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Contribution of innovative agricultural processing technology in farmer's prosperity

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India accounts for about 450 million tonnes of production of raw food materials. These animal and plant-based food materials pass through various stages of production like refining, storage and finally obtaining the end usable product using conventional and modern postharvest and food processing technology. The total food grains production was estimated 275.68 MT, in which 44.19 MT of cereals, 22.95 MT o pulses, 32.10 of oilseeds and 33.09 million bales of cotton in the year 2016-17 (as per Ministry of Agriculture) Harvesting, post-harvest activities, handling and storage report losses of 3.9 - 6 per cent in cereals, 4.3-6.1 per cent in pulses, 2.8- 10.1 per cent in oilseeds, 5.8-18.1 per cent in fruits, and 6.9-13 per cent in vegetables. Harvest and post-harvest loss of India's major agricultural products are estimated at Rs. 92,651 crore. Post-harvest losses in India stem from a range of factors including lack of post-harvest infrastructure, limited technical knowledge on good agricultural practices and inadequate market access. According to the Global Hunger Index-2017, India ranks 100 among 119 countries with the highest food insecurity. If the high volume of losses is reduced, then the country can significantly address the issue of food insecurity.

Agricultural processing technologies and machinery play an integral role in post-harvest management and subsequently value addition to the raw food commodities through final stages of preservation and processing. Post-harvest handling includes cleaning, sorting, grading, processing, packing, storage, transportation and distribution. The purpose of primary and secondary processing is to make food edible and tertiary processing makes the food ready to eat. Primary processing accounts for 75 per cent of the estimated value additions and 25 per cent is attributed to secondary/tertiary processing. New and improved technologies play a crucial role in enhancing food safety and quality. Several new products have been developed using these technologies. The formulation, processing and packaging of a food or beverage are accomplished for several clearly definable purposes, with numerous benefits to the consumer and society.

In India, around 60-70 per cent of food grains produced is stored at home level in indigenous storage structures like paanai and urai in Tamil, kulhi, chabri/peru, kothi and kuthla in Himachal Pradesh and kuthir in the southern parts of India. Earthen pots and bamboo baskets are the most commonly used storage device. These structures are made of locally available materials which allow free flow of air but causes insect infestation and damage by rodents. Research institutes have come up with different improved grain storage structures like Pusa bin is one of the important storage developed by IGSMRI (Indian grain storage management and research institute). PAU bin designed by Punjab agricultural university, cover and plinth (CAP) developed by food corporation of India. CAP storage is a term given to storage of food grains in the open with adequate precautions such as rat and damp proof plinths to reduce food grain losses during storage. Indian scientists have developed few notable drier models, which were used by the small and large group of farmers. A small capacity dryer was developed at G.B. Pant University of

agricultural and technology, Pantnagar, the recirculating batch dryer has been developed at IIT Kharagpur, cup and cone dryer for paddy drying is the somewhat different design of dryer has been tested at the old paddy processing research centre (PPRC) at Thirvarur.

Tremendous changes made by research and development institutions to develop improved processes for pre-treatment of pulses in order to achieve efficient and economic milling of pulses like Pantnagar, CIAE and CFTRI process. Efforts have been made to develop improved methods and machinery to process pulses more efficiently and ecumenically at various research development institutions in country. Notable among them are IARI, New Delhi, CIAE Bhopal, PKV Akola, GBPU and T Pantnagar, CFTRI Mysore and IIPR Kanpur. Machineries like IARI dehusking cum splitting machines, CIAE dehusking and splitting machines, PKV, CFTRI, IIPR and Pantnagar mini dal mill have proven to be extremely useful.

Development of post-harvest technologies for loss reduction and utilization of perishable horticultural crops with the main emphasis on extension of storage life and quality maintenance. Development of technologies/ processes for value addition, product diversification and waste utilization of fruits and vegetables is pertinent. IIHR Bangalore contributed to commercialize many technologies like osmotic dehydration of mango, pineapple, papaya, aonla, jackfruit, banana and sapota technology for making fruit bar, mango squash, pineapple squash, whole tomato crush squash, culinary pastes of onion, garlic, ginger and green chilli and brine preservation of mango slices for pickling which made notables changes in fruit and vegetable processing. Storage of fresh horticultural produce after harvest is one of the most pressing problems of a tropical country like India. Technology for zero energy cool chamber has been developed by IARI as an alternative of the common refrigerator. This is an on-farm storage chamber, for fresh fruits, vegetables and flowers to extend their market potential.

In India, research institutes have licensed different technologies which have changed agricultural processing field notable success over the past five to ten years in like pre-grinder for size reduction of mustard seed, mustard sauce, soymilk whey based fruit drink beverages algorithm of maturity index calculator and chart, automatic blender cum mixer, groundnut pod decorticator, low energy de-hulling of mustard seed, process technology for anola beverage, CIPHET pomegranate aril extractor, pomegranate aril extractor (hand tool) by CIPHET, Ludhiana manual potato peeler, pedal operated potato slicer, pedal/power operated grain cleaner and grader, cottage scale soy paneer plant, grain flour separator, groundnut cum castor decordicator, groundnut cum sunflower decordicator, groundnut decordicator for women, manual soybean dehuller, motorized soybean dehuller, paneer pressing machine, pedal operated seed cleaner and grader, potato digger, soymilk filtration unit by CIAE, Bhopal, vegetable preservator, CRIDA groundnut stripper, CRIDA herbal dryer, CRIDA castor sheller by CRIDA, Hyderabad. Egg cleaning device by NCIPM, New Delhi, Insect probe trap, TNAU kit Box, pearl millet based ready to cook food by TNAU, Coimbatore. New applications are being developed, such as the processing of pulses and their fractions into extruded or baked snacks, pasta, noodles and other protein-rich products, which can be produced in high volume for mass consumption.

Technologies for post-harvest and food processing are commodity driven and location specific. They add value to an existing product by avoiding post-harvest losses, thereby augmenting per capita food availability. Besides these benefits, technology helps in creating new opportunities for employment and income generation. Production agriculture coupled with on-farm processing is essential for sustainable production, high productivity, and better quality end products for domestic and export markets. Therefore, the establishment of Agro Processing Centre will help facilitate backward linkage with farmers, ensure better quality raw food materials for fresh products. Thus putting a check on the large rural-urban migration. The established centre would act as a strong linkage in reducing rural disparities and ensuring its overall upliftment. The need to develop technologies for total utilization of all agricultural produce and value added products has increased. Institutes such as CIAE, Bhopal have successfully commercialized technologies which help in running a soy-based food product enterprise to produce soymilk, tofu, soy flour and soy biscuits, soynuts, soysev, soychakli and soy-butter. Other institute like ICAR-National Research Centre on Pomegranate, Solapur (Maharashtra) have realized technologies for pomegranate juice, ready-to-serve (RTS) beverage, minimal processing of pomegranate arils, sparkling pomegranate wine and pomegranate seed oil. This will help many young entrepreneurs start and successfully run meaningful start-ups which contribute to the nation.

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