

## **f. Emphasis on Post-harvest Technology and Processing**

The quantitative and qualitative losses occur in horticultural commodities between harvest and consumption. Qualitative losses, such as loss in edibility, nutritional quality, caloric value, and consumer acceptability of the products, are much more difficult to assess than quantitative losses. Processing could have been an excellent remedy, but only 2% of produce is processed. Present vegetable and fruit processing industry is extremely decentralized. Around 70% of total processing units fall under cottage industry. India's share in international food trade is a minuscule 1.5%. Value addition to foods by processing is a mere 7% against 23% in China, 45% in Philippines and 88% in UK. India has also been exporting canned and dehydrated vegetables and various other products like pastes, frozen vegetables, ketchup, pickles, juices and powdered vegetables (onion and garlic) mainly to West Asian markets. These markets are receiving only 4.5 per cent of their fresh vegetables from India; so a tremendous potential exists in increasing export to these markets. Among dehydrated vegetables, beans, onion and garlic are important and among frozen vegetables prospects for peas, cauliflower, French beans, baby carrot and okra are bright. Chilli oleoresin is another important export item, earning foreign exchange worth Rs 88 crores every year.

## **g. Emphasis on Mechanization of vegetable crops**

India is having largest number of tractors in the world, (about 3.2 million) producing about 0.25 million per year. Still most of the horticultural operations in India are done manually or with animal power. Wherever, the farming operations are mechanized the crop productivity is high. The machinery developed by different SAU's and research institutes need to be popularized. The tractor drawn implements have found wide acceptability in potato cultivation, from sowing to harvesting. The suitable varieties of vegetable crops are to be selected and the cultivation practices are to be standardized for mechanization. The transplanters for vegetable seedlings developed at IIHR, PAU and CIAE needs adoption. For healthy seedling production, the vegetable nurseries need the adoption of media siever, media mixer and plastic bag filler developed at IIHR, Bangalore. By using this machinery containerized seedling production under protected structures has become commercial venture in India to produce healthy seedlings of tomato, capsicums, cauliflower, cabbage, chillies, brinjal hybrids at large scale. Besides single and double chisel, side dresser, bed maker, nursery bed roller, grove maker are the new tools becoming popular in the modern vegetable farming. There are several mechanized operations in processing industry which are followed in good hygiene practices. The commercially available boom sprayer, air-assisted sprayer can be used in raised-bed cultivated crops. The combine harvesters for digging potato, detopping and bagging of onions and garlic are urgently required. About 300 improved agricultural equipment/ technologies have been developed countrywide for various pre- and post-harvest operations by human, animal, mechanical and electrical power; modernization of rice, wheat, oil, and sugarcane milling industry to some extent, development of technology for value addition and for health and nutrition security. The mushroom spawn and cultivation machinery is also developed at IIHR, Bangalore and NRCM, Solan may be adopted to mechanize the Indian mushroom industry.

Mechanization is essential for timeliness in field operations and precision in placement of costly inputs to increase productivity, reduce unit cost of production and drudgery in farm operations as well as conservation of natural resources. For vegetable crop mechanization equipment for seed-bed preparation, planting, transplanting of seedlings, interculture, irrigation, spraying, harvesting etc., need to be used.

## **Future Strategy**

Vegetable production has been one of success stories of the last decade, and to continue to build on success, emerging challenges need to be addressed. Therefore, there is a need to prioritize research, development and extension, to make vegetables a key driver in rural and regional economic development.

Thus, there is need to strengthen research on durable resistance to multiple diseases and pests; heat, drought and salt tolerant varieties with efficient nutrient and water use efficiency; vegetable & seed production techniques, diversity and dynamics of major insects, microbes and pathogens; studies on pest, disease and weather relationships etc. Therefore, the following initiatives need to be taken under AICRP (VC) to strengthen the research activities:

- To collect, evaluate gene resources for utilization and conservation of the vegetable biodiversity existing in different agro-climatic zones of the country.
- To develop improved varieties and hybrids resistant to biotic and abiotic stresses with efficient nutrient and water use efficiency.
- Develop production and post-harvest technologies to improve product quality and minimize environmental impacts. Increasing the value of production by reducing variability in yield, quality, reducing crop losses and increasing marketability. Develop the production systems that minimize wastes and maximize recycling. More emphasis will be given on organic production of vegetables.
- Production of adequate quantity of nucleus and breeder seed of vegetables as per the national requirements including parental lines of hybrid varieties of vegetable crops.
- To develop the seed research programmes on standardization of priming treatments, pelleting and coating techniques, seed certification standards, and seed production techniques, vigour tests, seed drying, seed treatments, packing and safe storage techniques for quality improvement of vegetable seeds.
- Integrated management of emerging diseases and pests. Emphasis and encouragement should be on identification of new and effective bio-molecules for management of biotic stresses for ecofriendly and sustainable management of diseases and pests. Development of new innovative diagnostic techniques for rapid, accurate and cost effective detection of high impact pests and diseases.
- To act as a national repository of scientific information relevant to vegetable crops and as a centre for training for upgradation of scientific manpower in vegetable crops.

In this direction, All India Coordinated Research Project on Vegetable crops has been taking strong initiatives to address the issues in best possible way to bring good prosperity to the common people as well as country. Research on vegetables would be intensified during the next Five Year Plan in the identified area as listed below

- Development of varieties / hybrids resistant/ tolerant to biotic stress
- Development of varieties/hybrids tolerant to abiotic stresses like moisture stress and heat.
- Emphasis on maintenance breeding of popular varieties.
- Provision for demonstration of newly identified varieties on farmer's field.
- Emphasis on development of varieties/hybrids for processing and export quality.
- Development of technology related to climate change and protected cultivation.
- More emphasis on organic vegetable farming packages.
- To improve the water and nutrient use efficiency in vegetable crops.
- Export oriented quality vegetable production under organic farming model to maintain the soil health for sustainability.
- Vegetable based cropping system.
- Quality & Economic seed production technologies for O.P. & Hybrids.
- Quality transplant production under protected environment.
- Development of effective disease/insect pest forecasting systems.
- Status of pest and diseases and their management in current scenario of climate change.
- Enhancing potency of bioagents and search for new ones for application in pest and disease management.
- Development and refinement of cost-effective, biointensive IPM/IDM technology under field and protected cultivation.
- Breeder Seed Production of Vegetable Varieties as per DAC Indent & Requirements.