

## Innovations in Food Processing sector

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### Introduction

Food processing and value addition at all levels of the food supply chain are regarded as very important to enhance the farmer's income. To sustain the increased production of fruits and vegetables, milk, food grains, spices, etc, processing has to increase and more value addition is required. There should be direct linkages between farmers and industries. The farmers need to approach a business model to get remunerative price for the products. An individual farmer may find it difficult to address the scale of the economy. The farmer needs to understand the consumer's requirements to grow what is demanded by the market.

Consumer preferences are changing from cereals-based food to composite foods. There is a slow shift from usefulness in processing to usefulness to consumers. Processed foods are gaining importance and product innovation has become a key to getting a good demand. The concepts of organic farming, primary processing, value addition, ready-to-eat foods, etc., are being preferred. Fortification of flours, milk, eggs, fruits, etc., are new innovations coming to the market.



### Value addition in Products

Fortifying the bakery products with micronutrition and active compounds is finding a rich market. The processing levels of milk, meat, and fish are satisfactory. The processing of pulses, fruits, and



vegetables needs a boost. It cannot be done alone by a single body. The scientists, industries, and GOI must work together for the upliftment of farmers.

The Indian farmer is generally not aware of technological advancements and scientific developments in the field of agriculture. He is not well informed of the programs and policies of the government which are meant to bring relief and comfort to his life. To empower farmers to understand the existing scenario and to act accordingly, there is a need to create farming clusters, FPOs, and FPCs to ensure value addition and improve the post-harvest quality of food.

Three important areas where farmers should focus are primary processing, cold chain logistics, and the establishment of cold storage. This shall help to maintain the quality of food and make it available during the lean season when it is not available so that the farmers can improve their profit margin. It is also important in the present-day context that farmers should establish networks through which their products could be effectively marketed and get better profit.

In order to increase awareness about the importance of innovative technologies in production, processing, and value addition, it is essential to educate the farmers on technological advancements and scientific developments in the field of agriculture and food processing. Awareness about government policies and schemes needs to be increased. GOI is providing support to the farmers to establish primary processing units on the farm for minimal processing of crops.

### **Encourage Innovative Technologies**

Technocrats should take up focused R&D to address issues related to farmers and industries to bridge the gap between farmers and industries. Adding value to traditional foods by developing standard recipes for better quality, safety, and sustainability, the development of composite foods and fortified food including bio-fortification are ways to achieve this. Traditional foods are generally packed in bulk. Appropriate packaging materials should be used and the products should be branded for traceability and better keeping quality.

On the export front, India has been a raw material exporter. Food processing at an appropriate threshold must be considered a farm-level economic activity like scientific farm management. Planners are exploring the possibilities for food and agro-processing for farms and/or self-help groups for income and employment generation in rural India.



Important scientific developments are taking place for improving the quality and safety of food in view of consumer demand and global standards. Many technologies have evolved in the organized sector in the country. Public and private R&D institutions have significantly contributed to the introduction of innovative technologies. We now have IOT (Internet of things) concepts for addressing modernization, automation in processing, the establishment of cold chain logistics, blockchain technologies, the use of energy-efficient storage facilities, large-scale storage of commodities, etc. Innovative technologies include cold plasma technology, pulsed electrified field, Ohmic heating, bio-fortification, irradiation, hydrolyses bio-based/protein-rich food, high-pressure processing, homogenization, ultrasound, three-dimensional printing, organics, minimal processing, ready to eat and ready to cook technology, extrusion technology, traditional food in packed forms, improved packaging, use of fortified flour, milk, sugar, and fortified bakery products with micronutrient, grains and bio-active compounds.

There is good consumer acceptability for these products. Processing technologies must maintain the nutritional value of diet for addressing health and wellness concerns. There is a need for on-farm processing. We must also ensure the utilization of by-products and wastes from food processing industries through better use of technology and the establishment of value chains. Innovations like bringing in robotics and automatization in the food and agricultural sector will help.

Some issues that need our attention are intelligent cold chain systems; adaptive control of storage conditions with biological sensors; rapid detection of food adulterants, fungal and bacterial toxins, and other contaminants; using bio-sensors/nano-bio-sensors/molecular markers; application of robotics, artificial neural networking, nutrigenomics, non-destructive and/or online testing techniques and supercritical fluid extraction for the production of high-value products. We also need to focus on the development of biopolymers for packaging and bio-composites for structures based on nano-technological development, and biosensors to predict and manage the shelf life of processed foods.