

## Doubling Farmers' Income through Horticulture Interventions

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Horticulture has emerged as a core sector of agriculture over the past decade, growing steadily in annual area coverage and output. In the year 2016-17, horticulture stood at nearly 25 million ha and production was at a record 299.8 million tonnes of which 269.9 million tonnes was in fruits and vegetables alone. Horticulture is seen as optimal option for crop diversification in agriculture. The per unit earning capacity of farmers is much higher than in case of food grains and it also addresses environmental concerns. Nevertheless, most horticultural output requires specialised market linkages and connectivity, post harvest infrastructure and to make this sector more remunerative, there is a need to address the constraints involved.

The productivity of vegetables and fruits was noticed 17.11 and 14.51 tonnes per hectare, respectively in India during 2017 but this was negligible in case of aromatic crops (1.56 tonnes per hectare) and spices (2.21 tonnes per hectare). Therefore, there is more need to focus on aromatic crops and spices in state programme as compared to other commodities. Productivity growth in fruits and vegetable was meagre (1.57%) over the past decade. This is only due to non-availability of quality planting material, dwindling status of natural resources, abundance of resource poor farmers and low adoption of modern technologies. The challenge is to enhance productivity by increasing the factor productivity of all the horticultural production inputs, and at the same time sustaining it by adoption of good practices and precision farming principles. Hence, situation specific modern technologies should be identified/developed, refined/validated and popularized.

High cost of input in horticulture crops, prevalence of old and senile orchards, unorganized supply chain are the major bottle neck, therefore, adoption of organic agriculture practices and farming system approach should be promoted for decreasing input cost and ultimately increasing the income. Moreover, rejuvenation of old and unproductive orchards

and organized marketing are also very important for getting remunerative income. As reported 30% produce of horticultural crops are being spoiled due to their perishability. So their perishable nature should be judiciously targeted based on assessment of production and availability of market to escape unexpected low prices of produce due to high level of production.

Major thrust areas for horticulture development are cluster approach linked with post-harvest management and marketing, market intelligence to promote market led production, quality seeds and planting material, adoption of improved varieties and rejuvenation with improved cultivars, hi-tech horticulture and precision farming, high density plantations, etc.

### **Interventions for doubling the farmers' income**

- Diversification of present farming system with horticulture crops, availability of micro irrigation, resource use efficiency, increase in cropping density, better agronomic practices, incorporation of improved varieties and technologies, area expansion may be taken under consideration as sources of income growth in horticulture sector.
- Popularization of hybrids may be proved as prompt effort for increasing the income. The hybrid technology has capacity to revolutionise the production of vegetable crops and demand for hybrid seeds is continuously increasing. At present, the area under vegetable hybrids accounts for 10 per cent of the total area. High production, earliness, superior quality, uniform produce and resistance to biotic and abiotic stresses are the main advantages of F<sub>1</sub> hybrids. Adoption of hybrid varieties can increase 1.5-3 times more yields which mean more income from increased output from same area.
- Appropriately selected rootstocks have potential to modify the architecture of plants for efficient utilisation of resources. It can ameliorate the soil, enhance nutrient and water use. Therefore, rootstocks have become integrated in the production system of grapes, citrus, apple and many fruit crops for successful production.
- Genetically dwarf cultivars in mango, banana, papaya, sapota and dwarfing rootstocks in mango, guava, citrus, ber suit high density planting system for accommodating more plants, increasing output and income. Rootstock technology has capacity to double the production and even make it possible to grow fruit crops under stress conditions.

- Use of CMS line for hybrid seed production in vegetables and floriculture. Use of good quality seed and planting material is a prerequisite for the production of high yields. High quality seeds and planting material help to increase horticultural productivity; improve food security; lower money spent on food purchases and imports and raise domestic economic activity.
- Various diagnostic methods viz. ELISA, Polymerase Chain Reaction (PCR), multiplex PCR, Real Time PCR are available for different viruses, bacteria and fungi in order to enhance the production with diverse escaping practices.
- Protected cultivation is a good option for producing quality produce and efficient use of land and other resources in some horticultural crops. It is beneficial for nursery raising and cultivation of high value vegetables and flowers.
- Facilitation of micro-irrigation in horticulture sector in rainfed areas. Among various methods tried drip irrigation has proved successful in exhibiting high water productivity by saving irrigation water from 25 to 60 per cent in various orchard crops and vegetables with a 10 to 60 per cent increase in yield as compared to the conventional method of irrigation. It is one of the latest methods of irrigation which is becoming popular in areas with water scarcity and salt problems. The impact of micro-irrigation on resource conservation (saving in input costs to the farmer) is estimated in the range of 20 to 40 per cent in case of horticultural crops.
- The cultivation of horticultural crops is labour intensive and it needs timely operations for maximising the production. The availability of the labours is reducing in the villages. The end to end mechanisation of the horticultural crops is required to be adopted. Several machines and tools have been developed to enhance the efficiency of farm operation in high tech nursery, precision farming, high density plantation, protected cultivation, etc.
- **Bio-fertilizers** are microbial preparations containing living cells of different microorganisms which have the ability to mobilize plant nutrients in soil from unusable to usable form through biological process. Streamlining is required in the use of bio-fertilizers, VAM fungi, biological N fixers and other beneficial microbial agents for effective nutrient use efficiency.

- Nano encapsulated conventional fertilizers, pesticides and herbicides helps in slow and sustained release of nutrients and agrochemicals resulting in precise dosage to the plants.
- Horticulture based cropping system optimises use of the space and time and improves upon productivity from same piece of land. This has an income doubling impact for farmers.
- Promotion of Integrated farming system approach involving synergic blending of crops, horticulture, dairy, fisheries, poultry, etc. seems viable option to provide regular income and at site employment to small land holder, decreasing cultivation cost through multiple use of resources and providing much needed resilience for predicted climate change scenario.
- At present the cropping intensity in agriculture as a whole is 138.9 per cent, and segregated statistic is not available for horticultural crops. Any increase in the intensity would add to the production from farms accordingly. Higher cropping intensity is made possible with various measures, primarily irrigation, use of fertilizers, crop rotation, mixed cropping, relay cropping, etc.
- In perennial horticultural crops, the brown space available in the pre-bearing age of the orchard can be effectively utilised to grow short duration horticultural crops as intercropping or for interspaced planting and cultivation to gain higher income. Mechanical tools, tiller tractors, sowing gadgets, etc. can save critical time between crops thus enabling use of short duration crops or fast maturing varieties.
- There remains a considerable gap between the gross production and net availability of fruits and vegetables due to heavy post-harvest losses in case of horticultural produce. It is estimated that India incurs post-harvest fruits and vegetable losses worth over two lakh cores each year largely owing to the absence of modern cold storage facilities and lack of proper food processing units. More emphasis needs to be given to post-harvest management of fruits and vegetables. Besides storage and processing, the cold-chain is seen as a value adding activity as it allows farmers to capture greater value.
- Commercial floriculture has been steadily increasing with increased use of protected cultivation employing greenhouse, shade nets, polyhouse, etc. Commercial flowers

cultivation in India provides an opportunity for rural development owing to its higher returns per unit area and the new employment opportunities. Nearly 80% of area under floricultural crops is concentrated in seven states comprising Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal, Maharashtra, Haryana, Uttar Pradesh and Delhi. A major part of the area under flower cultivation is devoted to the production of Marigold, Jasmine, Rose, Chrysanthemum, Tuberose, etc., with considerable increase in the area under cut flower cultivation. Share of Uttar Pradesh in floriculture is only 5% which is at near bottom as compared to other states of country even very small states like Karnataka, Tamil Nadu are far ahead (>10%). Therefore, this sector can be identified as grey area which can be directly included in different farming systems as a viable diversification from the traditional field crops because of higher returns.

- Spices sector is one of the most vibrant sectors of the Indian agricultural trade. The share of spices in the total agricultural export works out to about 6 per cent annually. The world demand for organic spices is growing rapidly in developed countries like Europe, USA, Japan and Australia, India has a greater potential to encash this trend by diversifying into high-value-plus crops like saffron, cardamom, turmeric, chillies, ginger and vanilla beans.
- The demand for organic fruits and vegetables is increasing at a rapid pace. Such horticultural produce grown through organic means is nutritionally superior and free from the injurious pesticide residues. The protocol for organic production in many horticultural crops has been worked out which includes a use of resistant varieties, management of soil, use of vermi-compost and bio-fertilizers, and management of disease and pests using biological control as well as bio-pesticides. Recently Sikkim has been announced as hundred per cent organic cultivation state.
- The country has a vast production base which offers growth opportunities for export. Mangoes, Walnuts, Grapes, Bananas, Pomegranates account for larger portion of fruits exported from the country while Onions, Okra, Bitter Gourd, Green Chillies, Mushrooms and Potatoes contribute largely to the vegetable export basket. The major destinations for Indian fruits and vegetables are UAE, Bangladesh, Malaysia, Netherland, Sri Lanka, Nepal, UK, Saudi Arabia, Pakistan and Qatar. Floricultural exports from India comprise of fresh cut flowers (to Europe, Japan, Australia, Middle East and USA), loose flowers

(for expatriate Indians in the Gulf), cut foliage (to Europe), dry flowers (To USA, Europe, Japan, Australia, Far East and Russia), potted plants (limited to Middle East) besides seeds and planting material.

- Among fruits mango, guava, banana, papaya, aonla, bael, vegetables okra, onion, potato, cabbage, watermelon, flowers rose, tuberose, gladiolus, marigold and medicinal and aromatic plants artemisia, mentha, citronella, ashwagandha, palmarosa, brahmi, basil, damask rose, vetiver, lavender, are the potential crops. Standard of these crops may be validated/refined for export parameters in which APEDA and Directorate of Agriculture Marketing and Foreign Trade play a nodal role.
- **Agroforestry** conserves natural resources through various systems under different agro climatic regions. Millions of farmers are dependent on agroforestry farming systems as a way of increasing and sustaining agricultural productivity, as a source of essential food, fuel wood, fodder and building materials and as a supplementary source of income. In Uttar Pradesh enough forest cover is present in various pockets eg. Vindhyan, Tarai and Eastern Plain region where farming system based on agri-silvi pasture, horti-silvi pasture and other agro-forestry modules can be popularised to enhance the farmers' income.
- **Quality seeds** play significant role in the agriculture production. Farmers can enhance their income through participatory hybrid seed production programme for different seed companies. It is a form of contract farming where farmers are supplied with inbred lines for further crossing and production of hybrid seeds of vegetable crops. Hybrid seed production and other open pollinated seed production including planting material of vegetable crops, floriculture and fruit plants is the potential sector for prompt enhancement in farmers' income. Hence, this sector should be promoted in PPP mode. The productivity of horticultural crops like fruits, vegetables, flowers, plantation crops and spice crops can be increased by supply of disease free quality planting material to farmers.
- **Beekeeping** is an agro-based activity which is being undertaken by farmers/landless labours in rural area as an integrated farming practice. In various agricultural and horticultural crops, honey bees' pollination also improves the quality of produce. Honeybees, in addition to enhancing the yield of various crops also convert nectar and

pollen into honey and other beehive products, viz. bees was, royal jelly, propolis, etc. which provides additional income to the farmers/beekeepers.

- **Mushroom** cultivation can also represent a valuable small-scale enterprise option. Surplus crop residues which are being burnt in the country and becoming a threat for ecology should be utilised for casing preparation in mushroom production as example of 10% surplus provided significant gain in mushroom production.
- **Urban and peri-urban horticulture** needs to be promoted as one of the facets that will keep cities clean, as it has highest potential to reutilise recycled water and solid waste (compost) for gainful purposes.
- **Tomato, potato and onion are the most sensitive crops** to price fluctuations form almost 50 per cent of the total fruit and vegetable sales. The prices of tomato, onion and potato fluctuates owing to disparity between demand and supply fuelled by the clash of interests between the consumer, the producer and the middlemen on account of a drop in production because of unfavourable weather, a rise in transport costs, seasonality and supply chain constraints. To reduce price fluctuations, a complementary storage option to be developed to locate buffers of onion and potato close to the markets. These need not be high technology systems but designed to cater to a two week inventory cycle from the buffer into market. All efforts to increase potato production must be balanced with developing external demand and hence export trade needs to be promoted if pursuing future growth in production. A favourable trade policy for potato will favour higher production and productivity and also promote growth in cold-chain.
- Potato seed production at present is being taken up only in a few states like Punjab, Haryana and Uttar Pradesh. The seeds produced in these states are supplied to other producing states of the country. Seed production in states like Karnataka, Madhya Pradesh, Gujarat and Odisha can be promoted, so that the farmers of these states may get quality seed at reasonable prices.
- Protected cultivation of tomato needs to be promoted in different peri-urban areas, to meet the demand during lean period, i.e., from July to October.

- Area expansion programme for kharif and late kharif onion can to be taken up in non-traditional states like Madhya Pradesh, Rajasthan, Haryana, Bihar, Odisha and Gujarat to avoid the pressure on Maharashtra, Karnataka, Andhra Pradesh etc. during lean period i.e., July to March. Onion seed production is presently being undertaken by traders in the states of Maharashtra, Gujarat and some part of Madhya Pradesh, to supply the seed all over the country. Suitable seed producing pockets in other state like Rajasthan, Punjab, Bihar and Odisha can be developed so that there is more availability of seed at reasonable price across the country. Onion storage capacity is required to be enhanced in the states of Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh, Bihar, Odisha, etc. to cater the needs of north and north eastern regions of the country.
- The PRAMs (**Primary Rural Agri-Markets**) would serve for direct marketing to local buyers. PRAMs created at village level be modernized and established as aggregation hub to ensure the marketing of produce. These market will work on the line of Horticultural Producers' Co-operative Marketing and Processing Society Ltd. (HOPCOMS) and Mother Dairy Fruit and Vegetable Pvt. Ltd. (SAFAL) programmes. At least one modern state-of-art terminal flower market is required to be developed near each major metropolitan cities.