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## Entrepreneurial potential for processing of horticultural crops in Bundelkhand region

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### Abstract

The Indian economy is largely based on agriculture around 55% of the population dependent for their livelihoods on agriculture and allied sectors. Indian farmers are affected impacts of climate change, water scarcity and land degradation and many more calamities. In addition, increasing fragmentation of holdings, extreme weather events, rising input costs and post-harvest losses pose an enormous challenge to sustaining agricultural growth. Unfortunately about 25-30% of horticulture produce, 10-25% of vegetables and 30-40% of flowers gets wasted due to lack of postharvest management which resulted in huge loss of crores of rupees. Fruit and vegetable processing industry has taken a new direction and is growing gradually with strong growth rate annually. Infrastructure development for processing may take this industry to the new heights in the years to come with the help of sufficient exports and investments. Fruit and vegetable processing is done widely in the food and beverage industry. Fruits and vegetables are processed into a variety of products such as juices and concentrates, pulp, canned and dehydrated products, jams and jellies, pickles and chutneys etc.

**Keywords:** value addition, post harvest losses, processing, fruits, vegetables

### Introduction

The Indian economy is largely agrarian, with around 55% of the population dependent for their livelihoods on agriculture and allied sectors that generate 15% Gross Value Added (GVA) (Gol 2017a). Indian farmers are vulnerable to impacts of climate change, water scarcity and land degradation. In addition, increasing fragmentation of holdings, extreme weather events, rising input costs and post-harvest losses pose an enormous challenge to sustaining agricultural growth. Unfortunately about 25-30% of horticulture produce, 10-25% of vegetables and 30-40% of flowers gets wasted due to lack of postharvest management which resulted in huge loss of crores of rupees.

The minimization of these postharvest losses may be reduced by extending the shelf life of fresh horticultural produces either through pre or post-harvest management practices or by processing it into different value added products. Several factors influence the post-harvest losses in fruits and vegetables that include losses due to physical, physiological, mechanical and unhygienic conditions, lack of proper storage conditions, refrigerated facilities and diseases and pests, etc. While harvesting to handling for storage till marketing several wound pathogens are known to infect the produced that destroy the keeping quality, quantity ultimately economic losses. Post-harvest decay of fruits and vegetables occur either between flowering and fruit maturity or during harvesting and subsequent handling and storage. There are many technologies already developed in the past which are available in the literature but are not practiced may be due to either materials are not available locally, not much effective or the technology is more costly. By adoption of simple post-harvest management practices, processing and value addition operation viz., proper harvesting, sorting, grading, packaging, pulping, pickling, drying and dehydration at farmer's level during the peak season will help in minimization of post-harvest losses as well as doubling the farmer's income.

Fruit and vegetable processing industry has taken a new direction and is growing gradually with strong growth rate annually. Infrastructure development for processing may take this industry to the new heights in the years to come with the help of sufficient exports and investments. Fruit and vegetable processing is done widely in the food and beverage industry. Fruits and vegetables are processed into a variety of products such as juices and concentrates, pulp, canned and dehydrated products, jams and jellies, pickles and chutneys etc. The extent of processing of fruits and vegetables varies from one country to another. The fruit and vegetable processing industry in India is estimated to grow at a CAGR of 10.8% between FY 2015 and

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FY 2020. The food processing sector is critical to India as it contributes to the economy, increases agricultural yields, creates employment and raises life-standards of people across the country, especially in rural areas.

The stage of crop production immediately following harvest, including cooling, cleaning, sorting and packing may be termed as Post Harvest Handling. Fresh Fruits and Vegetables including root crops are mostly perishable in nature. They begin to deteriorate immediately after its separation from the parent plant and suffer considerable losses during the process of Marketing. These losses may be of following nature:-

1. Quality downgrading due to handling
2. Physiological spoilage (rooting & sprouting)
3. Pathological Spoilage from pest and diseases
4. Oversupply to markets

**Important sites of post-harvest losses:** Important sites where post-harvest losses are noticed in India are —

- Farmer's field (15-20%)
- Packaging (15-20%)
- Transportation (30-40%)
- Marketing (30-40%)

#### **Need for value addition in Horticulture**

- To improve the profitability of farmers.
- To empower the farmers and other weaker sections of society especially women through gainful employment opportunities and revitalize rural communities.
- To provide better quality, safe and branded foods to the consumers.
- To emphasize primary and secondary processing.
- To reduce post harvest losses.
- Reduction of import and meeting export demands.
- Way of increased foreign exchange.
- Encourage growth of subsidiary industries.
- Reduce the economic risk of marketing.
- Increase opportunities for smaller farms and companies through the development of markets.
- Diversify the economic base of rural communities.
- Overall, increase farmers' financial stability.

#### **Importance of Value Addition in Horticulture**

- Horticulture deals a large group of crops having great medicinal, nutritional, health promoting values.
- India as second largest producer of fruits and vegetables, only 10 per cent of that horticultural produce is processed, but other developed and developing countries where 40-80 per cent produce is value added.
- Horticultural crops provide varied type of components, which can be effectively and gainfully utilized for value addition like pigment, amino acids, oleoresins, antioxidants, flavors, aroma etc.
- Post harvest losses in horticultural produce are 5 to 30 per cent which amounts to more than 8000 crore rupees per annum. If we subject our produce to value addition the losses can be checked.
- Horticultural crops are right material for value addition because they are more profitable, has high degree of process ability and richness in health promoting compounds and higher potential for export.

#### **Methods of processing of fruits into products**

- Preservation by heat treatment.

- Aseptic packaging.
- Preservation of by removal of heat.
- Quick freezing.
- Preservation by removal of moisture.
- Preservation by addition of chemicals.
- Minimal processing

Bundelkhand region of Uttar Pradesh is low in productivity with limited choices of crops because of its too hot and semi humid climate. In spite of the scarcity of water the region possess a rich diversity of many species of horticultural crops e.g. wood apple, custard apple, ber, bael, karonda, etc which are used as food crops by the people of village communities. Some of the minor fruits and vegetables are basically collected from the wild and eaten by the local inhabitants while few are underutilized which exhibit rich diversity, but are not commercially utilized. Cultivation of most of these crops is restricted to small farms, backyards or marginal land. Being wild, most of these fruits possess high nutritional quality. An additional feature of these crops is that these can grow well in harsh climates and on the marginal lands without any special care. Farmers are earning some revenue by selling these fruits which they gather from the trees growing in forests or in backyard. These crops have the potential to contribute not merely to agriculture biodiversity but most importantly to the livelihood of poor. Development and dissemination of postharvest handling and value addition techniques for fruits like wood apple and custard apple could be one way to increase social welfare by generating income for the farmers of Bundelkhand. This will not only make us able to reduce the post-harvest losses but also improve the quality of fresh produce through proper storage, packaging, handling and transport.

Over the years, horticulture has emerged as one of the potential agricultural enterprise in accelerating the growth of economy. The horticulture sector encompasses a wide range of crops e.g., fruit crops, vegetable crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices and plantation crops. Bundelkhand with its wide variability of climate and soil, is highly favourable for growing a large number of horticultural crops. It is the fastest growing sector within agriculture. It contributes in poverty alleviation, nutritional security and have ample scope for farmers to increase their income and helpful in sustaining large number of agro-based industries which generate huge employment opportunities. Underutilized fruit and vegetable crops can easily be grown under adverse conditions and are also known for their therapeutic and nutritive value and can satisfy the demands of the health-conscious consumers. However, some of these fruits are not acceptable in the market in fresh form due to their acidic nature and astringent taste. Hence, there is a need to concentrate on research efforts in diversification and popularization of such underutilized fruit crops. To achieve this, there is a need to create demand for such fruit crops in the domestic and international markets. This, to some extent, can be achieved through developing suitable processing and marketing strategies for these underutilized fruits. Introduction Fruits are undoubtedly very important for nutrition security with high potential of value addition and foreign exchange earnings. Post-harvest losses of fruits and vegetables in developing countries are more serious than those in well developed countries. The total losses from harvest to the consumer point are as high as 35-40%, which is worth thousands of crores rupees. Underutilized crops have an

important role to play in satisfying the demand for nutritious, delicately flavored and attractive natural foods of high therapeutic value. The underutilized fruits like aonla, bael, jamun, karonda, passion fruit, phalsa, pomegranate, pumpkin, tamarind, wood apple etc. are the main sources of livelihood for the marginal and small farmers and play an important role in overcoming the problem of malnutrition. They are in general accepted as being rich in vitamins, minerals and dietary fibre and therefore, are an essential ingredient of a healthy diet. Fruit processing is necessary where it ensures fair returns to the growers to improve their economic condition. It also helps to mitigate the problem of under-employment during off-season in the agricultural sectors.

Since, farmers of Bundelkhand region of Uttar Pradesh are still unaware about the management, post harvest handling, processing potential and commercial utilization of these crops. By starting agri-startups in this sector not only they are able to utilize the unexplored potential of entrepreneurship in Bundelkhand region but also it provide employment to farmers/ rural community thereby saving the invaluable bio-diversity of the region for the future generation and stop migration of people from this region.

On the Other hand, Value Addition in Horticulture is the process in which a high price is realized for the same volume of a primary product, by means of processing, packing, upgrading the quality or other such methods. For example: Making Jam of Pomegranate and Strawberry.

India is the major producer of dried and preserved vegetable like preserved onions, cucumber and gherkins, provisionally preserved mushrooms of the genus agaricus, other mushrooms and truffles, green pepper in brine, dehydrated garlic powder, dehydrated garlic flakes, Potatoes dried, grams dal, etc. Many non-traditional vegetables mainly processed cucumber and gherkins and other vegetables produced like asparagus, celery, bell pepper, sweet corn, green and lime beans and organically grown vegetables are also being increasingly

exported. It is envisaged that India should be the food factory of the world so as to generate income, employment and foreign exchange in a big way, through significant increase in level of processing and achieve higher growth through value addition, increasing India's share in global and achieve quality image for Indian products in domestic as well as overseas market.

Significant developments in technology include better understanding of the process of ripening of fruits, optimum harvesting time, pre-cooling of freshly harvested produce, cold storing of the raw fruits and vegetables, sorting, cleaning, waxing, packaging technology for fruits. At CFTRI, DFRL, IIHR, Bangalore; IARI, New Delhi; GBPUA&T, Pantnagar; IIVR, Varanasi and HPKV, Palampur; a number of technologies have been developed. Most significant work has been recorded in the technology for ripening of the fruits under controlled conditions. Production of juices and value-added products including jams, jellies, pickles, canned products etc. has become a commercial success.

The industry using indigenous technology includes units engaged in juice extraction, concentration of juices, canning and production of several of the products like jams, jellies, canned fruits, dried vegetables etc. Technology is still being imported for establishment of large scale exported oriented units for production of items like banana paste, concentrates of various fruit juices, sorting, cleaning, washing, waxing and packaging of raw fruits and vegetables. The production of fruit and vegetable products in India are canned, bottled fruits and vegetables, jams, jellies, marmalades, fruit juices, fruit pulps, squashes, crashes, cordials, fruit syrups, fruit nectars, RTS fruit beverages, fruit juice concentrates, chutneys, pickles, mango slices in brine preserves, candied and crystallized fruits and peels, dehydrated fruits and vegetables, frozen fruits and vegetables, tomato products, sauces, soups etc.

Major processed products which can be prepared from fruits

Processed Product	Fruits
Jam	Jamun, Karonda, Aonla, Mulberry, Soursop, Tamarind, Wood apple
Jelly	Tamarind, Jamun, Karonda, Tamarind
Preserved	Ber, Aonla, Ker, Sangri, Karonda, Bael, Karonda, Soursop
Candy	Aonla, Karonda, Tamarind
Glazed Fruits	Tamarind, Annanas, Aonla
Confectionary	Amra, Aonla, Tamarind
Juice/Syrup/ Beverage/ Squash	Aonla, Ber, Bael, Jamun, Karonda, Phalsa, Mulberry, Pomegranate, Soursop, Wood apple, Tamarind
Wine	Mahua, Jujube, Ber, Indian fig, Karonda
Chutney	Karonda, Wood apple, Aonla
Sauce	Karonda, Tamarind, Wood apple, Pomegranate
Pickle	Jujube, Tamarind, Ker, Lasora, Gonda
Dehydration	Aonla, Karonda, Ker, Bael, Ber, Custard apple
Frozen Puree	Bael, Karonda, Ker, Phalsa Tamarind, Custard apple
Canning	Ber, Aonla, jamun, Ker

So for popularizing the underutilized fruits and vegetable crops among the farmers in Bundelkhand region, there is need of establishing the processing unit as well as strengthening the market facilities.

#### Agribusiness Opportunities in Bundelkhand

1. Processing and Value Addition
2. Vermi compost Production
3. Spice Processing
4. Vegetable Farming
5. Horticulture Nursery

6. Medicinal & Aromatic Plants Farming
7. Mushroom Farming
8. Dairy Farming
9. Floriculture and Landscaping
10. Bee Keeping
11. Goatery Farming
12. Agriculture Consultancy

#### References

1. Thompson AK. Controlled Atmosphere Storage of Fruits and Vegetables, CABI Publishing; 2nd revised edition,

- 2010.
2. Alzamora SE, Tapia MS, López-Malo A. Minimally Processed Fruits and Vegetables: Fundamental Aspect and Applications. Aspen Pub. Co., Inc., Maryland, US, 2000, 277-286.
  3. Alzamora SM, Cerruti P, Guerrero S, López-Malo A, Díaz RV. Minimally processed fruits by combined methods. In: Fundamentals and Applications of Food Preservation by Moisture Control. ISOPOW Practicum II, Barbosa-Cánovas, G. and Welti, J., Eds., Lancaster, PA, Technomic Publishing, 1995, 565-602.
  4. Arthey D, Ashurst PR. Fruit Processing. Blackie Academic & Professional, London, 1996, 142-125.
  5. Barbosa-Cánovas GV, Vega-Mercado H. Dehydration of Foods. Chapman & Hall, New York, 1996, 53-59.
  6. Bhattachajee SK, Dee LC. Post harvest technology of flowers and ornamental plants. Pointer publishers, Jaipur, 2005.
  7. Cantwell M. Post-harvest Handling Systems: Minimally Processed Fruit and Vegetables. Vegetable Information. University of California, Vegetable Research and Information Center, 2001.
  8. Government of India. Agricultural statistics at a glance 2016. Government of India, Ministry of Agriculture, Department of Agriculture and Cooperation, Directorate of Economics and Statistics, 2017A.
  9. Gupta, Ajay. List of Profitable Value Added Products from Fruits & Vegetables. Value Addition and Processing of Agri-Products, 2016. [www.entrepreneurindia.co](http://www.entrepreneurindia.co), [www.niir.org](http://www.niir.org)
  10. Verma LR, Joshi VK. Post Harvest Technology of Fruits and Vegetables. Vol. I & II. Vegetables. Indus Publishing Co. New Delhi, 2000.
  11. Stanley Kays J. Post Harvest Physiology of Perishable Plant Products. CBS New Delhi, 1998.
  12. Wills, McGlasson, Graham Joyce. 2007. Post Harvest- An Introduction to the Physiology and Handling of Fruits, Vegetables and ornamentals. Cab International.
  13. Sanal B, Krishna Kumar S. An analysis of value addition in agro products and its impact on the export potentials of India. International Journal of Management. 2017; July-August8(4):23-30.