



ICAR- CIPHET

An ISO 9000 Certified Institute in Post-Harvest Management,
Processing and Engineering of Agricultural Produce

For Research, Capacity Building,
HRD, Agro-based Industry &
Start-up support
www.ciphnet.icar.gov.in

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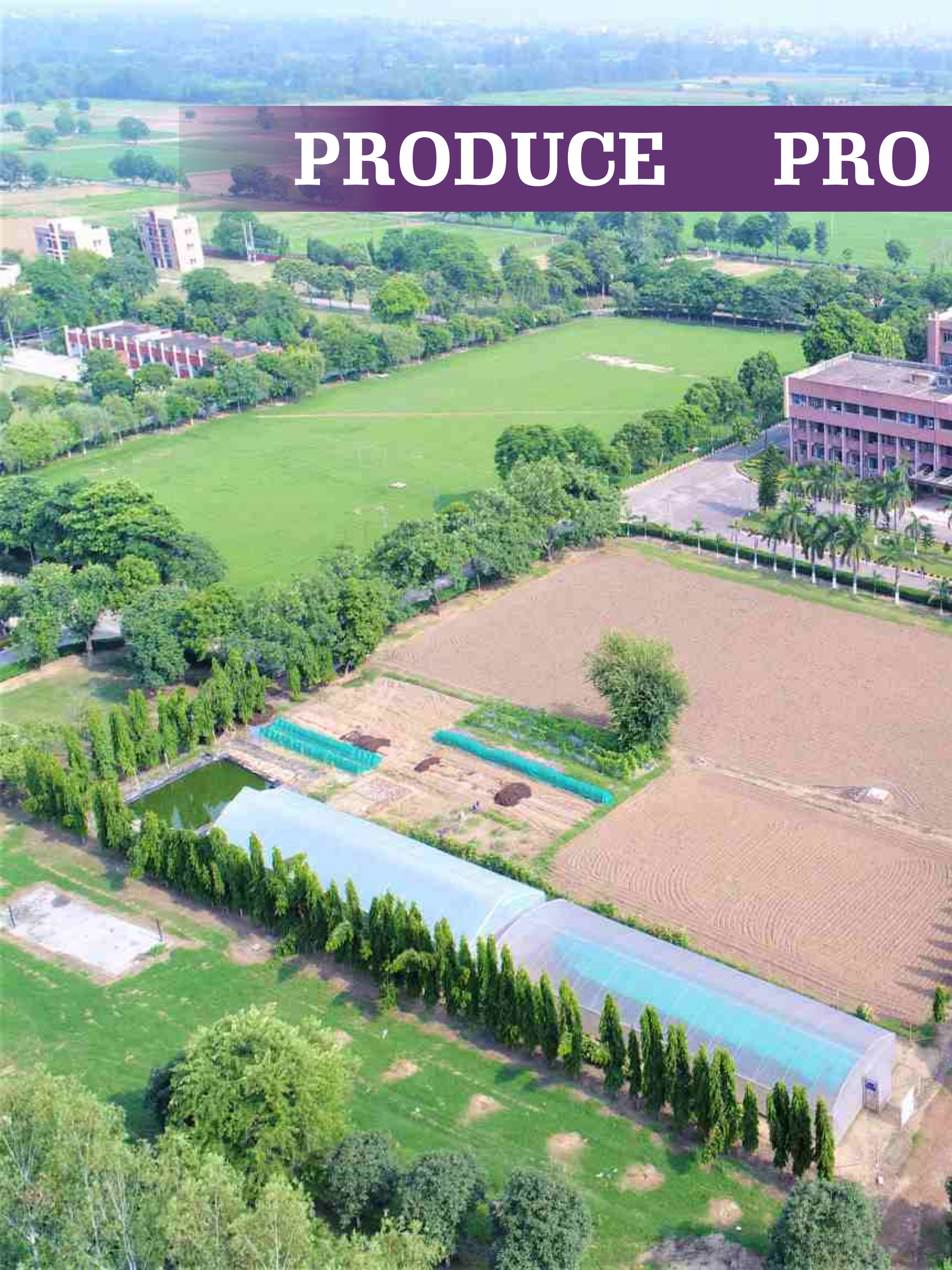
FOREWORD

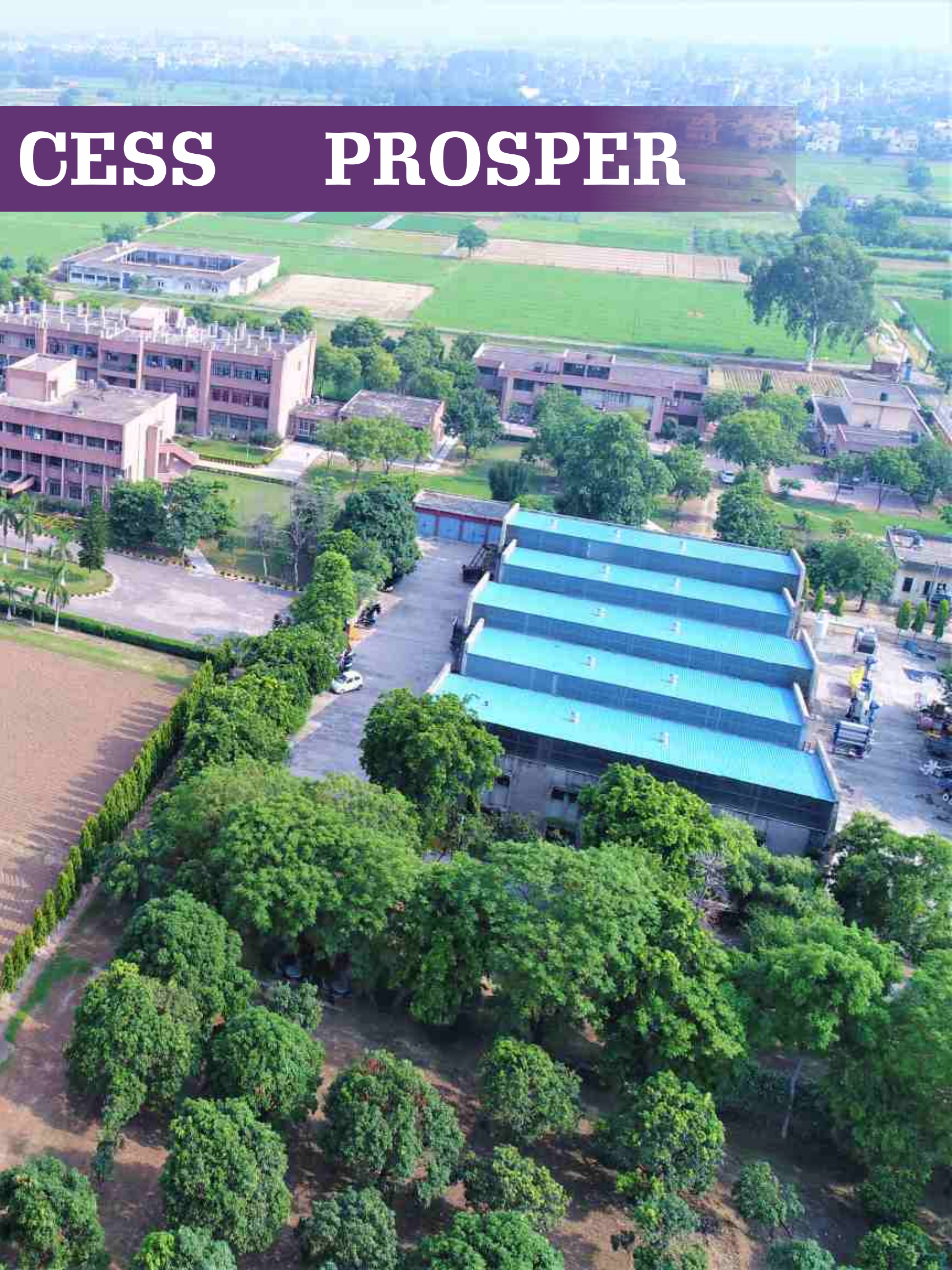


Green Revolution and White Revolution have been a pathbreaking achievements in the history of development in agricultural and allied sciences. Many more such revolutions are also on their way to support the cause of food security and now leading to nutritional security. All such revolutions get a fillip when produced food materials are handled, stored, processed, transported, marketed and utilized with rationality and at minimal post-harvest losses. This is where ICAR-CIPHET plays a pivotal role for finding out the facts and bottlenecks that prevail in post-harvest sector and bring out advisories that can help suitable policy decisions, for identifying the research-gaps for their appropriate solutions, for bringing out new innovative technologies through research and development, for capacity building of stakeholders, for sensitizing the farmers about the opportunities in the food processing sector and so on. The scientists working in the institute are committed to develop technologies, machineries, equipment, tools, appliances, etc. for popularizing farmgate processing all over the country and bring out commercial scale processing machineries for the industries as well. The institute has been functioning for analyzing foods for their inherent qualities as nutritional and medicinal properties and also finding out means to find adulteration in foods. Testing of post-harvest machinery to ensure supply of quality machines is also in the ambit of the institute. The scopes of this institute are wide and varied for finding specific problem-oriented solutions for farmers, rural entrepreneurs, street vendors, various government organizations /or private industries. This booklet is purposed to embody the primary information about the institute for all of our stakeholders as ready reference.

Dr. Nachiket Kotwaliwale
Director, ICAR-CIPHET

PRODUCE PRO





CESS PROSPER

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भाकृअनुप-सीफेट
ICAR-CIPHET

The CIPHET Logo depicts engineering and technological interventions for growth with openness to new ideas protecting perishable and durable agricultural produce and stakeholders

ABOUT ICAR-CIPHET

The Central Institute of Post-Harvest Engineering and Technology (CIPHET) is premiere national institute under Indian Council of Agricultural Research (ICAR), Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers' Welfare, Govt. of India for research and development including HRD in processing, engineering and post-harvest management of commodities of agriculture and its allied sectors in India. It is situated at PAU Campus, Ludhiana, Punjab (India).



Mandate

- Research on post-harvest processing, preservation, storage and value addition of agricultural commodities
- Human resource and entrepreneurship development in post-harvest engineering and technology.

Mission

Creating prosperity through minimization of post-harvest losses, from 15% to 5%, and increase in value addition, from present level of 10% to 30%value addition to produce and by-products from crops, horticulture, livestock and fisheries sectors.

Vision

Higher profitability of agricultural production systems ensuring better income to farmers and increased employment opportunities in rural sector through efficient post-harvest engineering and technological interventions for loss reduction and value addition to agricultural produce and by-products resulting in high quality and safe food and feed at competitive prices for domestic and export markets.

Thrust Area

- Post harvest technologies for loss reduction, value addition technologies for products of plant, animal, fish and microbial origin.
- Improvement of agricultural structures.
- Environment control for reduced losses and higher productivity.
- By product utilization and waste managements.
- Introducing sensors and automation in PHT sector for improved efficiency, economic feasibility and ensuring food quality and safety.
- Technology transfer, entrepreneurship development and marketing.

Genesis

ICAR-Central Institute of Post-Harvest Engineering and Technology (CIPHET) was established on 3rd October 1989 at Ludhiana, Punjab. ICAR-CIPHET is also headquarters for two All India Coordinated Research Projects (AICRPs) viz. AICRP on Post-Harvest Engineering and Technology (PHET) with 30 Centres and AICRP on Plastic Engineering in Agriculture Structure and Environment Management (PEASEM) with 14 Centres.

THE CAMPUSES

Ludhiana Campus

The Ludhiana Campus is the Head Office of the institute and it houses four Divisions including Agricultural Structure and Environmental Control, Food Grains and Oilseeds Processing, Automation and Sensor Technology and Transfer of Technology Division.



Abohar Campus

The institute's second campus was established on 19 March 1993 at Abohar, Punjab, India. It has been primarily responsible for conducting research and development activities on fruits, vegetables, and commercial horticultural crops. The Horticultural Crop Processing Division is designated as the Regional Station of ICAR-CIPHET on 24th January 2023 to address post-harvest issues of arid regions. This campus also houses the Krishi Vigyan Kendra (KVK) of Fazilka District of Punjab which operates under administrative control of ICAR-CIPHET, Ludhiana.



DIVISIONS

Agricultural Structure and Environment Control (AS&EC)

AS&EC is a major division that takes up research activities on different issues including application of nanotechnology in storage; Intelligent and appropriate packaging to fresh, minimally processed and value added food products from different sources; Encapsulation of high value agro produce; Transport simulation; Biofuel; Environmental control measures for commodity storage and housing of livestock, poultry and aquaculture production; and Techniques for detoxification application of bio waste in development of packaging materials, etc.

Automation And Sensor Technology (AST)

The division is mandated for automation of post-harvest unit operations for better control, higher efficiency, viable economics and development of devices and protocols for sensor-based quality assessment to ensure food safety. This is being addressed through the thrust areas such as automation & sensor enabling of machines already developed; Adaptation of technologies for indigenization; Automated controls for storage and animal housing; Robotics, IOT & block chains; and Sensing for food quality and safety.

Food Grains and Oilseeds Processing (FG&OP)

This division takes up research in post-production sector of cereals, pulses and oilseeds. The major thrust areas of the division include Development of machines and protocols for post-harvest management and processing of food grains, oilseeds, pulses and pseudo cereals; Application of frontier technologies in the post-harvest processing and value addition; Extraction technologies for high value compounds from agri-residues and agro-processing by-products; Management of grain storage insects/ pests; Development of innovative products to ensure nutritional security. Besides this, the division has pilot plants for millet processing and oil milling.



Horticultural Crop Processing (HCP)

The HCP Division is located at the Regional Station of ICAR-CIPHET at Abohar. This division is primarily engaged in development of post-harvest package for longer shelf life and long-distance transport of selected fruits, cut vegetables and cut flowers; Methods for conservation of nutrients, flavour and texture through appropriate processing and leading to value added products from fruits & vegetables; Development of dryers for drying of high value crops; Training and capacity building of various stakeholders. Further this division also undertakes activities for Development of environment control system for surface covered cultivation and standardization of poly-house design for different agro-ecological environment; Development of low cost equipment for water and nutrients management through micro-irrigation system in the poly-house.

Transfer of Technology (TOT)

The division undertakes activities related to technology as well as knowledge transfer by means of organizing training programmes for farmers, students, government officials and different stakeholders; Technology demonstration through business meets and exhibitions/ Kisan mela/ visiting rural sector, etc.; Facilitating visits of different stakeholders; Publications of Newsletter/ Technology leaflets/Training Manuals; Feeding to print and electronic media. The division is supported by units such as i] Institute Technology Management Unit (ITMU) ii] Agri-Business Incubation (ABI) iii] Agro-Processing Centre (APC).



ALL INDIA COORDINATED RESEARCH PROJECTS (AICRPs)

AICRP on Post-harvest Engineering and Technology (PHET)

The All India Coordinated Research Project on Post-Harvest Engineering & Technology was launched by the ICAR, in September 1972. The project is mandated to develop location and crop/commodity specific post-harvest technologies for minimization of quantitative and qualitative losses to produce of 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 (APCs), and to assess, refine and transfer proven technologies. The project operates at 30 centres spread in different parts of the country and located in State Agricultural Universities, Central Agricultural Universities, and ICAR institutes. Currently, there are 30 centres covering majority of states and the agro-climatic zones of India.



Locations of Coordinating Units and Cooperating Centres of AICRP on PHET

AICRP on Plastic Engineering in Agriculture Structure and Environment Management (PEASEM)

Earlier known as AICRP on Plasticulture Engineering and Technology (PET), this project came into being in the year 1988. At present this project is operative at 14 centers including six ICAR Institutes, seven SAUs and one CAU. The project is mandated to develop region specific agriculture structures including irrigation structures, storage structures, animal housing and handling systems, region specific protected cultivation and aquaculture structures and transport and packaging systems for perishable food commodities using plastics.



Locations of Coordinating Unit and Cooperating Centres of AICRP on PEASEM

Consortium Research Project (CRP) on Secondary Agriculture

CRP on Secondary Agriculture was initiated in 2015. The project aimed to utilize the whole biomass generated from agricultural production and by-products of agro industries. To develop specific methods of processing and value addition for these by-products, it works with objectives of maximizing the income and minimizing wastage. The long-term objective of the project is to achieve better quality of lives of food industry workers and ensure a cleaner environment around. This project operates in 5 centres including ICAR-CIPHET, Ludhiana (2 sub-projects), Tamil Nadu Agricultural University, Kumtur, NRC-Makhana, Darbhanga, ICAR-NISA, Ranchi and Indira Gandhi Krishi Vishwavidyalaya, Raipur.

KRISHI VIGYAN KENDRA (KVK)

The Krishi Vigyan Kendra is located at Abohar, District Fazilka for speedy technology transfer to the farmer's fields. The operational area of this Krishi Vigyan Kendra comes under the South - Western Punjab at District Fazilka that shares border with Haryana, Rajasthan and international border with Pakistan. This KVK serves as resource institute for recent advances in agriculture for bridging the gap between technology generation and its successful transfer through On-Farm trials, Frontline Demonstrations and other mass contact methods like Field days, Kisan Melas, Kisan Goshthis, special lectures etc. The KVK at Abohar gives special emphasis to post-harvest operations at farmgate in order to reduce losses and add value to the farm produce.



INFRASTRUCTURE/ FACILITIES



Engineering Workshop
There are two Engineering Workshops, one each in Ludhiana and Abohar campus. They are well equipped with modern machineries for fabrication of machines prototypes, their testing and refinement.



Library
The ICAR-CIPHET Library has a wide range of books, journals and e-information covering subjects in all fields such as Agricultural Engineering, Post-Harvest technology, Food Sciences, Information Technology, Computer Science, Processing and Product Development etc. Also there are books, journals and magazines related to mandate of institute, contemporary literature, current affairs, and administrative knowledge. The library subscribes to many research periodicals and journals related to science and technology through physical as well as on-line mode.



Guest House
ICAR-CIPHET has one Guest House located in the Ludhiana campus and one at its Abohar campus. Both these guest houses have double bedded (air conditioned/ air-cooled) rooms, dormitories and in-house dining facility, internet and WiFi facilities sufficient to support the training and capacity building programmes of the institute and some other official activities.

SERVICES

Research and Development

- Agricultural Structures
- Environment Management
- Automation and Sensor Technology
- Drudgery Reduction through Machine and Tool
- Machinery and protocols for primary processing, storage, packaging and product development:
 - ✓Cereals and other Food Grains
 - ✓Oilseed and Pulses
 - ✓Horticultural Product
 - ✓Fisheries Product
 - ✓Livestock Product
- Development of test codes and specifications for variety of food products and agro-processing machineries.

Policy Related Studies and Surveys

- Post-harvest losses
- Handling, procurement and storage protocols
- Quality assurance in agricultural commodities
- Mechanization of post-harvest sector
- Impact and auditing of certain initiatives affecting the post-harvest sector

Food Testing Laboratory (NABL accredited)

NABL accredited Food Testing Laboratory is a facility located in the Ludhiana campus which serves to analyse any food material, raw materials used for food processing, processed foods, food additives, condiments, etc. to provide authentic nutritional information about the concerned material/food. This laboratory helps farmers, students, entrepreneurs and food processors to get their product/material tested at an affordable cost. It is equipped with highly sophisticated equipment including AAS, HPCL, GC, etc.



Post-harvest Machinery and Equipment Testing Centre (PHMETC)

PHMETC is a centre, authorized by the Govt. of India, to ensure the supply of quality agricultural post-harvest machinery and equipment to the end-users through rigorous testing and certification. This centre is well equipped with modern precision measuring instruments and equipment for machine and material testing. The manufacturers of processing machineries mandatorily need to get their machineries tested and certified before supplying these to the beneficiaries of government sponsored programmes.

Agri-business Incubation Centre (ABIC)

ABIC, at Ludhiana campus, operates with an objective to promote setting up of agri-business enterprises based on ICAR-CIPHET developed technologies/facilities. This centre extends business incubation support to the interested and potential entrepreneurs/organizations [SHG/FPO/NGO etc.] for initiating a start-up, entrepreneurship, and business. The support is provided through assistance in the form of novel technology guidance, leasing out of institute Incubation facilities and hand-holding of the incubates. This support assists the incubates to develop their skill, self-reliance and confidence in doing business and thus to overcome the risks of anticipated initial loss in a new enterprise. Eventually, ABIC facilitates a novice entrepreneur to setup his/her enterprise successfully in the market.

Agro Processing Centre (APC)

APC is processing centre located at Ludhiana campus with its primary aim to serve as a model facility for primary and secondary processing of different agricultural produces under single roof, that can be established in rural areas for farm gate processing. This centre has basic agro-processing machineries (primary and secondary processing) for demonstration and promotion of farmgate processing. The facility is frequently used for the practical and live demonstration of basic unit operations in primary and secondary processing of different agricultural commodities during training and skill development programmes for farmers, entrepreneurs, students and government officials and related stakeholders, etc.



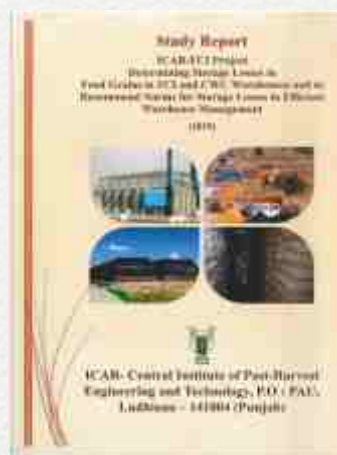
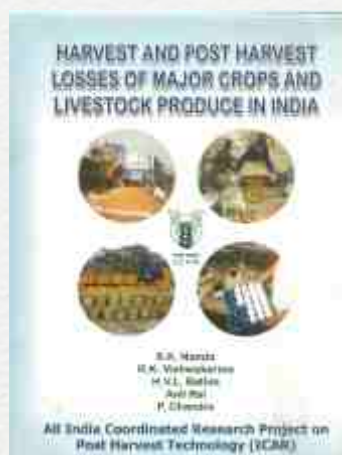
HUMAN RESOURCE DEVELOPMENT

- ✦ **Training of farmers & entrepreneurs:** ICAR-CIPHET regularly organizes trainings for farmers and entrepreneurs on different aspects of post-harvest management of agricultural produces and produces of allied sectors including fisheries and livestock. Entrepreneurship Development Programme (EDP) and sponsored training programmes (Government initiatives) are the two major platforms which have been encouraging farmers and youths to take up processing and value addition for income and employment generation.
- ✦ **Training of students:** Under-graduate to doctoral degree pursuant are trained under the attachment training programmes or research related skill development activities. Students from different SAUs, CAUs and private universities are attached to different divisions for the training and such trainings are accepted on request from the concerned university authorities only.
- ✦ **Training of staff/ faculty:** Sponsored refresher courses including ICAR winter school and summer school are conducted for teachers and scientists from different organizations at various times.
- ✦ **Training of extension functionaries:** Various in-house and on-site activities are conducted for creating awareness among extension functionaries about post-harvest issues, technologies and possible solutions.
- ✦ **Skill Development and Outreach**
 - ✓ Beneficiaries through Transfer of Technology
 - ✓ Entrepreneurship Development Programme
 - ✓ Specialized training on specific technology
 - ✓ Hand holding through providing business incubation facility
 - ✓ Collaboration with Industries and Institutions through network projects and MoUs
 - ✓ Farmers' First Programme



CONTRIBUTION TO NATIONAL POLICIES

- ✦ ICAR-CIPHET conducted two detailed studies for estimating the post-harvest losses in different commodities of agriculture and its allied sectors on pan India basis in 2012 and 2015. The results of these studies became the eye openers of the policy makers. A subsequent study by NABCON in 2022 was conducted following the same statistical method as ICAR-CIPHET followed and a reduction in loss in monetary term to be more than ₹ 20,000 crore was recorded.
- ✦ Norms for efficient warehouse management and determination of Food grain storage losses in FCI and CWC warehouses. Resulting in about ₹540 crores annually saving to FCI, due to adoption of the recommended protocols.
- ✦ Protocols for shelf life, safe storage, milling outturn and indicative norms for procurement of major pulses.
- ✦ Technical backup to 30 food testing laboratories funded by Ministry of food processing industries.
- ✦ Pilot scale facility and related protocol development for treatment of grapes before export.
- ✦ Evaluation and validation of specifications of an X-ray based facility employed for export of gherkins.



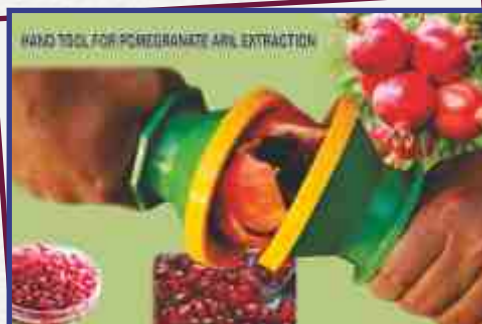
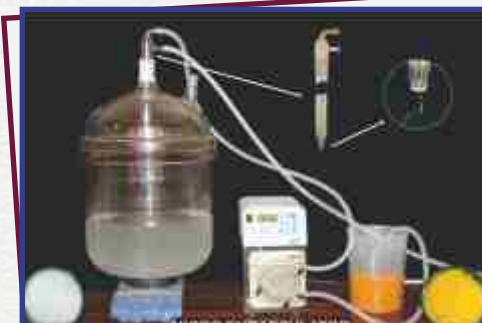
SIGNIFICANT ACHIEVEMENTS

Indicator	Since Inception of Institute till 2023
Technologies developed	99
Technology commercialized	62
No. of licensees	162
Patent filed	64
Patent granted	29

SALIENT TECHNOLOGIES

Machinery/Equipment

- ✦ CIPHET-Cryogenic spice grinding system
- ✦ Indigenous Pilot Plant for Production of Protein Isolates /Concentrate from De-oiled Cakes/Meals
- ✦ Mechanized System for popping and decortications of Makhana seeds (*Gorgon Nut, Euryale ferox*)
- ✦ Mechanized system for primary roasting of raw makhana seeds and process thereof
- ✦ Popped makhana grader
- ✦ Autoclavable microencapsulation system with multi stage break up two fluid nozzle for clean production of microcapsules
- ✦ Cool tower for production of microcapsules from high melting fats and waxes
- ✦ CIPHET- Banana-comb Cutter
- ✦ Microencapsulator with multiple air jet droplet generator for production of microcapsule
- ✦ Evaporative cooled room (2 ton)
- ✦ Indigenous meat forming machine
- ✦ High-volume low-speed (HVLS) fan
- ✦ Live fish carrier system and method of transportation of live fish therein
- ✦ Fish descaling hand tool (Two side bristled)
- ✦ Fish dressing cum waste collection system
- ✦ Taro peeling machine
- ✦ Wadi making machine
- ✦ Automatic Custard Apple Pulper
- ✦ Automatic Litchi Peeler
- ✦ CIPHET-Aonla pricking machine
- ✦ CIPHET-Aonla pricking machine
- ✦ CIPHET-Aonla grader
- ✦ CIPHET-Aonla shredder



- ✦ CIPHET-Pomegranate Aril Extractor
- ✦ Hand Tool for Easy Separation of Arils from Pomegranate
- ✦ Mechanized system for removing stalks of dry red chillies (*Capsicum annum* L.)
- ✦ Refractive window drying machine for manufacturing of fruit bars
- ✦ Solar operated phase change materials based fruits-vegetables vending push cart



Products and Processes

- ✦ Jamun bar preparation process
- ✦ Microbial method for production of protein isolate/concentrate from oilseed cakes/meals
- ✦ Process for Quality Protein Maize based gluten free muffins
- ✦ Process of sprouted cereals and pulses based nutritious pasta
- ✦ Process for preparation of Fat Free Flavoured Makhana
- ✦ Process for preparation of rose petal jam
- ✦ Process for preparation of nutritious multigrain chapatti flour
- ✦ A process of separating a compound containing allyl isothiocyanate from mustard seed (Bioinsecticide from mustard seed)
- ✦ Ready to constitute makhana kheer mix
- ✦ Dried onion flakes and powder
- ✦ Low fat meat emulsion and process for making the same
- ✦ Process for preparation of alcoholic beverage with nutraceutical properties from Kinnow peels
- ✦ Method of determining maturity of intact mango on tree



- ✦ Method of predicting maturity stage and eating quality of Indian mangoes using Near Infrared Spectroscopy
- ✦ Minimal processing of vegetables
- ✦ Process for producing low-fat, high-fibre processed meat products using food industry by-products
- ✦ Production of dried ginger flakes, powder and paste
- ✦ Production of microencapsulated herbal medicinal extracts
- ✦ Modified Atmospheric Packaging of different vegetables
- ✦ Shrink wrap packaging of fruits and vegetables
- ✦ Novel process for preparation of soft aonla candy



Value Added Food Products

- ✦ Groundnut based flavoured beverage, curd and paneer
- ✦ Gluten free barnyard muffins
- ✦ Pearl millet based extrudates, pasta and weaning mix
- ✦ Pearl millet based ready to reconstitute *upma* and *halwa*
- ✦ Green chilli puree and powder
- ✦ Encapsulated curcumin in microcapsules for use as food ingredient
- ✦ Blended guava leather/bar
- ✦ Strawberry fruit leather technology (Strawberry Fruit Barfi)



PILOT PLANTS AND INCUBATION FACILITIES

Ludhiana Campus

- ✦ Makhana Processing
- ✦ Groundnut Milk Processing
- ✦ Tomato Processing
- ✦ Rice Mill
- ✦ Dal Mill
- ✦ Chilli Processing
- ✦ Millet Processing



Abohar Campus

- ✦ Amla Processing
- ✦ Kinnow Grading and Waxing
- ✦ Cotton Ginning
- ✦ Grains Cleaning and Grading





ICAR-CIPHET Team as on 27 September 2023



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