

## Contribution of Innovative Agricultural Food Processing Technology in Indian Farmer's Prosperity

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India is an agricultural country, a human population of 1,396,864,884 in the current year 2020-21 having 2<sup>nd</sup> global world ranking with fertility-rate of 2.4 births per woman. A growing population might exceed its food supply in future, this rapidly growing population imposes a number of challenges in provision of food, hence it is stated that agricultural food processing is at the centre of food security challenges of XXI century where food processing availability needs an increasing agricultural productivity and food grain production through technology and innovation.

The word "Technology" encompasses a meaning of advanced manufacturing processing tools and instruments to enhance human ability to shape nature, solve vague problems, create new things for better understanding of the world and our value systems and "Innovation" is the process of translating an idea or an invention into a product or a service that creates significant value. The technological innovation is the combination of both as bringing a new product, process, or service successfully to build a profit. It also provides major driving force in the area of agriculture for doubling the farmer's incomes to boost farmer's prosperity as address by the Hon'ble P.M. Shree. Narendra Modi, Prime Minister, India. Thus, change goes beyond invention, which depicts elaboration and prototyping of a new technological principle; it is related to spread of new need based technology into the agricultural society.

Contribution of agricultural food processing sector for rural development as a tool for "Poorn Swaraj" means the complete self rule; as Father of Nation Mahatma Gandhi during 1930's promoted "CHARKHA" (spinning wheel) and balanced food nutrition by setting example and writing food processing articles in his famous magazine "Harijan". It was progressively continued by his followers namely, Narhari Bhave, Binoba Bhave and Jay Prakash Narayan. They promoted self-dependence through KHADI and village industries.



The inventory technological institutions developed by British Government before independence for taking care of agricultural development includes contribution of various institute like Imperial Agricultural Research Institute, Pusa; Indian Veterinary Research Institute, Mukteshwar; Dairy Research Institute, Bangalore etc. The post independence era in India witnessed rapid growth in agricultural processing sector specifically during 1980's. It followed successful phase of The Green Revolution that had resulted in increased agricultural production and the need for its post harvest management given by Indian Father of Green Revolution Dr. M. S. Swaminathan in the year 1965 and a programme "Operation Flood" project for milk launched by National Dairy Development Board (NDDB) in year 1970 designed by Dr. Verghese Kurien, Father of White revolution.

The progressive development of agricultural food processing sectors in developing countries like India has been associated with adaptation of various unit operations include post-harvest technology and its management, processing of primary products made from various fruits and vegetables, grain processing on cereals, pulses and oilseeds, secondary processed products as well as recycling technologies and concern input of various machineries/instruments required. Modern food processing facilities have been invented as a consequence of such type of operational principles. Traditional methods of food processing may not be able to compete with modern technologies that are replaced. The progress of the food processing sectors depends on development of innovative technological aspects of micro, small and medium sized enterprises (SMEs) in developing countries, which may gives entrepreneur's start up opportunities to achieve the standards of living.

Agricultural processing is defined as set of techno-economic activities carried out through technological innovation for development, maintenance and handling of agricultural produce and to make it usable as food. Hence, the scope of the agricultural processing encompasses all operations from the stage of harvest till material reaches to end users in the desired form. Inadequate attention to agricultural processing sector put losses to both producer and consumer and also hurt the economy of the Country. Agricultural processing is now regarded as the sunrise sector of the Indian economy in view of its large potential for growth and likely socio economic impact specifically on employment and income generation. In agricultural processing about 14 % of world's total work force of agricultural sectors are engaged in agro-processing sector directly or indirectly. However, in India, only about 3% of

work force finds employment revealing its vast untapped potential for start up opportunities to Indian youth. Properly developed, agricultural processing sector can sustained currently established *Make In India* project of Indian Government as a major player at global level in research, development, marketing and supply of inventory machineries, food process equipments, processed food products.

The technological innovation works in agricultural processing carried out in India from the last 70 years up to the year 2020-2021 categorized under response studies on physical, biochemical, nutritional, and engineering properties of different biological materials and its storage, handling, and moisture conditioning techniques. Refinement of traditional equipment, machineries and processes for production of different foods, feeds, fibres and fuel materials for better quality, higher capacity, energy efficiency, and reduced drudgery to workers. Design and Development of instruments and equipment for post harvest operations and their evaluation, feasibility analysis, field trails/multi location evaluation etc. Design, layout planning and development of pilot scale plants, agricultural produce bulk handling systems and area specific agro-processing models. Studies and modelling/simulation of post harvest systems, forecasting and policy analysis. Energy auditing and use of non-renewable sources of energy for post harvest operations.

The contribution of an agricultural processing technology under most popular selected criteria of various machineries includes agriculture produces refinement equipment such as, cleaners, graders and driers for on-farm operations as well as industrial operations. Processes and equipments for parboiling of rice, preparation of puffed rice and flaked rice and equipments like mini dal mill developed by Dr. PDKV., Akola for processing of pulses to produce dhal for higher recovery and better quality. Development of driers using agricultural residues, by-products and solar energy and for production of protein rich produces such as full fat soy flour, soy drink/ soy milk, soy paneer (TOFU) and soy fortified baked products. Development of equipments such as, leaf cup and *dona* making machine, multipurpose mills, mini flour mill, grain pearlers, maize dehuskers, shellers, groundnut decorticators, fruit graders, juice extractors, high recovery mechanical oil expellers and improved storage structures for cereals, pulses, oilseeds, onion and potato. Processes and equipment for production of high quality ground spices and spice mix, development of raw materials and processes technology for production of instant sweets, curries, snack foods, instant soft



drinks, *idli*, *dosa*, *sambhar* mixes/powders, egg powder, production and packaging of milk products such as *shrikhand*, butter milk, *paneer*, *ghee* and sweets, high recovery of sugarcane juice processes for production of high quality jiggery and liquid jaggery. Improved technology for processing of jute sticks to yield jute fibre and impregnation, preparation of jute based textile materials and bags. Control conditions of stored grain on pest and insects by using biological, chemical and physical methods, storage structures for on-farm, trade, and process plant level operations. Processing and canning of meat, meat products and fish and fish processing technology.

In agricultural processing sectors, many technological innovations was carried out but still during the current era some important need based new technology and machineries required a necessary design and development, which includes the need to promote modern rice mills and develop milling technology for fine rice. The number of roller flour mills to increase steadily; however, majority of mills may continue facing problems of low capacity utilization and working capital constraints and need to function through vertical integration of operations for sustaining profitability and achieve cost reduction through appropriate automation and computerization. Efforts are required to develop safe storage of flour produced from most of coarse cereals found problems due to its high degree of perishability, evolve more efficient machines and processes for pre-treatment of the grain, dehusking, sorting, polishing and packaging in order to improve dhal recovery and consume less energy. Also, there is a need for product diversification and development of technology for quick cooking and ready-to-eat dal. Due to shortage of edible oil in the country, efforts have also been directed to obtain edible oil from non-traditional sources including rice bran and oil palm.

The future areas of research include application of bio-technology for enhancing yield of edible oil from different oilseeds, application of de-oiled cake for food purposes through protein isolation and health applications for treating various physiological disorders. Agricultural processing industry has been facing problems of low capacity utilization, technological obsolescence and marketing under constraints of high fluctuations in raw material quality and fluctuating market price, poor technology for handling and storage, inadequate R. & D. support for product development, high cost of energy and uncertainty in availability of adequate quantity for processing purposes, inadequate and expensive cold

chain facilities and varying requirement of processing conditions from one material to another.

Efforts are on to develop infrastructure for export of both fresh and processed meat and poultry with hygienic condition in slaughter houses and use of blood, viscera and other wastes which is not satisfactory. The meat from culled birds and goats is tough textured, better suited for processed meat products. However, there is no tradition of using processed meat products in India, yet. The total fish processing and storage facility in India grossly is inadequate compared to the potential for fish production and processing. Inland fisheries need low cost palletized feeds and machineries required for the preparation of the pallets and special containers to transport fingerlings and fish and to make better use of fish waste and by-products.

To achieve and maintain India's share in the trade, quality of spices and their products will have to be improved. New products like dehydrated pepper, freeze dried green pepper, ginger candy, ginger flakes have to be developed. Development of internationally accepted quality products, packed under hygienic conditions need attention in this context. There is a requirement of technology for desiccated coconut, coconut cream and other products for coastal area of the country. The plantation crops like oil palm, necessary efforts are required for processing and value addition, especially with regard to quality of products, energy inputs, packaging etc. to meet the international quality standards and to reduce cost of production. In case of medicinal plants, studies need to be conducted to develop technology in testing procedures/analytical facilities to meet stringent international standards and to carry out product/process development for low cost chemicals from both raw materials and other by-products. The technology innovation required for the cultivation of high quality varieties under protected conditions, proper tools and equipment, appropriate packaging and storage can create a niche for Indian flowers, and cut flowers and their wrapping materials for the popularization in the world market.

For achievements of Agricultural Processing technology, necessary suggestion incorporated and identified the thrust areas for research and development, prepared medium term research and development programme and implemented to support the national plan for improvement and extension of agricultural processing technology at different levels. The effective contribution of existing innovative technology and above discussed new need based



technology influence the major advantages resulted into minimise the post-harvest losses, extend the shelf-life of food-produce thus increasing food security, stabilise prices of raw materials during peak season and to provide the start up opportunities through custom hiring services of agricultural processing machineries in rural and semi urban area of the country. It promotes economic growth on a large scale and good returns to farmers so that the objective of Government of India for farmer's doubling income by the year 2022 could be achieved and dreams comes true of our former President, Late. A.P.J. Abdul Kalam's mission "vision 2020" by the flourishing contribution of agricultural food processing technology as one of the contributory key factor for prosperity of Indian farmers.

