protocol developed (Jan-Dec 2022): Nos (02)

Name of the products	**Thermoplastic sheet from cassava starch-bagasse/banana fibre/cassava stem fibre composite**
Use	Thermoplastic sheets can be used for making moulded articles.
Details	Thermoplastic starch sheets were prepared from cassava starch and bagasse/banana fibre/cassava stem fibre
Photographs	
Cost	

Name of the process	**Standardisation of techniques for the absorption biofumigant in chalk and calcium carbonate blocks**
Use	Management of stored product pests by using ICAR-CIPHET and ICAR- CTCRI developed bioformulations
Details	• Developed different absorbent media for the impregnation of biofumigant to manage stored product pests. • Various doses of the above formulations were impregnated in to chalk and calcium carbonate blocks and validated against Tribolium castaneum (red flour beetle) and Sitophilus oryzae (Rice weevil). • Biochemical changes of fumigated products.
Photographs	Chalk impregnated Exposure of the with biofumigant impregnated chalk to pests

		
Cost		

Machine/Technology Transferred (Jan-Dec 2022): Nos (3)

S. No	Name of machine/technology transferred	No of units	Address of farmers/ entrepreneurs/ manufacturers	Date of Technology Transferred	Total revenue generated
	Technology on fried snack foods and fried chips from Tapioca	3	1. Kerala State Co-Operative Federation For Fisheries Development Ltd, Matsyafed, Kamaleswaram, Manacaud P. O., Thiruvananthapuram 2. Chipro Karshaka Swayam Sahaya Sangham Ponkunnam. P. O., Kottayam (Dist) 686506 3 M/s. Uzhavoor Mythri FPC, Marangattupilly, Kottayam	14-01-22 10-04-22 22-12-22	88,500/-

Extensions activities (Jan-Dec 2022) Nos (32)

Kisan melas /Agri-fairs: Nos (02)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	**Trichur**	Department of Agrl, Trichur	Oct, 2022	3000
2	**Kollam**	Parakod Panchayath, Kollam	August, 2022	150

Training organized: Nos (30)

S. No.	Venue	Date	Number of participants			
			Male	Female	Student	Total
1	Techno Incubation Centre, CTCRI		412	350	49	811

Salient achievements of the centre (Jan-Dec 2022)

Publications

Peer reviewed

Chintha, P., Giri, N., Thulasimani, K., Sajeev, M. S., & Safiya, S. (2022). Development of low fat and anthocyanin rich purple sweet potato vacuum fried chips. Journal of Food Science. Journal of Food Science (NAAS rating 9.17). https://doi. org/10.1111/1750-3841.16185.

Number of papers published in journals (Nass rating less than 4): **Nos ()**

Number of book chapters: **Nos (10)**

1. Krishnakumar, T., Sureshkumar, J and Sajeev, MS.2022. Post-Harvest Technology of Tropical Tuber Crops. In. Postharvest Technology of Tropical Fruits and Vegetables (Ed. Surajit Mitra and T. K. Bose). Daya Publishing house, New Delhi, pp.359-384, ISBN:978-93-5461-429-3
2. Krishnakumar, T., Pradeepika, C., Namrata A. Giri., Sajeev, M. S. and Moorthy, S. N.2022. Antioxidant properties and health benefits of tuber crops. In. Antioxidant properties and health benefits of horticultural crops (Ed. Arghya Mani et al.). Brillion publishing, New Delhi, pp.307-338, ISBN:978-93-92725-67-8
3. Prakash P., Jaganathan D., Sheela Immanuel., Sivakumar P. S., Muthuraj R. and Krishnakumar, T.2022. Value chain assessment of Chinese Potato in Tamil Nadu: Challenges and Strategies. In. Sustainable agricultural innovations for resilent agri-food systems (Ed. Rajinder Peshin et al.). Proceedings of the Indian Ecological Society International Conference, The Indian Ecological Society, Ludhiana, India ISBN:978-81-957440-1-5.
4. Krishnakumar, T. and Sajeev, M. S.2022. Pre and post-harvest machineries to strengthen the value chain in tuber crops. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.59-78.
5. Sajeev, M. S., Krishnakumar T., and Pradeepika C.2022. Development of ready-to-eat extruded snacks using tuber crop starch/flour. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.79-90.
6. Krishnakumar, T., Sajeev, M. S. and Pradeepika C.2022. Production methods of starch, sago and wafers from cassava starch. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.105-115.
7. Pradeepika C., Krishnakumar, T. and Sajeev, M. S.2022. Effect of different processing strategies on stability and retention capacity of phenolic compounds present in sweet potato. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.193-196.
8. Sajeev, M. S., Krishnakumar T., and Pradeepika C.2022. Textual quality of tuber crop-based products. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.201-208.

9. Sajeev, M. S., Krishnakumar T., and Pradeepika C.2022. On-farm processing/community level incubation centres for promoting rural entrepreneurship. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.215-219.
10. Krishnakumar, T., Sajeev, M. S. and Pradeepika C.2022. Quality and safety aspects of tuber crop-based products. In: ICAR Short Course on "Novel Processing and Value addition Technologies for Augmenting Entrepreneurial Opportunities in Tuber Crops" held at ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, during 15-24, February, 2022, pp.220-227.

Number of books edited and compiled: **Nos (2)**

1. Ravi V, Paney V,Asha devi, A,Nedunchezhiyan M, Susan John, K, Saravanan, R, Harish ER, Veena SS, Sajeev M S.2022. Taro (COlocasia esculenta (L). Schott): Improvement, production, Protection and Utilisation, ISBN:978-93-5628-668-9, Blue Rose Publishers, New Delhi
2. Krishnakumar T., Sajeev M. S. and Pradeepika C.2022. Training manual on "Novel processing and value addition technologies for augmenting entrepreneurial opportunities in tuber crops", ICAR-CTCRI, 234 p.

Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **Nos (10)**

1. Krishnakumar, T. Jaganathan, D., Muthuraj, R. and Prakash. P.2022. Tenkasi farmers go for high-yielding Chinese potato, The Hindu Newspaper (English), on 10.01.2022
2. Pradeepika, C., Senthishankar, C., Visalakshi Chandra., Krishnakumar, T. and Sajeev, M. S.2022. Probiotic rich frozen yoghurt. Kerala Karshakan (English journal), 10 (03), pp.45-47.
3. Krishnakumar, T., Sajeev, M. S., Jaganathan, D., Muthuraj, R.2022. Chinese Potato Grader, Technical Leaflet, ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram 695 017, Kerala.
4. Krishnakumar, T., Sajeev, M. S. and Pradeepika C.2022. Abstract: Development and performance evaluation of a power operated size-based Chinese Potato grader. In: 56th Annual convention of Indian Society of Agricultural Engineers- Agricultural Engineering innovation for global food security.
5. Sajeev M S, Nandhu R, Krishnakumar T and Pradeepika C.2022. Development of thermoplastic sheet from cassava starch-sugarcane bagasse composites.56th Annual Convention of Agrl. Engineers, 9-11 November 2022, TNAU Coimbatore
6. Prakash P., Jaganathan D., Sheela Immanuel., Sivakumar P. S., Muthuraj R., Krishnakumar, T. and Prabhat Kishore.2022. Abstract: Socio-economic impact of improved variety and production technologies of Chinese Potato in Tamil Nadu. Indian Journal of Agricultural Economics, Vol.77, No.3, July-September 2022.
7. Sheela M. N., Sheela Immanuel., Sajeev M. S., Krishnakumar, T., Muthuraj, R. Jaganathan, D. And Prakash, P.2022. Chinese potato grader set to enhance income of farmers The Hindu Newspaper (English), on 25.03.2022.
8. Sheela M. N., Sheela Immanuel., Sajeev M. S., Krishnakumar, T., Muthuraj, R. Jaganathan, D. and Prakash, P.2022. CTCRI introduces Chinese Potato grader to boost farmer's income. Krishi Jagran magazine (English), on 26.03.2022.
9. Sheela M. N., Sheela Immanuel., Sajeev M. S., Krishnakumar, T., Muthuraj, R. Jaganathan, D. and Prakash, P.2022. Chinese potato grader set to enhance income of farmers Dinamalar Newspaper (Tamil), on 26.03.2022.

10. Sheela M. N., Sheela Immanuel., Sajeev M. S., Krishnakumar, T., Muthuraj, R. Jaganathan, D. and Prakash, P.2022. Chinese Potato grader set to enhance income of farmers ARGENPAPA magazine (English), The potato portal Argentina, on 29.03.2022.

Patents (Jan-Dec 2022): Nos (1)

1	Patents filed Krishnakumar, T., Sajeev, M. S., Pradeepika, C., Muthuraj, R. and Jaganathan, D. Patent application number: 202241043900 A. Title of the invention: A power operated size-based Chinese potato grader and a method of grading thereof

Entrepreneurship established (Jan-Dec 2022): Nos (2)

S. No.	Name and Full Address of Entrepreneur	Working Area of Entrepreneurship	Date of establishment	Budget of Entrepreneurship
1	Chipro Karshaka Swayam Sahaya Sangham (Reg No. V2R/BP/128/2022 dated 07.01.2022 Block Panchayat Vazhoor) Ponkunnam. P. O., Kottayam	Vazhoor, Kottayam	25 Nov. 2022	15 lakhs
2	M/s. Uzhavoor Mythri FPC, Mannackad, Marangattupilly, Kottayam	Manackad, Kottayam	12 Dec. 22	15 lakhs

Any other relevant information (Jan-Dec 2022):

22 off campus training sessions on Value addition and entrepreneurship development in tuber crops were organised at Kerala and Tamil Nadu. Actively involved in one district one product campaign at Trivandrum and Kollam district where cassava and other tuber crops were selected for the scheme. Guidance was given to the FPOs and other NGOs to start cassava-based entrepreneurships. Acted as a Co-Chairman, Agrl Processing session on 9th Nov in 56th Annual Convention of Agrl. Engineers, 9-11 November 2022, TNAU Coimbatore and Chairman of the session on Food waste/Circular economy linked food chain with sustainable upstream and downstream process in the 29th ICFoSt, Indian Convention of Food Scientist and Technologists, 07th January 2023 at Trivandrum. Acted as examiners for Ph D and M Tech viva voce/ qualifying examinations of Agrl Universities.

29. Centre Name: MPUAT, Udaipur (Rajasthan)

Manpower Detail (Jan-Dec 2022)

S. No.	Categories	Sanctioned positions	Filled positions
1.	Scientific	06	01
2.	Technical	08	01
3.	Administrative	01	0
4.	Supporting	0	0

Financial Detail (April- Dec., 2022)

S. No.	Budget head	Budget Estimate, ₹ in Lakh (as per EFC)	Fund released, (₹ in Lakh)	Fund Utilized, (₹ in Lakh)
1.	Salary Head	95.00	83.00	58.84
2.	Recurring	5.95	4.25	2.80
3.	Non-recurring	2.00	2.00	
4	Total	**102.95**	**89.25**	**61.64**

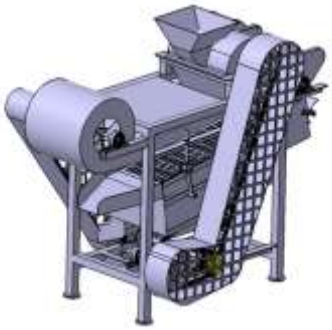
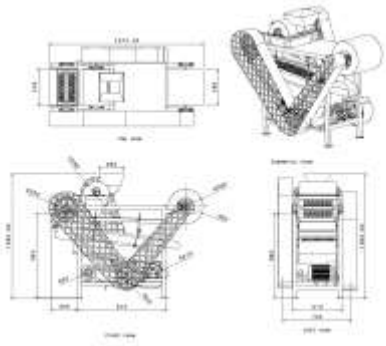
Details of Projects

S. No	Title of the Sub-project/Activity	Name of PI and Co-PI's	Duration)	
			Start	End
	Ongoing projects			
1.	Development of nano formulations from custard apple seed oil (Natural bio-pesticide) for effective storage pest management	PI: Deepak Rajpurohit Co-PIs: D. Jain, Ramesh Babu, N. K. Jain	March 2021	January 2024
2.	Development of a machine for depoding and shelling of green bengal gram	PI: S. K. Jain Co-PIs: N. K. Jain, D. Rajpurohit	March 2021	January 2023

Technology Development and Outreach Activities (Jan-Dec 2022)

Machines/Gadgets Tools/ Instruments Developed: Nos (One)

Name of machine	**Bengal gram de-poder cum sheller**
Capacity of machine	20-25 kg of bengal gram plants per hour and able to produce 5-6 kg of kernels per hour
Use of machine	To strip bengal gram and shell out kernels from pod
Details of machine	A prototype for green bengal gram de-poder cum sheller was developed with 20-25 kg plant/h capacity for de-poding (98% efficiency) and shelling capacity of 5-6 kg kernels/h (90 % efficiency in three passes). A comb with tapered spikes was used for depoding; rotor with helical soft strip along with grated concave-based on friction-abrasion was used for shelling.
Photographs	

 Schematic diagram of bengal gram de-poder cum sheller	 Drawing of bengal gram de-poder cum sheller
Cost of machine (₹)	₹ 60,000/-

Extensions Activities (Jan-Dec 2022): Nos (22)
Kisan Melas /Agri-fairs: Nos (01)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1	"Technology and Agriculture Machinery Demonstration Mela" at CTAE, MPUAT, Udaipur on 11th March, 2022	AICRPs, CTAE, MPUAT, Udaipur	March, 2022	1200

Technology Demonstration/FLD: No. (21)

S. No.	Name of the venue	Organizer name	Month/Year	No. of Participants
1.	CTAE, MPUAT, Udaipur Demonstration to farmers from Neemach	PHET Centre	February, 2022	22
2.	Farmers field at Jhadol Ginger Processing Technology	PHET Centre	March 2022	14
3.	Agro Processing Center (M/s. Sanajiwani Enterprises" Nimbahera, Distt. Chhitorgarh on 29.03.2022	PHET Centre	March 2022	12
4.	Agro Processing Centre (Gwarpatha juice center, Van Surksha Aivam Prabhandhan Samiti, Atatiya, Ogna, Tehsil Jahadol, District Udaipur) on 31.03.2022	PHET Centre	March 2022	14
5.	Custard apple Pulp Processing Center at Jaswantgarh on 1.04.2022	PHET Centre	April 2022	12
6.	CTAE, MPUAT, Udaipur Demonstration of Garlic Bulb breaker, Garlic peeler on 25/04/2022	PHET Centre	April 2022	28
7.	CTAE, MPUAT, Udaipur Demonstration of on Ginger Peeler and Ginger Polisher	PHET Centre	April 2022	28
8.	CTAE, MPUAT, Udaipur Demonstration and making acquaintance with the machinery and methods of	IDP, NAHEP	May 2022	43

	cleaning, processing, drying and grinding of various spices			
9.	CTAE, MPUAT, Udaipur, Demonstration on Processing of Turmeric on 17/05/2022	IDP, NAHEP	May 2022	43
10.	CTAE, MPUAT, Udaipur, Demonstration on value addition of turmeric through grinding on 18/05/2022	IDP, NAHEP	May 2022	43
11.	CTAE, MPUAT, Udaipur Demonstration of Processing of Chilli	IDP, NAHEP	May 2022	43
12.	CTAE, MPUAT, Udaipur, Demonstration and Hands on Training processing and value addition of chilli	IDP, NAHEP	May 2022	43
13.	CTAE, MPUAT, Udaipur, Demonstration of processing and value addition of coriander	IDP, NAHEP	May 2022	43
14.	Madar village Demonstration of Ginger Peeler, Garlic Bulb Breaker and Aloe Vera Gel Extractor machine	PHET Centre	August 2022	55
15.	Pargipada village, Demonstration of Ginger Peeler, Garlic Bulb Breaker and Aloe Vera Gel Extractor machine	PHET Centre	September 2022	21
16.	CTAE, MPUAT, Udaipur Demonstration of various machines and technologies developed	PHET Centre	September 2022	03
17.	CTAE, MPUAT, Udaipur, Demonstration of Ginger peeler, Garlic Bulb Breaker and Aloe Vera Gel Extractor machine	PHET Centre	September 2022	32
18.	CTAE, MPUAT, Udaipur, Demonstration of Ginger peeler, Garlic Bulb Breaker and Aloe Vera Gel extractor machine and various other machines	PHET Centre	September 2022	32
19.	CTAE, MPUAT, Udaipur, Demonstration of Ginger peeler, Garlic Bulb Breaker and Aloe Vera Gel Extractor machine	PHET Centre	October 2022	17
20.	CTAE, MPUAT, Udaipur Demonstration of Ginger peeler, Garlic Bulb Breaker and Aloe Vera Gel Extractor machine	PHET Centre	November 2022	156
21.	CTAE, MPUAT, Udaipur Demonstration of Ginger peeler, Garlic Bulb Breaker, Maize dehusker and sheller, Aloe Vera Gel extractor machine, Custard apple depulper and various other machines developed	PHET Centre	December 2022	104

Salient Achievements of the Centre (Jan-Dec 2022)

Publications

1.	Peer reviewed 1. Kundan, SK Jain and NK Jain (2022) Comparison of drying characteristics of green chilli in tray and heat pump dryer. The Pharma Innovation Journal. 11(7): 1604-1607. (NASS 2022 Rating: 5.23) 2. Gourav, Narendra Kumar Jain and Sanjay Kumar Jain (2022) Study on quality aspects of cryogenic grinding of ginger. The Pharma Innovation Journal Vol. 11(7): 1890-1894. (NASS 2022 Rating: 5.23) 3. Patel Deep, Sanjay Kumar Jain, S S Lakhawat (2022) A Low Cost Storage for Horticulture Commodities for Enhancing Farmer's Income: An Overview on Evaporative Cooling. Journal of Food Process Engineering. DOI: 10.1111/jfpe.14134. (NASS 2022 Rating: 8.36) 4. Jain R, N L Panwar, SK Jain, T Gupta, C Agarwal, S S Meena (2022) Bio-hydrogen production through Dark Fermentation: An Overview. Biomass Conversion and Biorefinery. DOI. org/10.1007/s13399-03282-7. (NASS 2022 Rating: 10.99)
2.	Number of papers published in journals (Nass rating less than 4): **Nos (3)** 1. Jasdeep, Sanjay Kumar Jain (2022) Studies on Drying of Coriander Leaves. International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) Vol.11(7): 9953-9958. DOI: 10.15680/ IJIRSET.2022.1107110. 2. Sajat Badiwal and N. K. Jain (2022) Effect of Temperature in Cryo-grinding on Physio-Chemical Parameters of Turmeric Powder. The International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) Vol.11 (10): 12713-12719. DOI:10.15680/IJIRSET.2022.1110031. 3. Shriyansh Dadheech and N. K. Jain (2022) Effect of Temperature in Cryo-grinding on Physio-Chemical Parameters of Garlic Powder. The International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) Vol.11 (10): DOI:10.15680/IJIRSET.2022.1110031.
	Number of books edited and compiled: **Nos (Two)** 1. Fundamental of Plant Biochemistry and Biotechnology. Dr. SK Khandelwal, Dr. Ajay Sharma, Dr. Devendra Jain, Dr. Deepak Rajpurohit, Dr. Ganesh Rajamani. Pages 144. Himanshu Publications. New Delhi. ISBN No: 978-81-7906-673-7. 2. Padap jaivrasayan aur jaivpradauki kae mool siddhanth. Dr. SK Khandelwal, Dr. Ajay Sharma, Dr. Devendra Jain, Dr. Deepak Rajpurohit, Dr. Ganesh Rajamani. Pages 170. Himanshu Publications. New Delhi. ISBN No: 978-93-94954-34-2.
	Proceedings, compendiums, Technical bulletins, News paper, other Magazine, annual reports other than ACIRP-PHET): **No. (04)** 1. lt; dekj tu (2022 vukt Hk.Mkj.k rdfudh कृf"k çlLdj.k e m|ehrk fodkl. U;s bfM;k ifCyf'kx, tslh, 2. lhek roj rFkk lt; dekj tu (2022 ygsu dk çlLdj.k rFkk mldh mRikn कृf"k çlLdj.k e m|ehrk fodkl U;s bfM;k ifCyf'kx, tslh, 3. lhek roj rFkk lt; dekj tu(2022 gYnh dk çlLdj.k rFkk mRikn कृf"k çlLdj.k e m|ehrk fodkl U;s bfM;k ifCyf'kx, tslh, 4. ,l- d- [kMyoky] vt; 'kek] nowæ tu] nhid jkt iqjkfgr vkj x.k'k jktke.kh ikni tojlk;u vkj toçk|kfxdh dh ey fl)kr. fgek'kq ifCyd'kUl, mn;iqj, uÃ fnYyh-

RPP-I of AICRP on PHET Centres with comments of ICAR-CIPHET (38th Annual Workshop)

1. PDKV, Akola	
S. No.	**Title of the Project/Activity**
1	**Title:** Development of mobile dryer for soybean drying. **Objectives:** 1. To test ICAR-AICRP on PHET PDKV Waste Fired Dryer for drying of soybean 2. To modify and develop mobile dryer for drying of soybean. 3. To evaluate the performance of developed mobile dryer for drying of soybean.
2	**Title:** Adaptive trials of turmeric processing technology developed by other centers of ICAR-AICRP on PHET. **Objective:** 1. To evaluate the performance of mobile turmeric steam boiler for the varieties grown in Maharashtra 2. To popularize ICAR AICRP on PHET turmeric processing technology through training and demonstrations.
3	**Title:** Preparation of Organic Powder to Inhibit Black Mold and Pectinase enzyme Causing Rot in Onion **Objectives:** 1. Preparation of organic powder and evaluation of its effect on shelf life of onions during storage. 2. Evaluation of effect of organic powder on black mold of onion and inhibition of pectinase enzyme synthesis by black mold. 3. Estimation of biochemical parameters after treatment of organic powder on Onions.
4	**Title:** Development of UV-Assisted treatment device for management of pulse beetle *C. chinesis* L. **Objectives :** 1. To find out the effective exposure of UV light on eggs of pulse beetle hatching, reproduction and population growth parameters. 2. To develop the UV Treated Device for management of pulse beetle. 3. To study the economic feasibility of developed treater.
5	**Title:** Preparation of dust formulation of aromatic oils and testing of the bioefficacy against pulse beetle *C. chinesis* L. **Objectives :** 1. Preparation of dust formulation from dal mill by-product powder and aromatic oils. 2. To test the bioefficacy of product against pulse beetle. 3. To study the enzymatic inhibition of dust formulation in pulse bettle.
6	**Title:** Development of Process Protocol for UV-C Irradiation of Custard Apple (*Annona squamosa*) Fruits for Delayed Ripening, Reduced Post Harvest Decay and Reduced Insect Infestation under Storage. **Objectives:** 1. UV-C Irradiation of Custard Apple Fruits using UV-device developed by AICRP on PHET, Dr. PDKV, Akola (MS). 2. Modification in UV-Device to suit to custard apple fruits. 3. Treatment and evaluation of effect of UV-C Irradiation of Custard Apple Fruits for Delayed Ripening, Reduced Post Harvest Decay and Reduced Insect Infestation under Storage.
7	**Title:** Development of Process Protocol for Preparation of Iron, Calcium, Vitamin-A and Zinc Enriched Chocolate Bar from Natural Resources. **Objectives:** 1. Preparation of Vitamin-A, Iron, Calcium, and Zinc Enriched Chocolate Bar (VICZ-Bar).

	2. Study of physical and biochemical properties of VICZ-Bar. 3. Packaging and shelf life study of VICZ-Bar.
8	**Title:** Development of UV-assisted cold storage for storage of Nagpur Mandarins and Chickpea. **Objectives:** 1. To make provision of UV-lamps in cold storage rooms. 2. Comparison of air samples in UV-assisted and plain cold storage rooms for microbial load. 3. Comparison of post harvest decay of Nagpur mandarin fruits in UV-assisted and plain cold storage rooms. 4. Comparison of Insect infestation of Chickpea in UV-assisted and plain cold storage rooms.
2. ICAR-VPKAS, Almora	
1	**Title:** Development and evaluation of Multi-Pulse thresher for Hilly regions **Objectives:** 1. To design and develop a drum and concave suitable for threshing of different pulses hills 2. To evaluate the performance of multi-pulse thresher 3. To evaluate the multi-pulse thresher ergonomically suitable for threshing pulses as compared to manual threshing
2	**Title:** Development and evaluation of composter for digested pine needle **Objectives:** 1. To design and develop a cylindrical and continuous rotating types cylinder for composting of digested pine needle 2. To optimise the parameters suitable for composting of digested pine needle to manure.
3	**Activity Title:** Development and evaluation of hybrid (solar cum electric) type mini oil machine for hilly regions **Objectives:** 1. To design and develop a scaled down version of kachhi ghani suitable for hills house holds 2. To evaluate the performance of hybrid (solar cum electric) type mini oil machine
3. RARS Anakapalle	
1	**Title:** Development of process technology for production of Bio-ethanol from sugarcane juice and bagasse. **Objectives:** (i) Development of prototype unit for the production of bio-ethanol from sugarcane juice and bagasse. (ii) Standardization of process technology for production of bio-ethanol from sugarcane juice and bagasse. (iii) Characterization of bio-ethanol produced from both sugarcane juice and bagasse. **(iv)** Evaluation of sugarcane varieties suitable for bio-ethanol production
2	**Title:** Design and development of boiling pan with automatic stirring cum scum removal equipment to prepare quality jaggery for small scale entrepreneurs. **Objectives:** (i) Design and fabrication of boiling pan with automatic stirring cum scum removal equipment. (ii) Evaluation of stirring cum scum removal equipment during jaggery making. (iii) Quality analysis of jaggery prepared in boiling pan with automatic stirring cum scum removal equipment.
3	**Title:** Design and development of a smart device to check adulteration in solid jaggery. Objectives: (i) To design and development of a smart device for measuring the concentration of So_2 (ppm) in solid jaggery based on laboratory studies. (ii) To evaluate the performance of a smart device to measure the concentration of So_2 (ppm) in solid jaggery. (iii) Techno-economic analysis of a smart device to check adulteration in jaggery.

4	**Title:** Design and development of solar and biomass hybrid jaggery manufacturing unit for production of solid and granular form of jaggery. Objectives: (i) Development of solar energy powdered sugarcane crusher, juice filtration system and biomass gasifier based steam boiling system for boiling of sugarcane juice. (ii) Performance evaluation of solar and biomass hybrid jaggery manufacturing unit for production of solid and granular form of jaggery. (iii) Techno-economic analysis of the above unit.
4. UAS, Bangalore	
1	**Title:** Development of sub-baric processor for conditioning, roasting and popping of millets **Objectives:** 1) Fabrication and testing of sub-baric processor for millets processing 2) Evaluation of effect of mixing and reduced temperature-pressure on roasting, and conditioning & popping quality of millets.
2	**Title:** Development of millet based instant mixes for diversified uses. **Objectives:** 1) Standardization of process techniques for development millet based instant mixes 2) Evaluation of functional, cooking and nutritional qualities of the developed millet based instant mixes 3) Assessment of shelf-life quality of the developed millet based instant mixes
3	**Title:** Conduct of energy audit of dairy and food industry in Karnataka **Objectives:** 1) To conduct survey of energy consumption in dairy plants of Karnataka Milk Federation and food plants 2) To study the energy consumption pattern and evaluation of energy consumed in dairy and food plants 3) To identify points for energy saving from the evaluation report and suggest implementable modifications to become energy efficient
4	**Title:** Development of process technology for designer millet powder RTC mix for traditional, weaning and fast foods. **Objectives:** 1) To study the effect of reduced temperature and pressure on drying, roasting, conditioning and popping of millets 2) Preparation of designer millet powder RTC mix using the millets processed under reduced temperature and pressure 3) Evaluation of shelf-life, nutrition and sensory quality of the designer millet powder RTCmix
5	**Title:** Biochemical interventions to utilize tamarind kernel powder as multi-nutrient source for animal feed. **Objectives:** 1) To standardize the method of preparation of tamarind kernel powder 2) Biochemical interventions to utilize tamarind kernel powder as multinutrient source for animal feed. 3) Assessing the palatability of the animal feed with tamarind kernel powder
6	**Title:** Development of Millet based *Kori Rotti* making machine **Objectives:** 1) Standardization of process protocol for production of *millet based korirotti* in traditional method 2) Design and development of semi-automatic *Kori Rotti* making machine for commercial use 3) Performance evaluation and cost economics of developed machine for commercial production of millet *based korirotti*

7	**Title:** Utilization of fruit waste powder for development of millet based functional foods. **Objectives:** 1) Standardization of process parameters for the development of fruit waste and millet-based functional products 2) Evaluation of functional, sensory and nutritional qualities of the developed products 3) Assessment of shelf-life quality of the developed fruit waste and millet functional products
8	**Title:** Assessment of digestibility and biochemical changes of the processed millet products **Objectives:** 1) To study the in-vitro digestibility of the processed millet products 2) Assessing the biochemical changes in major nutrients after processing of millet products
9	**Title:** Study the effect of processing on gelatinization profile of Nutri-Cereals **Objectives:** 1) Study the gelatinization profile of Nutri-Cereals 2) To study the Effect of Cooking, Boiling, Roasting and Extrusion (Cold and Hot) on gelatinization profile and starch component of Nutri-Cereals
10	**Title:** Rediscovering traditional popped millet products for current life-style. **Objectives:** 1) To develop a suitable process for converting traditional methodologies for current usage 2) To assess the nutritional, functional and organoleptic quality of popped products 3) To evaluate the shelf-life of the products
11	**Title:** Parboiling studies to improve the milling, functional and nutritional properties of Buckwheat **Objectives:** 1) Studies on effect of different hydrothermal treatments on milling properties of buckwheat 2) Studies on effect of different hydrothermal treatments on different functional and nutritional properties of buckwheat 3) Storage studies of hermetically bagged/packed parboiled buckwheat
12	**Title:** Biochemical interventions to utilize tamarind leaves as multi-nutrient source for animal feed **Objectives:** 1) To standardize the method of preparation of tamarind leaf powder 2) Preparation of animal feed with tamarind leaf powder 3) Assessing the palatability of the animal feed with tamarind leaf powder
13	**Title:** Standardization of process protocol for Vacuum concentration and drying for producing millet composite foods **Objectives:** 1) To optimize the processing parameters of vacuum concentration & drying for production of millet composite foods 2) To characterize physico-chemical, nutritional and sensory qualities and study the storage stability of millet composite foods
14	**Title:** Standardization of process protocols for development of value-added tamarind pulp products **Objectives:** 1) Standardization of process protocols for development of RTS juice, tamarind pulp paste and tamarind pulp concentrate 2) Optimization of process parameters for production of tamarind pulp powder using spray drying technology 3) Storage studies of developed value-added tamarind pulp products
15	**Title:** Development of PCM based reusable device for cooling beverages and liquid foods: A novel approach to replace ice in glass. **Objectives:** 1) Fabrication and testing of PCM based reusable device 2) Evaluation of cooling performance of the developed reusable device

5. ANGRAU, Baptala	
1	**Title:** Development of Solar Flat Plate Collector-assisted Dryer for Production of Mango Leather **Objectives:** 1. To develop solar flat plate collector-assisted dryer for mango leather production 2. To evaluate the drying kinetics of the mango leather 3. Quality characterization of the developed mango leather using solar flat plate collector-assisted dryer 4. To study the storage stability of solar flat plate collector-assisted dried mango leather in different packaging materials 5. To estimate the cost economics of the production of solar flat plate collector-assisted dried mango leather
2	**Title:** Development of rapid and cost effective paper-based sucrose detection strips for the authentication of sugar free products **Objectives:** 1. To develop the paper-based strips for the sucrose detection 2. To find the detection level of the strips 3. To study the effect of food composition on the detection level 4. To authenticate locally available sugar free products using the developed strips
3	**Title:** Real-time monitoring of mango juice fermentation process using microbial potentiometric sensors **Objectives:** 1. To determine the mass of inoculum and fermentation completion time using microbial potentiometric sensors 2. To determine appropriate signals from microbial potentiometric sensors indicative of completion of fermentation process 3. To establish correlation between fermentation completion time and mass of inoculum by regression analysis
4	**Title:** Design and development of a dual-competitive lateral flow aptasensor for detection of antibiotic residues in milk **Objectives:** 1. To find the dissociation constants of the aptamer-target molecule complexes. 2. To develop assay using nano gold coated aptamers within the LOD of 5ppb 3. To manufacture the device, developing extraction matrix and validation.
5	**Title:** Design and development of a diabetic friendly cooker which can reduce glycemic index of rice **Objectives:** 1. To study the retrogradation and pasting effects on rice cooking to lower its glycemic index 2. To develop cooker with possible and best retrogradation and pasting effects which can lower glycemic index of rice and its validation.
6. OUAT, Bhubaneswar	
1	**Title:** Development of an aseptic fruit pulp processing unit for micro-entrepreneurs **Objectives:** 1. To develop an aseptic fruit pulp processing unit of 25 kg per batch capacity 2. To study the performance of the unit for processing and storage of selected fruit pulp
2	**Title:** Development of real time on-package freshness indicator for minimally processed vegetables **Objectives:** 1. To standardise the intelligent colourimetric label with incorporation of anthocyanin pigments 2. Application of the intelligent label to assess the storability of minimally processed vegetables

3	**Title:** Development of IoT based sensor device for detection and control of pest and rodents in grain storage structures **Objectives:** 1. To develop IoT based sensor device for detection of pest and rodents in grain storage structures 2. To provide and assess different measures for control of pest and rodents
4	**Title:** Application of carbon dioxide and ozone for safe storage of groundnut pods **Objectives:** 1. To fabricate carbon dioxide and ozone treatment device for application in groundnut pod storage structure 2. To optimize the dose of carbon dioxide and ozone to maintain quality of groundnut for grain and seed purpose
5	**Title:** Development of a solar power assisted multi-millet milling unit **Objectives:** 1. To develop a solar power assisted multi-millet milling unit 2. To test the performance of the developed machine for milling of different millets
6	**Title:** Development of process technology for preparation of meat analogue from oyster mushroom **Objectives:** 1. To optimize the process parameters and ingredients for preparation of oyster mushroom meat analogue 2. To study the storage stability of the developed meat analogue
7	**Title:** Development of rice analogue using different millets **Objectives:** 1. To optimize the process parameters and ingredients for preparation of rice analouge using different millets 2. To study the nutritional and cooking parameters of the developed product
7. TANVASU, Chennai	
1	**Title:** Assessment of heterocyclic aromatic amines in ready to eat chicken meat products **Objectives:** i. To assess the prevalence of heterocyclic aromatic amines in ready to eat chicken meat products. ii. To formulate the basis for standards for heterocyclic aromatic amines in ready to eat chicken meat products.
2	**Title:** Standardisation of a non –destructive method to assess proximate principles of meat by Fourier Transform Near Infra – red Spectroscopy **Objectives:** i. To assess the proximate principles of beef, mutton, pork and chicken meat using Fourier Transform Near Infra – red Spectroscopy.
3	**Title:** Development of millet incorporated chicken meat nuggets **Objectives:** i. To assess the dietary fiber of various millets ii. To develop functional chicken meat products with millets. iii. To determine the shelf-life of the developed functional meat products at refrigeration temperature (4 $\pm$ 1^{o}C).
4	**Title:** Development of a Novel Nano Calcium Fortified Value Added Meat Spread **Objectives:** i. To standardize the procedure for preparation of meat spread from low value meat. ii. To study the effect of nano calcium levels on nutritional, physicochemical and sensory quality of value added meat spread. iii. To assess the shelf life of the developed meat spread stored at refrigeration temperature (4 $\pm$ 1^{o}C).

8. TNAU, Coimbatore	
1	Encapsulation of monolaurin from coconut oil for enhancing its bioavailability
2	Study on Ozone Kinetics for Enhancement of Shelf Life of Guava (*Psidium guajava* .L)
3	Development of process protocol for export potential value-added products from turmeric
4	Development of pulsed magnetic field system for shelf life extension of fruit juices
5	Development of non-destructive quality monitoring system for fruits
6	Design and Development of thresher for grain amaranthus.
7	Microbe mediated decontamination of aflatoxin in farm produce for improving shelf life and quality of the seeds
8	Development of finger millet sprout-based functional fermented beverage using probiotic, prebiotic and synbiotics
9	Standardization of postharvest ripening and value added products in avocado
10	Optimization of process parameters for colour retention of nutmeg mace through radio frequency drying and quality attributes
11	Isolation and characterization of Inulin from wheat bran for the development of functional foods
12	Valorization of Polyphenolic compound from orange peel
13	Herbal Medicine for Dysentery from Cocculus hirsutus (L.) Diels using Post Harvest and Food Engineering Principles
14	Development of machinery for continuous depulping and drying of neem fruit for extraction of Azadirachtin
15	3D food printing of micronutrient enriched millet based functional food
9. HAU, Hisar	
1	**Title:** Evaluation of photochemical treatment in shelf-life enhancement of white button mushrooms. **Objectives:** 1. Optimization of light intensity, exposure time and distance of the light source from sample. 2. Study of the storage and packaging requirements of the treated sample under refrigerated conditions.
2	**Title:** Development and evaluation of millet noodles **Objectives:** 1. Standardisation of process parameters for development of millet noodles. 2. Effect of different treatments on the quality of millet noodles
10. CAU, Imphal	
1	**Title:** Effect of varying parboiling conditions on retention of anthocyanin contents in black scented rice of Manipur. **Objectives** : i) Optimisation of the parboiling parameters to improve the quality characteristics of black scented rice of Manipur. ii) Standardisation of extraction methods of anthocyanin from parboiled rice of black scented rice.
2	**Title:** Evaluation of capsaicin, Ascorbic acid, α-Carotene and ß-Carotene in fresh and process King chilli (*Capsicum chinense* Jacq.) from North East India **Objectives:** i) Standardisation of drying, Pickling and powdering of King chilli from Northeast India **ii)** Estimation of capsaicin, Ascorbic acid, α-Carotene and ß-Carotene in fresh and process King chilli (Capsicum chinense Jacq.) from North East India
3	**Title:** Oligosaccharide profiling from pineapple wastes towards prebiotic potential **Objectives:** i) Extraction of functional Oligosaccharide from pomelo wastes ii) Standardization of process protocol for extraction of functional Oligosaccharides Prebiotic application of Oligosaccharides

11. JNKVV, Jabalpur	
1	**Title:** Development and testing of pneumatic roaster-cum-separator for hot air puffing of chickpea. **Objectives:** 1. Design and fabrication of hot air blower and heating chamber for heating the air up to required puffing temperature and terminal velocity for specific gravity based separation of chickpea. 2. Design and fabrication of roasting chamber for hot air puffing of chickpea and simultaneous separation of puffed chickpea from unpuffed chickpea. 3. Design and fabrication of collection unit for puffed chickpea.
2	**Title:** Design And Fabrication of a Cost-Effective Solar-Powered Portable Minor Millet Milling-Cum-Cleaning Machine. **Objectives:** 1. Design and fabrication of a solar-powered cleaner for Millets. 2. Design and fabrication of a solar-powered dehusker-cum-polisher for Millets. 3. To optimize its efficiency to maximise the capacity for minimum energy consumption.
3	**Title:** Development and testing of device to detect adulteration and microbial spoilage of milk. **Objectives:** 1. To develop an electronic device to monitor the salinity, temperature, pH, dielectric constant, alcohol, acetone and ammonia content in milk. 2. To optimize the indicator criteria to display the adulteration and microbial spoilage of Milk.
4	**Title:** Design and development of green leafy vegetable cutter-cum-shredder to encourage on farm processing. **Objectives:** 1. To design and develop a green leafy vegetable cutter cum shredder 2. Qualitative evaluation of the cut and shredded green vegetables packed in different packaging materials to ascertain the shelf life.
5	**Title:** Production of compressed biogas from waste pea peels and agricultural residues. **Objectives:** 1. Utilization of the waste pea peels and agricultural residues as substrate for the production of compressed biogas. 2. Optimization of the process parameters for the production of compressed biogas.
6	**Title:** Development of Bio-composite film for packaging using agro-waste **Objectives:** 1. Evaluation of agro waste like orange peels, pomegranate peels, garlic peels Onion peels etc. to develop a packaging Film. ***2.*** To taste the strength and other properties of the bio-composite film.
12. AAU Jorhat	
1	Development of wax coating technology from bagasse to increase the shelf-life of jaggery under high moisture Environment.
2	Technology for the production of rice flakes from brown rice
3	Development of Vegan Protein Concentrate (VPC) based product for industrial application in food sector
4	Development of blended botanicals for the control of stored grain insect-pests
13. JAU Junagarh	
1	Development of peanut based extruded product suitable for fasting.
2	Optimization of process parameters for protein extraction from peanut through fermentation
3	Management of insect pest of storage wheat in bin by ozone
14. ICAR-CPCRI, Kasaragod	
1	**Title:** Development and Characterization of Biodegradable Plate from Cocoa Pod Husk **Objectives:**

	1. Optimization of compression machine parameters for the production of biodegradable plate from cocoa pod husk 2. Characterization of developed plates
2	**Title:** Development and Evaluation of Rotary Dryer cum Flavor Coating Machine for Production of Coconut Chips **Objectives:** 1. Development of rotary dryer cum flavor coating machine 2. Optimization of drying temperature and time 3. Quality evaluation of the coconut chips
15. AAU, Khanapara	
1	**Title:** Development of a low cost solar operated mini slaughter cabin for pigs suitable for rural and semi urban areas
2	**Title:** Development of nutraceutical enriched functional meat (Chicken) products incorporating finger millet bran
3	**Title:** Preparation of "Demi glace" from chicken bone - A dark brown mother sauce
4	**Title:** Development of a portable handy meat patty cum samosa making gadget for day to day used
5	**Title:** Technology for Utilization of chicken feather as a substrate for oyster mushroom cultivation
16. IIT Kharagpur	
1	**Title:** Design, development, and performance evaluation of shear-induced structuring device for meat analogue. **Objectives:** i. To design and develop a shear-induced structuring device for meat analogue. ii. To study the performance evaluation of developed device using plant-based proteins. iii. To optimize the process parameters and comparison study with high moisture extrusion.
2	**Title:** Development of X-ray imaging system for sorting and grading of potatoes **Objectives:** i. To develop x ray image acquisition system for detecting the internal defect in potatoes ii. To detect and classify potatoes based on surface defects using CCD camera. iii. To develop an x ray imaging belt conveyor system based on ML and DL algorithm for sorting and grading of potatoes.
3	**Title:** Instrument to quickly detect the presence of heavy metal contaminants in fresh vegetables via non-destructive method **Objectives:** i. To grow vegetables in different heavy metal contaminated soil and determine the quantity of absorbed heavy metal by vegetable ii. To develop a setup to determine and correlate the weight & electrical conductivity of vegetables. iii. To develop a data library for the setup and check for quality control
4	**Title:** Development of the wireless sensor for noninvasive monitoring of food spoilage **Objectives:** i. Study the ethylene production and spoilage kinetics of the selected fruits ii. Fabrication and characterization of gas sensing layer iii. Develop a RFID sensor for sensing the ethylene gas iv. Characterize the RFID sensor response during the food spoilage
5	**Title:** Sustainable valorization of water chestnut (singhara) peel to develop novel food packaging materials: Waste to Wealth approach **Objectives:** i. To valorize water chestnut peel into a sustainable value-added product by extracting different types of nanocellulose

	ii. To optimize the processing conditions for nanocellulose fractions and develop commercial grade active packaging films iii. To study the shelf-life of different fresh produce packed in the developed film pouches
6	**Title:** Development of Sapota seed oil Oleogel and its application in low fat cookies **Objectives:** i. To optimize ultrasound-assisted extraction of oil from Sapota seed. ii. To prepare and investigate the characteristics of oleogels produced from sapota seed and rice bran wax. iii. To develop cookies made with the prepared oleogels as a substitute for commercial fat.
7	**Title:** Alkaline phosphatase activity in pasteurized milk **Objectives:** i. Comparative evaluation against Lovibond comparator method will be evaluated that the HPLC method has an advantage of detecting very low levels of ALP activity and raw milk contamination. ii. The lowest milk droplet diameter will be found out for which colour can be detected
8	**Title:** Design and Mechanization of a continuous Soru Chakli/ pitha making machine unit **Objectives:** i. Design and Mechanizatuion of a continuous Soru Chakli/ pitha making machine unit. ii. Mixing of rice-powder, sugar, maida or suji mixed in a batter. And then fried and steamed upto a temperature. Using Machine learning algorithm to establish control operation for a defined set up temperature and adjustment based on rheological properties of batter. iii. Effect of shear rates and shear stress values for the batter, study of Cumulative wt % vs particle size, effect of steaming on mean particle size also the flow behaviour indices will be studied.
17. RS&JRS Kolhapur	
1	**Title:** Deployment of process technology and equipment to prepare instant soluble jaggery cubes. **Objectives:** 1. To prepare instant soluble jaggery cubes. 2. To design, develop and performance evaluation of equipment for instant soluble jaggery cube. 3. To study the storage stability of prepared instant soluble jaggery cubes.
2	**Title:** Development of automatic machine to prepare customized size jaggery molds. **Objectives:** 1. To design and develop automatic machine to prepare customized size jaggery molds. 2. To optimize process parameters for preparation of customized size jaggery molds. 3. To evaluate performance of developed machine. 4. To study the storage stability of prepared molds.
3	**Title:** Design and development of improved strainer for scum removal during jaggery processing. **Objectives:** 1. To design and develop improved strainer for scum removal during jaggery processing. 2. To study the ergonomics of the developed strainer.
4	**Title:** To Study a supply chain model for the production of jaggery and valued–added products at centralized facility involving conventional jaggery units. **Objectives:** 1. To study the effect of residence time on quality of the clarified sugarcane juice. 2. Preparation of jaggery and value added products from the stored clarified jaggery juice. 3. Survey of traditional jaggery making units in Kolhapur district. 4. To study the storage stability of prepared jaggery and value added products.

18. IISR, Lucknow	
1	**Title:** Deployment of jaggery coating machine for value added products **Objectives** 1) To design and develop a jaggery coating machine. 2) To evaluate the performance of developed jaggery coating machine. 3) To work out the cost economics of developed jaggery coating machine.
19. PAU, Ludhiana	
1	**Title:** Development and evaluation of cold plasma system for Quality Retention of perishables during storage **Objectives:** 1. To design, develop and evaluate a laboratory-scale cold plasma system 2. To optimize the cold plasma process parameters for perishables like mushroom and cut vegetables 3. To study the storage stability and shelf-life of treated produce.
2	**Title:** Development of sensor platform for rapid detection of chemically doctored fruits and vegetables **Objectives:** 1. To survey the vegetable markets in different districts of Punjab for present practices of manipulating surface freshness in fruits and vegetables 2. To evaluate and correlate the hyperspectral imaging technology/dielectric properties combined with machine/deep learning to identify the surface presence of different chemicals in selected fruits and vegetables. 3. To develop a gadget for non-destructive identification for chemically doctored fruits and vegetables
3	**Title:** Development of IoT based Honey Adulteration Detection Analyzer using machine learning **Objectives:** 1. To develop correlation between Physico-chemical and dielectric properties of pure and adulterated honey 2. To develop honey adulteration detection analyzer based on micro-controllers and sensors 3. To develop sensor fusion algorithms for assessment of honey quality 4. To validate the developed honey adulteration detector analyzer
4	**Title:** Development of IoT based biogas flushed automated storage system to manage major insect-pests of mungbean and kabuli chana **Objectives:** 1. To investigate the behavior of biogas on major insect-pests of mungbean and kabuli chana 2. To design and develop the IoT based biogas flushed automated storage system 3. Validation of developed system against major insect-pests of mungbean and kabuli chana
5	**Title:** Development of sustainable packaging for fresh horticultural produce through myco-fabrication of mycelium-lignocellulose biocomposites **Objectives:** 1. Optimization of cultural conditions for development of sustainable packaging material from mycelium-lignocellulose biocomposite 2. Mechanization of the myco-fabrication process for industrial suitability 3. Evaluation of the developed packaging material for storage of fresh horticultural produce.
6	**Title:** Development of process protocol for isolation of leaf protein concentrates from tuber crops **Objectives:** 1. To compare novel techniques for protein extraction and process optimization

	2. To characterize leaves and leaf protein concentrates **3.** To develop process for formulation of protein mix and its storage stability
20. MAFSU, Mumbai	
1	Lateral flow-assay-based rapid detection method for pathogens in foods of animal origin
2	Design and development of poultry scalding cum plucking machine
3	Preparation of pet foods from slaughter house byproduct and spent hen meat
21. Dr. RPCAU, Pusa	
1	**Title:** Development of process technology for preparation of watermelon jaggery **Objectives:** 1 To determine the physico-chemical properties of watermelon flesh and rind juices. 2 To develop the process technology for the preparation of watermelon jaggery. 3 To optimize the processing parameters of developed product.
2	**Title:** Development of low cost storage facility for bulk storage of fruits and vegetables using air conditioner **Objectives:** 1. **To** design and develop a low cost cold room for bulk storage of fruit and vegetables. 2. To evaluate the techno-economic feasibility of the developed cold room for the storage of fruits and vegetables.
3	**Title:** Development of value added products from beetroot including its by-product utilization **Objectives:** 1. Survey of existing practices for post-harvest management and utilization of beetroot 2. To determine the engineering and bio-chemical properties of beetroot 3. Development of process technology for value added products of beetroot
22. UAS, Raichur	
1	**Title: Standardization of pre-treatments for selected millets to enhance milling yield** **Objectives:** 1. To standardize the pre-treatments (IR) for selected millets 2. To develop a suitable pre-treatment unit for millets to enhance the milling yield 3. To evaluate the quality characteristics of processed millets after pre-treatment
2	**Title : Development of low alcoholic beverage (Wort) from selected food commodities** **Objectives:** 1. To standardize the process technology for production of low alcoholic beverages from selected fruits and vegetable 2. To analyse the quality characteristics and shelf life of developed low alcoholic beverage
3	**Title: Development of process technology and equipment for production of black lime and black garlic** **Objectives:** 1. To develop process technology for production of black lime and black garlic 2. To develop suitable equipment for large scale production of black lime and garlic
4	**Title : Development of process technology for production of bread and extruded products from broken rice** **Objectives:** 1. To standardize the process parameters for production of rice and extruded products from broken rice 2. To evaluate the quality characteristics and shelf life of developed products
5	**Title:** Performance evaluation of tamarind de-huller developed by UAS, Bengalore centre
23. IGKVV, Raipur	
1	**Title:** Development of process technology for isolation of major components of essential oil through fractional distillation.

	Objectives: 1. Extraction of essential oil through various distillation methods and chemical profiling of extracted oil. 2. Isolation of major components from extracted essential oil. 3. Evaluation and utilization of isolated compound for value addition.
2	**Title:** Development of value chain for *kusum* (*Schleichera oleosa*) fruits and seeds **Objectives:** 1. Documentation of present status on utilization of *kusum* fruit and seed. 2. Evaluation of physico-chemical properties of *kusum* fruit and seed. 3. Decortication of *kusum* seed and extraction of oil. 4. Characterisation of *kusum* oil for possible value addition and effective utilization.
3	**Title:** Development of process technology for utilization of Babul (*Acacia nilotica*) pod/seed. **Objectives:** 1. Documentation on present status on utilization of babul pod/seed. 2. Evolution of physico-chemical properties of babul pod/seed. 3. Characterisation and development of process technology for the value addition of different fraction of babool seed. 4. Training and demonstration of developed technology.
4	**Title:** Development of process technology for the production of popped paddy from the local varieties of paddy and value addition. **Objectives:** 1. Mechanization of popped paddy (Lai/Khilli) processing technology. 2. Identification of popular varieties of paddy used for the production of popped paddy (Lai/Khilli) and standardization of the process variables 3. Development of value added products from popped paddy (Lai/Khilli) through jaggery coating.
5	**Title:** Development of process technology for enhancement of Vitamin D in Mushroom **Objectives:** 1. Nutritional profiling and evaluation of important phytochemicals and Vitamin D content in edible mushroom. 2. Process standardization for enhancement of Vitamin D in mushroom 3. Scaling up the technology of enhancement of Vitamin D in mushroom.
24. YSPUH&F, Solan	
1	**Title:** Harnessing the nutraceutical potential of ripe pumpkin (*Cucurbita moschata*) and its by-products for developing functional food products **Objectives:** • To utilize ripe pumpkin for developing ready to eat (RTE) food products • To explore pumpkin by-products (peel, seed and fibrous strands) for formulating the nutraceutical and functional food products
2	**Title:** Designing and fabrication of osmo-sonicator dryer: potential applications in processing horticultural commodities **Objectives:** • To design and fabricate lab scale osmo-sonicator dryer • To study the efficacy of the fabricated osmo-sonicator dryer for horticultural produce
3	**Title:** Approaches for incorporation of fruits and its by-products for developing millet based fermented and non-fermented health foods **Objectives:** • To optimize process protocol for production of millet and fruit blended milk analogues and health drinks • To optimize process protocol for millet based protein enriched (apricot press cake protein isolate) energy bars • To optimize process protocol for the development of millet and fruit based low alcoholic malted beverages

4	**Title:** Process protocol for the development of kangra tea and fruit based novel fermented functional foods **Objectives:** • To standardize the process of laphet (fermented tea) and Laphet hnat (fermented tea leaf pickle) from kangra tea leaves • To optimize protocol for the development of apple based herbal kombucha from kangra tea leaves • To study the storage stability of the developed products
5	**Title:** Process protocol for development of beetroot concentrate and valorization of its pomace **Objectives:** • To optimize the parameters for concentration of beet root juice and its utilization in food products • To optimize the parameters for green extraction, encapsulation and utilization of betalains from beetroot pomace • To study the stability of betalains in food products
25. KAU, Tavanur	
1	**Title:** Development of a process protocol for the production of fruit pulp enriched chocolate spread **Objectives:** 1.To standardize a process protocol for the production of fruit based chocolate spread 2. Quality and sensory evaluation of developed chocolate spread 3. Storage studies of developed chocolate spread
2	**Title:** Accelerated aging of cocoa mucilage wine through hydrodynamic cavitation **Objectives:** 1.Development and evaluation of a hydrodynamic cavitation reactor system for the accelerated aging of the low alcoholic cocoa mucilage wine 2. Optimization of process parameters 3.Characterization of accelerated aged cocoa mucilage wine in comparison with fresh and aged wine
3	**Title:** Development and performance evaluation of chocolate filling and enrobing machine **Objective:** 1. Development of a chocolate filling and enrobing machine **2.** Performance evaluation of the developed machine in terms of capacity, efficiency, energy requirement etc.
4	**Title:** Development and performance evaluation of jackfruit seed peeler **Objective:** 1. Determination of engineering properties of jackfruit seed 2. Development of a jackfruit seed peeler 3. Performance evaluation of the developed peeler in terms of capacity, efficiency, energy requirement, mechanical damage etc.
5	**Title:** Production and characterization of Activated Carbon from cocoa bean shell **Objectives:** **1.** To prepare Activated Carbon from Cocoa bean Shell 2. To optimise the Carbonization and Activation process of Cocoa bean Shell 3. Characterization of developed activated carbon
6	**Title :** Ultrasound assisted Extraction of Theobromine from cocoa bean shell **Objectives:** 1. To characterize the physic chemical properties of cocoa bean shell 2. To optimize process parameters for ultrasound assisted extraction of Theobromine **3.** To conduct comparative studies of traditional methods and ultrasound assisted extraction methods of Theobromine from cocoa bean shell in terms of extraction yield and physical chracteristices.

7	**Title:** Development and evaluation of a pneumatic extruder for production of fortified rice noodles (idiyappam) **Objectives:** 1. To develop a pneumatic extruder for production of rice noodles (Idiyappam) 2. Evaluation of the performance of the developed system towards extrusion of fortified rice noodles leading to the optimization of the process parameters
26. CTCRI, Thiruvananthapuram	
1	**Title:** Development of functional rice analogue from cassava based composite flour. **Objectives:** 1. Optimization of cassava based composite flour for the production of rice analogues 2. Estimation of physico-chemical, functional and cooking qualities of the rice analogue from cassava based composite flour 3. Pilot scale production of functional rice analogues using the facilities available at UAS, Raichur 4. Techno-economic analysis of the cassava based functional rice analogue
2	**Title:** Design and development of grader (size and weight based) for sweet potato tubers for high quality chips production. **Objectives:** 1. 1. To determine the physical and mechanical properties of tubers from different sweet potato varieties relevant to the design of sweet potato grader 2. To design and fabrication of the sweet potato grader based on size and weight of the tubers 3. To conduct performance evaluation of the sweet potato grader 4. Techno-economic analysis of the sweet potato grader
27. BAU Ranchi	
1	**Title:** Development of Green Chillies Powder using Heat Pump Dryer **Objectives:** 1. To dehydrate green chillies using heat pump dryer 2. To study the shelf life of developed green chillies powder
28. MPUAT, Udaipur	
1	**Title:** Development of pulp extractor for hard shelled forest fruits