

India's Innovation Wing: Fruit and Vegetable Technology Department, CFTRI, Mysore

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SUMMARY

The Fruit and Vegetable Technology Department at CFTRI, Mysore, is a shining example of India's commitment to food technology and research. The department's relentless efforts have paved the way for sustainable food practices, reduced food waste, and improved the nation's nutritional security. Through ongoing research and cooperation, it continues to play a critical role in defining the future of fruit and vegetable processing and contributing to the broader evolution of India's agricultural and food industries.

INTRODUCTION

Post-harvest losses continue to be a major source of worry, jeopardizing food security, economic sustainability, and environmental conservation. In a world grappling with the paradox of hunger amid abundance, post-harvest losses emerge as a critical issue that requires immediate action. Despite significant gains in agricultural production, a significant portion of the world's food supply is lost or wasted during the post-harvest period. The Central Food Technological Research Institute (CFTRI), situated in Mysore, India, has taken on this severe task. The CFTRI is well-known for its foresight in food technology and research. One of its feature departments is the Fruit and Vegetable Technology Department, which plays a crucial role in enhancing the knowledge, inventiveness, and sustainability of fruit and vegetable processing. This article delves into the significance, objectives and accomplishments of the CFTRI's Fruit and Vegetable Technology Department and its distinguished ways of addressing post harvest losses.

Status of post harvest losses of fruits and vegetables in India:

The size of post-harvest losses vary according to geography, commodity, and supply chain. Globally, approximately one-third of all food produced for human consumption is lost or wasted, with the problem being exacerbated in poor countries due to limited infrastructure, technology, and market access. Inadequate storage facilities, transportation challenges, a lack of correct handling practices, insect and disease infestations, and market inefficiencies all contribute to post-harvest losses. Climate change and extreme weather events can exacerbate losses by impacting crop quality and storage conditions. Post-harvest losses have enormous economic implications, resulting in financial losses for farmers, poorer income for the entire value chain, and higher food prices for consumers. According to the Ministry of Agriculture and Farmers Welfare (MoAFW), post-harvest losses of fruits and vegetables in India totaled INR 31,486 crore this year. The Sustainable Development Goals (SDGs), which aim to cut food waste in half by 2030, emphasize the necessity of reducing food waste in order to improve social, economic, and environmental results. Aside from that, post-harvest losses are a major contribution to food insecurity, hunger, and environmental degradation by wasting resources that result in food losses, usually leading to malnutrition and other deficiencies (Singh, 2020).

Role of FVT- CFTRI:

The CFTRI Fruit and Vegetable Technology (FVT) Department's principal goal is to improve post-harvest handling, processing, and usage of fruits and vegetables. The department's research is focused on developing unique and sustainable methods for increasing the nutritional content of fruits and vegetables, extending the shelf life of perishable foods, reducing post-harvest losses, and increasing the nutritional content of perishable foods.

The CFTRI's Role in Post-Harvest Loss Mitigation:

The Central Food Technological Research Institute (CFTRI) of India is in the forefront of addressing post-harvest losses through research, innovation, and capacity-building activities.

Preservation Technological Innovations: The CFTRI has developed ground-breaking food preservation procedures that extend the shelf life of perishable foods. These methods, which range from vacuum packaging

to modified environment packaging, help to preserve food quality and freshness while lowering post-harvest losses and the need for chemical preservatives.

Cold Chain Development: The CFTRI has made significant contributions to the development of resilient cold chains, which are crucial for preserving the quality of perishable items. Through its research, CFTRI has optimized storage conditions, transportation techniques, and packaging solutions to avoid degradation and extend shelf life.

Capacity-building activities: CFTRI's capacity-building activities, including as training programs and workshops, provide farmers and stakeholders with information about safe post-harvest handling, storage procedures, and value-added strategies. These activities enhance employees' skill sets throughout the supply chain, resulting in less losses due to mismanagement.

FVT-CFTRI Research Areas:

Post-Harvest Technology: CFTRI researchers in this department examine the best methods for harvesting, sorting, grading, and packaging fruits and vegetables to reduce spoilage and maintain quality during transit and storage. Fruit juice beverages, fruit bars, fortified fruit goods, fruit jams, jam slices, Instant tomato products, and value added products from underutilized fruits such as jamun, amla, fig, dates, litchi, watermelon, muskmelon, and passion fruit were developed.

Food Preservation: The department investigates novel methods for preserving the nutritional content and flavors of fruits and vegetables, ensuring their availability even during off-seasons, such as freeze-drying, vacuum drying, modified atmosphere packaging (MAP), and controlled atmosphere packaging (CAP). CFTRI recently advised that keeping tomatoes in 4% salt solution (brine) and covering them with polythene will preserve them. This is a preferable option for farmers because it costs only Rs. 3/- to preserve one kilogram of food while also economizing the produce when market prices often surge.

Nutritional Enhancement: CFTRI researchers use fortification, biofortification, and minimum processing to increase the nutritional profile of fruits and vegetables. FVT-CFTRI developed technology for high-value processed fruits and vegetables with enriched micronutrients such carotenoids, ascorbic acid, omega fatty acids, dietary fiber, polyphenols, and minerals. This helps to combat malnutrition and meet the dietary needs of the people.

Value-Added goods: The department focuses on the development of value-added goods from fruits and vegetables, such as jams, jellies, sauces, and ready-to-eat meals. Many of these breakthroughs have already been commercialized and made available to entrepreneurs and the food processing industry. Value-added convenience foods containing critical micronutrients obtained from fruits and vegetables were designed for certain target groups to address malnutrition..This not only reduces waste but also allows farmers and food processors to grow economically.

Waste Management: CFTRI scientists are working on transforming fruit and vegetable waste into valuable byproducts like as natural antioxidants, dietary fiber and bioactive substances, which will help to promote sustainable waste management practices. This not only reduces food wastage but also enhances food and environmental security, paving ways for a sustainable world, pushing us a little near to achieving SDG's.

Pilot plant: CFTRI's fruit and vegetable department has an extended arm for post-harvest fruit and vegetable processing. The pilot plant, which was outfitted with a variety of equipment, assisted in the design and formulation of numerous items such as functional foods and ready-to-eats using technologies such as controlled atmospheric and modified atmospheric temperature, cold temperature storage, carton packaging, and polypropylene packing. Fruit mixers, pulpers, canning lines, fruit ripening machines, and other equipment are available at the plant. It encourages the development, testing, and scaling up of novel fruit and vegetable processing technology, thereby expanding the food processing industry, reducing food waste, and enhancing overall food security and quality. This facility acts as a link between laboratory-size experimentation and full-scale industrial production, allowing researchers to test and develop their ideas before implementing them on a bigger scale. Now let us investigate the significance and features of the Pilot Plant in the Fruit and Vegetable Technology Department of CFTRI.

The Pilot Plant is crucial in the research and development of innovative technologies and procedures for fruit and vegetable processing. It provides a realistic environment for researchers to validate their discoveries before they are scaled up for commercial production. This mitigates the hazards of directly scaling

up unproven technologies to industrial levels and ensures a smooth and efficient transfer from laboratory to production.

Characteristics and Activities:

Scaled-Up Processing: The Pilot Plant is outfitted with cutting-edge machinery and equipment designed to simulate industrial-scale processing conditions. Fruit and vegetable washing, sorting, cutting, blanching, drying and packaging can all be replicated by researchers.

Process optimization is the process of fine-tuning processing parameters and procedures to achieve the highest possible product quality, nutritional content, and safety. Experimenting with different ways and combinations to discover the ideal circumstances at each stage of processing is required.

New Product Development: The facility aids in the development of new value-added items by evaluating alternative recipes, formulations, and processing methods. Researchers can test different fruit and vegetable combinations in order to create unique goods that respond to changing consumer preferences.

Quality Control: The Pilot Plant supports real-time monitoring and evaluation of several quality indicators throughout processing. This guarantees that the finished product satisfies the quality standards and requirements that were set.

Technology Transfer: Once a technology or process has been proven at the Pilot Plant, it can be transferred to other industries for larger-scale adoption. This helps to grow the food processing industry by bringing innovative and effective procedures.

Education and Training: The Pilot Plant also functions as a training facility for students, researchers and industry experts. It provides hands-on experience and exposure to diverse food processing methods and equipment.

Collaborations and Impact:

Farmers, food firms, government agencies, and international organizations are among the stakeholders with which the Department of Fruit and Vegetable Technology collaborates. The department's research has been instrumental in introducing improved food processing technology, improving the agricultural economy, and reducing post-harvest losses. Furthermore, their research has resulted in the building of new food processing units in rural areas, resulting in the creation of new jobs. The Pilot Plant collaborates often with food manufacturers, farmers, and other research organizations. These relationships enable researchers to interact directly with industry leaders, grasp the sector's actual issues and adjust their research to successfully solve these challenges.

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