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Agri-produce processing and value addition for nutrition security

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ABSTRACT

Agriculture forms the backbone of Indian economy and even though there has been large industrialization in last 60 years, agriculture still occupies a place of importance. Agriculture has abled to provide us food security, but, still failed in providing nutritional security. Value addition is one of important components of nutritional security. Sometimes surplus production is the cause of lower price of produce in market. Crop diversification and Food processing with value-addition are the two important pillars of nutritional security as well as two important techniques of profit maximization. The most important problem facing the country today perhaps is providing remunerative price to the farmers for their produce without incurring additional burden of subsidy through minimum support price or some such measures. This problem could be solved largely in the surplus production of cereals, vegetables, fruits, milk, fish, meat, poultry, etc., which are processed and marketed aggressively both inside and outside the country. Value addition coupled with marketing has thus the potentials of solving the basic problems of agricultural surplus or wastage and providing rural jobs, ensuring better prices to the growers, etc.

Key Words : Nutrition security, Agriculture forms, Indian economy, Value addition

INTRODUCTION

Nutrition security is a global challenge, and a prerequisite for a healthy and peaceful society. Nutrition security "exists when secure access to an appropriately nutritious diet is coupled with a sanitary environment, adequate health services and care, to ensure a healthy and active life" (FAO, IFAD, and WFP, 2015). Food processing is any deliberate change in a food that occurs before it is available. Typically, inedible raw materials are processed into more useful, shelf stable and palatable foods or potable beverages for human consumption (IFICF, 2010). Since prehistoric times, food processing has been a key aspect of the food production chain that links agricultural production with the provision of food to people in the form and at the time it is required (Floros *et al.*, 2010). Value addition is a process in which for the same volume of a primary product, a high price is realized by means of processing, packing, upgrading the quality or other such methods. Value-added agriculture refers most

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generally to manufacturing process that increases the value of primary agricultural commodities. Value-added agriculture may also refer to increasing the economic value of a commodity through particular production process, eg., organic produce, or through regionally branded products that increase consumer appeal and willingness to pay a premium over similar but differentiated products. Value-added agriculture is regarded by some, a significant rural development strategy. Small scale processing unit, organic food processing, non-traditional crop production, agri-tourism and bio-fuels development are examples of various value-added projects that have created new jobs in some rural areas

To a large extent, food processing has been used to preserve food, improve food safety and maintain quality. Over the last 100 years, traditional food preparation and preservation processes have been industrialized. The industrialization of food processing, with its economies of scale, has increased the availability of foods in both in local and export markets Some of the common industrial processes used in food manufacturing include milling, cooling/freezing, smoking, heating, canning, fermentation, drying, extrusion cooking (Schmidt, 2009).

Processing can occur at various points along the supply chain. It can be applied proximate to food harvest or capture (e.g. initial processing of agricultural commodities) or further downstream when it is applied in the manufacture of formulated food products (e.g. bread, biscuit, noodles, yogurt). Commercial food processing involves techniques that are difficult for the general public to grasp and that are out of their control, thus introducing a lack of transparency and generating suspicion concerns about the nutritional content and other aspects of the production of processed foods, such as sustainability and cost, have led to criticisms of processed foods as “ultra-processed” and incompatible with good nutrition. However, the type and extent of processing do not necessarily correlate with the nutritional content of the product. For example, high-temperature, short-term pasteurization and ultrahigh temperature sterilization cause less loss of nutrients than do older methods such as pasteurization and sterilization. Processing techniques that involve milling; separating; exposures to air, light, heat, or radiation; changes in acidity or osmolality; or other techniques during freezing, drying, canning, or vacuum packing can and often do alter the content of nutrients and other nonessential bioactive food constituents. Food processing can also lead to an increase in dietary components that may need to be limited, such as salt, sugars, and saturated fats.

Nutritional improvement in processed foods :

Processed foods are an important component of the food supply. Few would argue that the increased bioavailability of macronutrients like starch from the processing of grains to flour and subsequent incorporation into breads, enhanced safety of meat achieved by refrigeration and cooking, improved safety of milk achieved through pasteurization and the year round availability of seasonal fruits and vegetables achieved through preservation, canning and freezing have not been beneficial to society and nutritional security. However, there are also processed foods that are high in salt, refined starch, sugar and fat which present unhealthy food options to the consumer.

Nutritional security ensures an adequate, balanced, varied, and wholesome diet. To enhance the contribution of processed foods in helping to address these challenges, several processing technologies need to be undertaken to restore /enrich the nutrients lost during

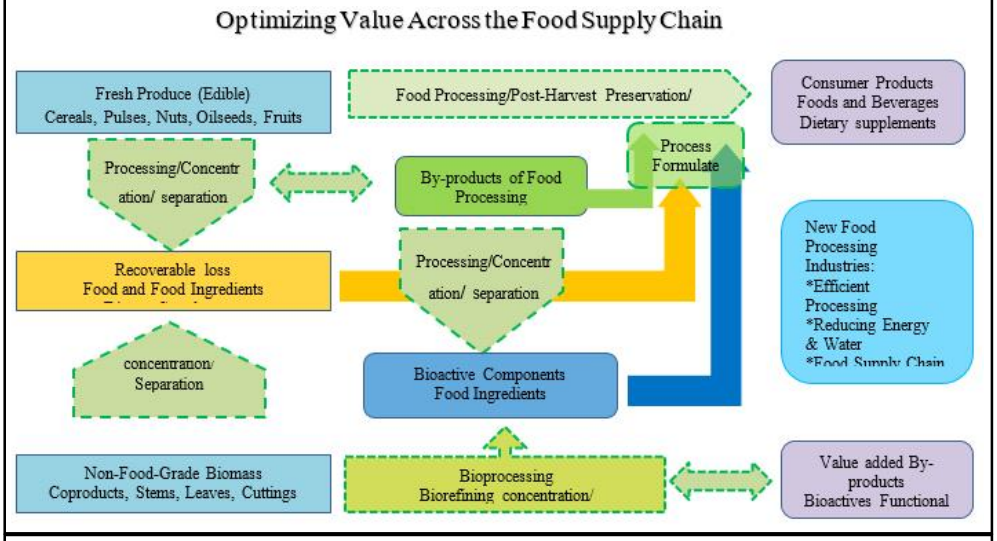

Fig. 1 : Food processing – Possibilities for optimizing the food supply chain

processing of foods

The fortification and enrichment of foods during processing have beneficial effects on population health. Endemic brain damage, goiter and cretinism can be prevented by correcting for iodine deficiency and provided the rationale for the iodine fortification of salt with associated major impacts on the prevalence of these conditions. The introduction of commercially produced iodizedsalt during the middle of the last century substantially reduced iodine deficiency.

Low level of folic acid in the diet of newly pregnant women causes neural tube defects and severe congenital malformations, affecting the brain and spinal cord in the developing fetus.

The role of Vitamin D beyond bone health is increasingly being recognized. A range of vitamin D enhanced foods such as milk, yogurt, cheese, orange juice, soup and bread have been shown to effectively increase circulating vitamin D levels.

Long chain omega-3 polyunsaturated fatty acids (LC n-3 PUFAs) are essential 503 for many biological functions, having wide ranging health benefits from brain development and function to heart health and immune function. Many people consume fish or other seafood infrequently, resulting in an inadequate intake of LC omega-3 PUFA which may result in sub optimal health.

Food safety of processed foods :

Another concern about food processing involves fear about food safety. In the 19th century, during the transition from farms and subsistence agriculture with home-processed food to urbanization and a commercially processed food supply that was ineffectively regulated, adulteration and other abuses in the manufacture of processed foods were common. Food-borne illness crises have continued to erupt from time to time and their scope and distribution

is often large because of today's highly concentrated food processing and distribution system. Such problems have led to concerns about the adequacy of hazard identification and risk reduction and have prompted calls for more rigorous regulation to avoid safety risks. Appropriate processing and preparation techniques for foods and a strong regulatory program are two essential means of safeguarding health in the face of these safety challenges.

Recent technological advances in food processing :

Food processing techniques dates to the prehistoric ages when crude processing techniques incorporated slaughtering, fermenting, sun drying, preserving with salt, and various types of cooking (such as roasting, smoking, steaming, and oven baking). Salt-preservation was especially common for foods that constituted warrior and sailors' diets, up until the introduction of canning methods. Modern food processing technology in the 19th and 20th century was largely developed to serve military needs. Although initially expensive and somewhat hazardous due to the lead used in cans, canned goods would later become a staple around the world. Pasteurization, discovered by Louis Pasteur in 1862, was a significant advance in ensuring the micro-biological safety of food. In the 20th century, World War II, the space race and the rising consumer society in developed countries (including the United States) contributed to the growth of food processing with such advances as spray drying, juice concentrates, freeze drying and the introduction of artificial sweeteners, coloring agents, and preservatives such as sodium benzoate. In the late 20th century products such as dried instant soups, reconstituted fruits and juices, and self-cooking meals such as MRE food ration were developed. While traditional food processing will continue to play a major role in providing food for people, it is expected that there will also be an increasing role for the application of novel and emerging food processing technology for improving the quality of food and processing efficiency.

Non-thermal processing of foods :

Novel and emerging technologies, particularly high pressure processing (HPP), pulsed electric field (PEF), cold plasma,UV irradiation and ultrasound have been examined as treatments for improving the shelf life of foods and altering material properties. The application of emerging, non-thermal techniques was shown to potentially reduce energy requirements for food processing and may contribute to improved energy efficiency in the food industry Of the emerging technologies, there has been most commercial application ofHPP. In HPP, pressures in the range of 200–1000 MPa are used. (Wrangham, 2009) HPP disrupts microbial cells but retains nutrients and flavour molecules, allowing 299 shelf-life 300 extension without the detrimental effects of high temperatures on food quality whilst 301 retaining the fresh-like character of foods. HPP has been commercialized as a cold pasteurization process for a range of products including guacamole, processed meats, tomato salsas, oysters and yogurts. However, more investigation is still needed to understand how HPP can be used to modulate enzyme reactions and fermentation, and its effects on food-spoilage viruses and bacterial spores. In PEF, short electric pulses are applied to food, causing permeabilization of microbes and the cells of plant and animal tissue. It may be used as an alternative to pasteurization. In ultrasound processing, sound waves are transmitted through the food medium. Both low (20-

100 kHz) and high (400 kHz and above) frequencies have been used in food processing. Low frequency ultrasound has been applied for disintegration and homogenization of foods, and to enhance extraction of components. Ultrasound may also be used to improve the efficiency of drying, filtration, brining, freezing and thawing processes. High frequency ultrasound, with the creation of standing waves, facilitates the separation of oils from emulsions such as milk and increases the yield of oil in the palm oil milling process. (Neish 2009). HPP, PEF and ultrasound can also enhance extraction of anthocyanins from grape by-products with up to three, four and two-fold increase in extraction, respectively.

Minimal processing technologies:

Consumers increasingly demand foods which retain their natural flavour, colour and texture and contain fewer additives such as preservatives. Minimal processing describes non-thermal technologies to process food in a manner to guarantee the food safety and preservation as well as to maintain as much as possible the fresh-like characteristics of fruits and vegetables.

Hurdle technology:

The combined use of several preservation methods, possibly physical and chemical, or a combination of different preservatives is an age-old practice. It has been commonly applied by the food industry to ensure food safety and stability. In smoked products, for example, combination treatment includes heat, reduced moisture content and antimicrobial chemicals deposited from the smoke onto the surface of the food.

Nano technology introduction:

Nanotechnology is a powerful new technology for taking apart and reconstructing nature at the atomic and molecular level. It involves atomic level manipulation to transform and construct a wide range of new materials, devices, and technological systems.

Smart packaging and food tracking:

Nanotechnology will dramatically extend food shelf life. Mars Inc. already has a patent on an invisible, edible, nano wrapper which will envelope foods, preventing gas and moisture exchange. Smart ‘packaging (containing Nano-sensors and anti-microbial activators) is being developed that will be capable of detecting food spoilage and releasing nano-anti-microbes to extend food shelf life, enabling supermarkets to keep food for even greater periods before its sale. Nano-sensors, embedded into food products as tiny chips that were invisible to the human eye, would also act as electronic barcodes. They would emit a signal that would allow food, including fresh food, to be tracked from paddock to factory to supermarket and beyond (IFT, 2010).

Functional foods and Nutraceutical foods: Clearly, all foods are functional, as they provide taste, aroma, or nutritive value. Within the last decade, however, the term functional as it applies to food has adopted a different connotation that of providing an additional physiological benefit beyond that of meeting basic nutritional needs. The term functional foods were first introduced in Japan in the mid-1980s and refers to processed foods containing ingredients

that aid specific bodily functions in addition to being nutritious

Conclusion :

The challenges to feed the world in 2050 cannot be met through improvements in food production alone. Reduction and recovery of food losses throughout the food chain from production to consumption and improvements in preservation, transportation, nutritional content, safety and shelf life of foods will be key strategies to combat food and nutrition demands of the future. A goal is to improve health of the consumer and to achieve healthier ageing for the population. It is essential to engage society in science to engender the trust of consumer in the food supply and important to ensure ethical food production and responsible consumption for a sustainable ecosystem.

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