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Horticulture

Recognising the Role of Women in Swachh Bharat Mission

Swachh Shakti Saptah, a week-long programme of activities across the country was launched by the Ministry of Drinking Water and Sanitation on 1st March, 2017 to highlight the role of women in Swachh Bharat Mission and to recognize their leadership. The objectives of the event were to (i) honour women Sarpanches, grassroots champions, and other Swachhagrahis who have played a pivotal role in making their villages Open Defecation Free (ODF) (ii) bring to light, from women's perspective, various aspects of sanitation, poverty alleviation, skill India, digital India, housing, and Beti Bachao/ Beti Padhao (iii) appraise the women



The Prime Minister, Shri Narendra Modi addressing at 'Swachh Shakti 2017' - A Convention of Women Sarpanches, in Gujarat on March 08, 2017

sarpanches of the various development innovations in Gujarat such as (i) Dairy Development (ii) Water Conservation (WASMO model, drip irrigation) (iii) Self Help Groups (iv) Food Processing (v) E-Gram / Digital Gram (vi) Khadi and (v) Agriculture Produce Markets. The event also aims to (i) Be a reminder to all the participants and dignitaries of their commitment to Swachh Bharat Mission (ii) Facilitate inter-ministerial capacity building as it pertains to SBM action plan, technologies, behavior change etc. (iii) Encourage support to the felicitated GPs to ensure ODF sustainability (v) Propagate successful ideas and foster leadership among poor performing districts and (vi) Encourage a similar event at the State level for Gram Panchayats to enable cross-learning

The national launch of Swachh Shakti Saptah was made in Gurugram, Haryana, at a joint event with the Government of Haryana. Over 1000 women swachhta champions from grassroots in Haryana attended the event.

Nationwide events honouring women champions, women sarpanches, ASHA workers, school teachers, young students and senior citizens marked the Saptah which culminated with a mega-event in Gujarat named Swachh Shakti 2017 where the Prime Minister, addressed 6000 women Swachhagrahi Sarpanches from ODF Gram Panchayats across the country and honoured them for their contribution to Swachh Bharat. Addressing the Swachh Shakti 2017, at Gandhinagar the Prime Minister said that 2019 will mark the 150th birth anniversary of Mahatma Gandhi, who, he recalled, had stated that cleanliness is even more important than political freedom.

The Prime Minister urged the gathering to maintain the momentum which has been generated towards cleanliness. He asserted that Swachhata, or cleanliness, has to become our habit. He said the poor gain the most when we achieve cleanliness and eliminate dirt. He also asserted that he can see the determination to make a positive difference when he meets women Sarpanches, who, he added, wish to bring about a qualitative change. Talking about the 'Beti Bachao, Beti Padhao' initiative, he said that villages with women Sarpanches can play a key role in the drive to end female foeticide.

Over 1.7 lakh villages and 118 districts have already been declared Open Defecation Free (ODF). Women across the country have championed the cause of a Swachh Bharat at the grassroots and have played a leading role in the progress made so far.



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Kurukshetra seeks to carry the message of Rural Development to all people. It serves as a forum for free, frank and serious discussion on the problems of Rural Development with special focus on Rural Uplift.

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Editorial

Our country is the second largest producer of fruits and vegetables in the world. Most of us take pride in this fact. But very few are aware that India's horticulture output has consistently exceeded the production of foodgrains for past several years. No wonder then, the horticulture is emerging as the main growth engine of Indian agriculture.

India is bestowed with diverse soil and agro-climatic conditions. This makes the country particularly suitable for growing a wide variety of horticultural crops such as - fruits, vegetables, ornamentals, medicinal plants, spices, mushrooms and flowers. These crops play a unique role in India's economy by improving the income of the rural populace.

Because the cultivation of the horticultural crops is labour intensive, they generate lot of employment opportunities for the rural population. In fact, the small and marginal farmers have taken a lead in this sector as horticultural crops give them higher returns per unit area. Amid concerns of changing climate, horticulture has demonstrated its resilience to drought and other extreme weather events. This makes horticulture's role altogether more important in ensuring the income security of our farmers and achieving 4.0 per cent growth rate in agriculture.

Other than farmers, horticulture holds importance for industry as well. It sustains a large number of agro based industries by the way of supplying raw materials to them. These industries also generate large number of employment opportunities for youth in processing and marketing of horticultural products.

Besides the domestic industry, export potential of horticultural products is also growing by day. For example, there exists a big gap between the demand and supply of floricultural products globally. India can capitalise on this by exporting the diverse and rich varieties of flowers that it grows.

Then there are some newly emerging areas in horticulture, such as- mushroom cultivation. Demand and production of mushrooms in country is increasing every year. Indian growers and consumers further need to be made aware of the qualities of mushrooms, particularly the nutritional and medicinal values.

So far, we talked about the horticulture as a farm or industrial activity. But quite a significant production is taking place at household level too, with people growing vegetables in their backyard and flowers in the pots kept in the balconies. Fresh vegetables produced such, provide the vital nutrients to family members.

Thus, we can see that horticulture can play an important role in country's poverty alleviation and nutritional security. Fruits and vegetables are very important in overcoming vitamin and micronutrient deficiencies; and we all are aware of the worryingly high levels of malnutrition among the children, women and adolescent girls in India.

These all reasons have prompted the Government to initiate a number of policies for horticulture promotion. A National Horticulture Board has been set up with specific mandate of promoting the horticulture. National Horticulture Mission is being implemented across 18 states; remaining states being covered under a separate Horticulture Mission for North East & Himalayan States. In addition special schemes exist for bamboo and coconut. In 2014-15, these schemes were subsumed under the Mission for Integrated Development of Horticulture to bring about better coordination and synergy.

These schemes are trying to address the issues inhibiting the growth of horticulture sector, viz- high wastage due to inadequate storage and processing facilities and poor functioning of distribution and marketing chains. Most of these issues require regulatory or technological interventions. So, the Government needs to focus on both these aspects. In the end we can say, if country's horticulture potential is harnessed wisely, it would go a long way in achieving the stated goal of 'doubling the farmers' income by 2022'.

HORTICULTURE: THE GROWTH ENGINE OF AGRICULTURE SECTOR

Dr. Harender Raj Gautam and Rajesh Kaushal

Today, India is food secure due to our self sufficiency in foodgrains but we have to achieve the goal of nutritional security by making the required quantity of fruits and vegetables available to our population at affordable prices. As continuous area expansion is a constraint, our focus is needed on crop intensification, productivity and quality for higher returns.

Horticulture has emerged as the main growth engine of Indian agriculture in the last two decades with spectacular performance in term of production. Horticulture contributes 30.4 per cent to GDP of agriculture from nearly 13 per cent of the total cropped area and support nearly 20 per cent of the agricultural labour force. India has witnessed voluminous increase in horticulture production over the last few years. Over the last decade, the area under horticulture grew by about 2.7 per cent per annum and annual production increased by 7.0 per cent. The area under fruit crops during 2014- 15 was 6.2 million ha with a total production of 89.5 million MT (metric tonnes). Vegetables are important component in horticulture sector, occupying an area of 9.5 million ha during 2014-15 with a total production of 167.1 million tonnes with average productivity of 17.3 MT/ha. Horticulture continues to surpass the food grain production for the last three years, with an annual production of 283.5 million MT in comparison to food grain production of 257.1 million MT in 2014-15. India witnessed the shift in area from foodgrains towards horticultural crops over last five years (2010-11 to 2014-15). The area under horticultural crops has been increased about 18 per cent, but expansion of area under foodgrains is only 5 per cent during the stipulated period.

Horticulture mainly constitutes of fruits, vegetables, ornamentals, medicinal and aromatic plants, mushrooms and many allied activities like bee-keeping sericulture etc. Today, India is food secure due to our self sufficiency in foodgrains but we have to achieve the goal of nutritional security by making the required quantity of fruits and vegetables available to our population at affordable prices. As

continuous area expansion is a constraint, our focus is needed on crop intensification, productivity and quality for higher returns.

Fruit Production:

In India, the major share in total fruit production is of mainly banana (33.4 per cent), mango (20.7 per cent), citrus (12.5 per cent), papaya (6.3 per cent), guava (4.1 per cent), grape (2.9 per cent) and apple (2.8 per cent). The major fruit producing states are Andhra Pradesh, Maharashtra, Karnataka, Bihar, Uttar Pradesh, Tamil Nadu, Kerala and Gujarat. These eight states account for 70 per cent of the area under fruit cultivation. If horticulture is to gain further momentum in the country, we need to improve our productivity. Fruit productivity in India is only 12.3 MT/ ha in comparison to 23.3 in USA, 22.3 in Indonesia and 16.5 in Brazil. Productivity of banana (37.0 MT/ ha) is better in India than the world average of 21.2 MT/ ha, but lower than the best of 58.9 MT/ ha in Indonesia. Productivity of orange is (11.6 MT/ ha) in India .The productivity of apple is only 8.0 MT/



ha in India. In banana, Madhya Pradesh leads with 66.0 Mt/ha followed by Gujarat (63.5 MT/ha) in productivity. Average productivity of mango in the country is 7.1 MT/ ha, but productivity of mango in Andhra Pradesh is 16.4 MT/ ha. Similarly, Karnataka (21.9 MT/ ha), Punjab (20.7 MT/ ha and Rajasthan (18.0 Mt/ ha) are far ahead in citrus productivity.

Vegetable Production:

Vegetables constitute about 60 per cent of horticulture production. Potato, tomato, onion, brinjal, cabbage and cauliflower account for maximum share in vegetable production in the country. Total vegetable production was highest in case of West Bengal (23,045 thousand tonnes) followed by Uttar Pradesh (18,545 thousand tonnes), Bihar, Madhya Pradesh, Gujarat, Maharashtra and Odisha. Though, India is the second largest producer of the vegetables, but our productivity of 17.3 MT/ ha is far lower than other leading countries. There is a huge gap in the productivity of important vegetable crops like potato, tomato, brinjal, onion and cabbage. Countries like USA, Netherlands and Germany are far ahead in potato productivity than India. Productivity of onion 16.1 MT/ ha in India. Our productivity of brinjal is only 19.1 MT/ ha in comparison to 68.5 MT/ ha in Spain and 36.0 Mt/ ha in China. In cabbage, Republic of Korea recorded the highest productivity of 71.2 MT/ ha followed by Japan (67.6 MT/ ha) in comparison to 22.6 Mt/ ha in India.

Floriculture:

Usually, the small land-holding pattern is considered a handicap for the country's agricultural production but floriculture is an advantage in due to its 'low volume, high value' character. Since, the sector has a huge export potential, this sector can provide a lot of opportunities to the farmers after proper training. Increasing domestic demand for both cut and loose flowers has also attracted farmers, mainly in leading flower producing states like Tamil Nadu, Karnataka, West Bengal, Madhya Pradesh and Maharashtra, towards floriculture. States like Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim have huge untapped potential in this field. The north-eastern states, especially Mizoram, have also turned towards cultivating flowers of export varieties in a big way.. The major export destinations are United States, Netherlands, Germany, United Kingdom, United Arab Emirates, Japan and Canada.



Mushroom Cultivation:

Mushroom cultivation has become a profitable business with the produce fetching good returns in the market because of the rise in demand for edible mushrooms. India generates over 600 million tonnes of agricultural residues and a large amount of it is either burnt in situ or left in the fields for natural decomposition. The annual world production of all types of mushrooms is estimated to be over 25 million tonnes. Important species of mushrooms in cultivation are button, shiitake, oyster, wood ear and paddy straw mushrooms and all of these contribute 99 per cent of the total world production. India produces only 0.12 million tonnes mushroom out of which, button mushroom contributes about 85 per cent of the total mushroom production of country. Out of the vast pool of agricultural residues, even if 1 per cent is utilized for mushroom production, the country can produce over 3 million tonnes of mushrooms and 10 million tons of organic manure annually. Mushrooms can play an important role in the livelihoods of rural and peri-urban dwellers, through food security and income generation. Mushrooms can make a valuable dietary addition through protein, various micronutrients and their medicinal properties. In addition, mushroom cultivation can also represent a valuable small-scale enterprise option.

Policy Initiatives:

Central Government has taken major initiatives in 10th and 11th Five Year Plans for accelerating the growth of horticulture in the country. A National Horticulture Mission was launched as a Centrally Sponsored Scheme to promote holistic growth of the

horticulture sector through an area based regionally differentiated strategies. The three flagship schemes having an impact on horticulture development are, National Horticulture Mission, Horticulture Mission for NE and Hilly Areas and Rashtriya Krishi Vikas Yojana are being implemented simultaneously. Success of these schemes prompted the Central Government to launch Mission for Integrated Development of Horticulture (MIDH) during XII Plan (w.e.f. 2014-15) for holistic growth of the horticulture sector covering fruits, vegetables, root and tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo. The Mission subsumes the earlier missions like National Horticulture Mission (NHM), Horticulture Mission for North East & Himalayan States (HMNEH), National Bamboo Mission (NBM), National Horticulture Board (NHB), Coconut Development Board (CDB) and Central Institute for Horticulture (CIH), Nagaland. All States and UTs are covered under MIDH.

The mission envisages production and productivity improvement of horticulture crops including fruits and vegetables through various interventions. Activities such as production of planting material, vegetable seed production, coverage of area with improved cultivars, rejuvenation of senile orchards, protected cultivation, creation of water resources, adoption of Integrated Pests Management (IPM), Integrated Nutrients Management (INM), organic farming, including *in-situ* generation of organic inputs are taken up for development of fruits and vegetables. Capacity building of farmers and technicians are also provided for adopting improved technologies. This scheme also envisages creation of infrastructure for Post Harvest Management (PHM), Good Agricultural Prices (GAP), Centre for excellence for horticulture and marketing for holistic growth of horticulture sector. As agriculture is a concurrent subject, many State Governments are taking novel initiatives for boosting the growth and productivity of horticulture in their respective states. Himachal Pradesh has a strong economy of more than Rs. 6500 crore annual income based on horticulture as the main occupation of the people. Apple cultivation is going to have a major boost in the State with the implementation of Rs. 1100 crore World Bank aided project for the next 5 years

Research and technology generation are essential for achieving higher productivity and quality

in horticulture. The Indian Institute of Horticultural Research was the first horticulture research institute established by the ICAR in September 1967 for concerted and focussed research in the field of horticulture. The institute located near Bengaluru at Hesaraghatta is credited for developing and conserving 6,900 different varieties of vegetable, fruits, medicinal and ornamental crops in the field gene bank of the institute. Then, another major initiative in the country was establishment of Dr Y.S. Parmar University of Horticulture and Forestry in 1985 at Solan in Himachal Pradesh which has played a significant role in technology generation in temperate and sub-tropical horticulture. Now, there are separate horticulture universities in the States of Haryana (Central university), Uttarakhand, Andhra Pradesh and Karnataka

Challenges:

Productivity Enhancement: The reasons for low productivity can be attributed chiefly to non-availability of quality planting material, dwindling natural resources, resource-poor farmers, low adoption of modern technologies, etc. The challenge is to enhance productivity by increasing factor productivity in all horticulture-production inputs while sustaining it by adopting good agricultural practices and precision-farming principles.

Value-Addition and Reduction in Post-harvest Losses: At present, there is a huge mismatch between production capacity of fruits, vegetables, flowers and medicinal crops in the country, and the infrastructure available for post-production distribution, storage and value-addition. Food processing can reduce the huge losses of Rs. 55, 000 crores in foodgrains, fruits and vegetables. Value addition can be done in foodgrains, fruits, vegetables, dairy products, meat, poultry, fish and medicinal and aromatic plants. Theoretically, one per cent post-harvest loss reduction of horticulture produce is expected to save Rs 230 crores annually. There are number of diversified ventures in agriculture which are suited to almost every region and economic strata of the population. Food Processing Industry is employment intensive. It has been estimated for India that for every Rs.10 million invested, it creates 18 jobs directly and 64 indirectly in the organized sector and 20 jobs in the unorganised sector across the supply chain.. For the projected growth in the Food Processing Industry, it

is expected that the requirement of human resource would be about 17.8 million in 2022. Agro-food processing industries should be concentrated in the production hubs of different crops so that prices of the crop produce are stabilized in the market and farmers also get remunerative prices.

High-tech Protected Cultivation: Protected cultivation is high-tech cultivation which result in 5 to 12 times higher output than cultivation in the open field. In India, protected cultivation under polyhouses is approximately 25, 000 hectares which is negligible in comparison to some of the leading countries in the field of protected cultivation. In India, we have about 232.74 thousand hectares area under cultivation in floriculture in 2012-13. Our yield potential is still lower in comparison to world leaders in protected cultivation. In Haryana, National Horticulture Mission (NHM) has joined hands with Israel to rope in farmers in protected cultivation in vegetable farming. Under this, Indo-Israel Centre for Excellence in Vegetables has been established at Gharaunda near Karnal and the project is spread over 15 acre and doing a business of Rs 55 lakh per annum. On an average, setting up a green house or poly house on one acre of land requires around Rs 40 lakh (Rs 900 per sq m) and in one year it gives a minimum return of around Rs 60 lakh.

Streamlining Marketing of Agriculture Produce: Our system of marketing also needs major technology and capital intervention to modernize and unify the marketing network in different parts of the country. Such interventions will help to raise the income of the farmers, reduce the post-harvest losses in the crops and will also help in moderating the prices of the different commodities. Central Government has allocated Rs. 200 crore to the newly created Agri-Tech Infrastructure Fund, which would support online integration of 585 Agricultural Produce Market Committee (APMC) marketing yards in the next three years. Further, Government has made available an outlay of Rs 5,000 crore for the next five years. Marketing system can be unified through online agri-trade in which Karnataka has done exemplary work. The state has integrated 55 mandis with trade to the tune of Rs 8,500 crore.

Technology Transfer Tools: Technology transfer in agriculture should focus on key interventions at different stages of the crop starting from land

preparation to sowing of the seed, crop protection, harvesting, post-harvest management and marketing. Technology transfer need effective interactive groups at grass root level in the villages. These groups should become the tool for disseminating information about various government sponsored schemes and these entities will help in liaisoning with various Govt. departments for developmental activities. A comprehensive Kisan knowledge Management Systems (KKMS) should be developed to provide and disseminate information related to the modern technology, modern farm implements, best agricultural practices and post-harvest management including market information. Dissemination of crucial information related to weather data and agro climatic conditions, prices of agriculture produce is needed by the farmers at regular basis. There are various interventions like Village Knowledge Centres, Farm Schools, Farmer's Clubs, Kisan Call Centres, Radio and Television, Mobile Phones, Internet and dedicated television Kisan Channel of Doordarshan which are making a good impact and their delivery system should be made more effective and target oriented. Community Radio Stations should be established in Agriculture Universities and institutes for the dedicated services of technology dissemination. Gram Panchayats should be developed as the knowledge centres with internet connectivity.

Integrated Disease and Pest Management Strategies: There is need for more emphasis on Integrated Pest Management (IPM) to manage the target pests effectively with reduced synthetic pesticides and development of new non-chemical, eco-friendly approaches such as botanicals, bio-control agents and semio-chemicals. Further, bio-intensive IPM and IDM strategies should be developed in order to reduce the development of resistance to pesticides and mitigate pesticide residue problems in horticultural produce. Such efforts will increase the nutritional benefits to the consumers and also have a positive impact on the exports of horticultural produce.

Efficient Use of Natural Bio-resources in Production: There should be emphasis on such production systems in horticultural crops which are sustainable and efficient. Irrigation should be augmented with the modern methods and integrating the same with the water harvesting at

HORTICULTURE: TOWARDS A SILENT REVOLUTION

Dr. Parveen Kumar

The horticulture sector is the one which can escape the weather shocks, if not the price drops. It has all the potential to help 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 generates large number of employment opportunities besides helping to achieve the national goal of 4.0 per cent agricultural growth.

Within the agriculture sector, the horticulture sector is now widely recognized as the most rapidly growing sector. It has been rightly called a 'Silent Revolution'. The agriculture sector in India has yet achieved another feat. Not many of us know that the production of horticulture including fruits and vegetables has exceeded the food grains production. If we talk of the last decade alone, the horticultural output has increased by nearly 70 per cent from around 167 million tonnes in 2004-05 to over 283 million tonnes in 2014-15. This was higher than the food grains production in that year. The year 2016-17 is the fifth consecutive year when the horticulture production will outstrip that of food grains as per advance estimates. The data further shows that the horticulture crops were planted in an area spanning over 24.4 million hectares in 2016-17, marginally lower than 24.5 million hectares planted in 2015-16. Among the states, Uttar Pradesh tops the list with an estimated horticulture produce of 37 million tonnes followed by West Bengal 27.5 million tonnes, Gujarat 23.4 million tonnes and Madhya Pradesh and Maharashtra (20.7 million tonnes each).

The overall share of horticulture in the agriculture sector's gross domestic product has grown to over 30 per cent, even though it accounts for nearly 17 per cent of the farm land. The country is, in fact, the leader in several horticultural crops including mango, banana, papaya, cashewnut, areca nut etc. According to Agricultural Census 2010-11, over 87 per cent of the total vegetables and 90 per cent of fruits are grown by small holders.

One of the possible reasons for this could be that the cultivation of horticultural crops particularly vegetables is highly labour intensive and the small cultivators easily manage it largely with family labour. Most of the horticultural crops are grown with assured irrigation and are therefore, more immune to monsoon deficits. This varies from 71 per cent of the area irrigated for tomatoes to 86 per cent for potato. Nearly 7 per cent of the land in the country producing the eight main vegetables (onion, potato, tomato, okra, cauliflower, cabbage, brinjal and tapioca) has access to irrigation. In comparison to this, only 50 per cent of area under food grains has access to irrigation. With the exception of wheat, which is an irrigated crop, irrigation access varies from 16 per cent for pulses to 59 per cent for rice. Better incomes, urbanization and a change in consumption pattern in favour of fruits and vegetables seem to be driving the demand for their more production and this is being addressed by small farms. Consumption data from the National Sample Survey Organization (NSSO) shows that while monthly consumption of cereals per person in rural areas declined from 13.4 kg in 1993-94 to 11.2 kg in 2011-12, consumption of vegetables went up from 2.7 kg to 4.3 kg during this period.

Milestones in the Horticulture Sector:

- The fifth consecutive year horticultural production will outstrip the food grains production is an evidence of structural changes in the Indian agricultural sector.
- The technology led gains in the productivity of horticultural crops have given the farmers

an opportunity to diversify from food and other crops to horticulture which are more remunerative.

- The small and marginal farmers have taken a lead in taking horticulture and also that a considerable chunk of land that has been brought under horticultural crops is irrigated. This is quite encouraging.
- The impact of irrigation, better agronomic practices and improved varieties has been reflected very well in the robust growth of horticultural output which is estimated at around seven per cent a year in the past decade.
- The acreage under horticulture has also grown by around two per cent a year. Significantly, horticulture production has either continued to grow or dip only marginally even during bad monsoon years including the drought years of 2004, 2009, 2014 and 2015.
- Horticulture has also demonstrated its resilience to drought by producing more. It could have been still more, had the constraints faced by the horticulture sector been addressed.

Table 1: Horticulture Production over the years:

S. No	Year	Production (metric tonnes)
1	2013-14	268.8
2	2014-15	283.5
3	2015-16	286.2

Table 2: Leading Fruit producing States in India

S. No	State	Production (million tonnes)
1	Uttar Pradesh	37.0
2	West Bengal	27.5
3	Gujarat	23.4
4	Maharashtra	20.7
5	Madhya Pradesh	20.7

Government Efforts for Horticulture:

Keeping in view the importance of the horticulture sector in the Indian economy

,the Government of India has started various schemes for holistic development in the field of horticulture. The National Horticulture Mission (NHM) is now a part of the Mission for Integrated Development of Horticulture (MIDH). It had taken off from 2014-15 and integrates the ongoing schemes of National Horticulture Mission, horticulture mission for North East and Himalayan States, National Bamboo Mission.

Table 3: Different Schemes for the Development of Horticulture

S. No	Name of the scheme	Objective
1	National Horticulture Mission under MIDH	Implemented by state horticulture missions in selected districts of 18 states and four union territories for overall development of Horticulture.
2	Horticulture Mission for North East and Himalayan states under MIDH	Implemented for overall development of horticulture in North East and Himalayan states including Sikkim and three Himalayan states of J&K, Himachal Pradesh and Uttarakhand
3	Market Intervention Scheme (MIS) Government of India with state governments	For horticultural produce not covered under price support mechanism to prevent distress sale in the event of bumper crop
4	Pradhan Mantri Fasal Bima Yojana (PMFBY) Ministry of Agriculture and Family welfare	To provide insurance cover to horticultural crops at the rate of 5 per cent of the total sum assured
5	Micro Irrigation (Government of India 80 per cent and State Government 20 per cent)	To promote the use of micro irrigation techniques like Drip and Sprinkler irrigation system. Each beneficiary to be assisted to install micro irrigation systems in their holdings to a maximum extent of 5 hectares.

Challenges in Horticulture Sector:

- a. **Lack of Good Quality Planting Material:** The yield of the fruit trees in India is far less than in most of other countries. This is being attributed to the lack of quality planting material. For instance, in India, the average Mango production is 3-4 tonnes per acre as against 8-10 tonnes per acre in developed countries.
- b. **Lack of Post Harvest Produce Management Chain from Farm to Fork:** As most of the horticulture produce is perishable, lack of suitable post harvest structures and value addition facilities at the grass root levels deincevntize the farming community to take on horticulture as a primary profession.
- c. **Multiplicity of Intermediaries:** Although, consumer prices of the fruits remain higher, but the hard reality is that most of the fruit growers do not get reasonable returns for their produce. This is perhaps because of the lack of regulated markets and in their absence, the multiplicity of intermediaries in marketing which consumes a large chunk of their income from the produce.
- d. **Distress Sale and Mass Destruction:** Due to lack of post harvest structures and an institutional framework for marketing of the produce, at times when there is excess production, the farmer, in an attempt to contain losses, goes for distress selling and sometimes for mass destruction of the produce. There are several instances where the producers do not turn up to reclaim their stocks kept in cold stores because the storage charges would have exceeded the amount they would have got from sale of their produce.

Overcoming Constraints in Horticulture:

- Provision of quality planting material to the growers will help in raising the yields. More produce will come with more income for farmers and farmers will be motivated to grow more of these crops ultimately reducing the pressure from the cereal crops.
- Expansion of fruits and vegetables processing industry with backward linkages with farmers can help in value addition and waste reduction

of the horticultural produce thus, ensuring higher returns to the growers. The Central Government has also recently created a price stabilization fund. This fund can go a long way in preventing wide price fluctuations.

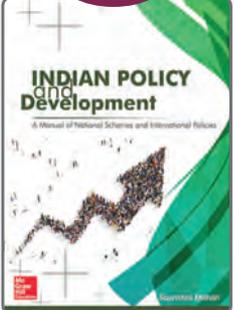
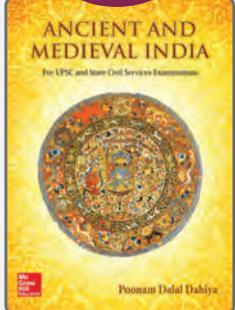
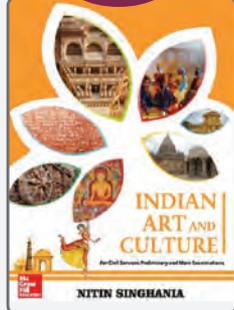
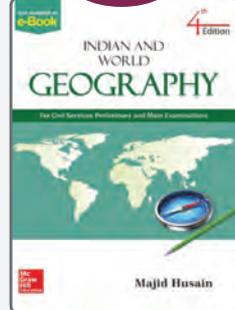
- a. The government has also started the National Agricultural Market which will address the marketing aspect of the growers. Farmers will have access to country wide markets without being physically present there and a choice to sell their produce in the market which gives them the highest returns.
- b. Drought prone and climate resilient fruit plants should be developed and supplied to the growers that should overcome the climate change and give good yields.
- c. The private players should also be encouraged to invest in the horticulture sector by setting up more and more post harvest and cold chain structures and providing value addition facilities. One of the leading Industry which grows 127 varieties of Mango in a 600 acre green belt at its Jamnagar Refinery Complex looks to beat Israel and Brazil in productivity.
- d. Rejuvenation of old orchards is also going on and it should be done on a large scale.
- e. Insurance and price support are also vital factors. Insurance against weather risks like hail storms and other natural calamities which result in fruit drop must be compensated suitable. Similarly, the growers should also get a minimum price support for the produce.

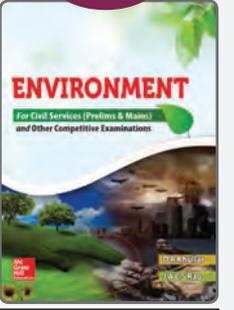
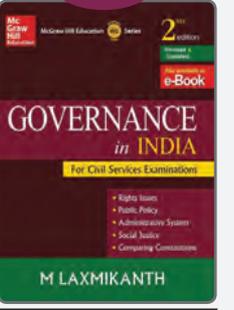
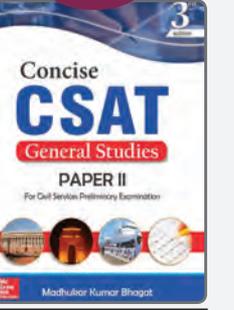
It would not be wrong to say that the horticulture sector is the one which can escape the weather shocks, if not the price drops. It has all the potential to help in poverty alleviation, nutritional security and have ample scope for farmers to increase their income and helpful in sustaining large number of agro based industries which generates large number of employment opportunities besides helping to achieve the national goal of 4.0 per cent agricultural growth.

(The author is Senior Research Fellow; Advanced Center for Rainfed Agriculture (ACRA); SKUAST-J & K. Email: pkumar6674@gmail.com)

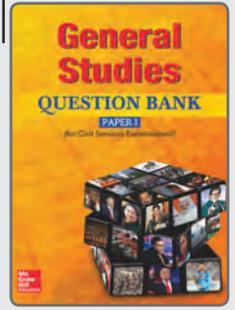
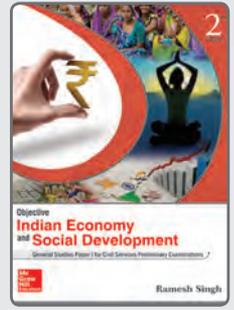
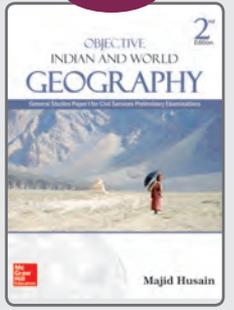
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HORTICULTURE AND INDIAN ECONOMY

Dr. H. Usha Nandhini Devi and Dr. Jawaharlal M

Horticulture is not merely a means of diversification, but forms an integral part of food, nutritional security and poverty alleviation, and also an essential ingredient of economic security. India, like many other countries, is very concerned about food security, thus, rural development has become a primary area of focus in the current agricultural and horticultural development scenario.

India is bestowed with diverse soil and agro climatic conditions suitable for growing a wide variety of horticultural crops. These crops form a significant part of total agricultural produce in the country comprising of fruits, vegetables, root and tuber crops, ornamental plants, medicinal and aromatic plants, spices, condiments and plantation crops.

The importance of horticulture can be substantiated by its benefits like high export value, high yield per unit area, high returns per unit area, efficient utilization of wasteland, provision of raw materials for allied industries, better use of undulating lands, and stabilization of women's empowerment by providing employment opportunities through fruit and vegetable processing, floriculture industry, seed production, mushroom cultivation, nursery business, etc.

Horticultural crops play a unique role in India's economy by improving the income of the rural people. Cultivation of these crops is labour intensive and as such, they generate lot of employment opportunities for the rural population. India with more than 28.2 million tonnes of fruits and 66 million tonnes of vegetables, is the second largest producer of fruits and vegetables in the world, next only to Brazil and China. However, per capita consumption of fruits and vegetables in India is only around 46kg and



130g against a minimum of about 92g and 300g respectively recommended by Indian Council of Medical Research and National Institute of Nutrition, Hyderabad. Fruits and vegetables are also rich source of vitamins, minerals, proteins, carbohydrates etc. which are essential in human nutrition. Hence, these are referred to as protective foods and assume great importance in the nutritional security of the people. Thus, cultivation of horticultural crops plays a vital role in the prosperity of a nation and is directly linked with the health and happiness of the people.

Fruits and vegetables are not only used for domestic consumption and processing into various products (Pickles, preserves sauces, jam, jelly squashes, etc.), but also substantial quantities are exported in fresh and processed form, bringing much-needed foreign exchange for the country. These groups of crops also provide ample scope for achieving bio-diversity and diversification to maintain ecological balance and to create sustainable agriculture and can make an impact on the national economy in the years to come.

India is earning foreign exchange through export of several horticultural produces viz., flowers to America, Netherlands, Germany, Japan, UK, onions to Malayasia, UAE, Singapore, Sri Lanka and Bangladesh; vegetables to Sri Lanka, United States, UAE, Spain, Saudi Arabia, Bangladesh, U.K., Kuwait; fresh grapes to UK, Netherlands,



UAE, Bangladesh, Germany; fresh fruits to Bangladesh, UAE, Saudi Arabia, UK and Sri Lanka processed vegetables to Egypt, Sri Lanka, UAE, America and Turkey and Mango pulp to Saudi Arabia, UAE, Netherlands, Kuwait and Germany; pickles and chut-

neys to UK, America, UAE, Spain etc.

The recent emphasis on horticulture in our country consequent to the recognition of the need for attaining nutrition security and for more profitable land use has brought about a significant change in the outlook of the growers. The need for great utilization of available wastelands against the background of dwindling water and energy resources has focused attention to dry land, to arid and semi-arid tracts and

to horticultural crops, which have lesser demands on water and other inputs besides being 3 to 4 times more remunerative than field crops.

It is estimated that India has 240 million acres of cultivable wasteland, which is lying idle, which can be brought under orchard crops without curtailing the area under food crops. The country has abundant sunshine throughout year, a surplus labour and widely varied agro-climatic condition, which offers a high potential for successful and profitable commercial horticulture.

Horticulture is not merely a means of diversification, but forms an integral part of food, nutritional security and poverty alleviation, and also an essential ingredient of economic security. India, like many other countries, is very concerned about food security, thus, rural development has become a primary area of focus in the current agricultural and horticultural development scenario.

(The Authors H.Usha Nandhini Devi and Jawaharlal.M are with Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. Email: drushajana@rediffmail.com)

ECONOMIC SURVEY 2015-16: HORTICULTURE SCENARIO

According to the Economic Survey 2015-16, the scenario of horticulture crops in India has become very encouraging. The percentage share of horticulture output in agriculture is more than 33 per cent. Under the purview of agriculture and allied activities, the share of plan outlay for horticulture, which was 3.9 per cent during Ninth Plan, has increased to 4.6 per cent during the Twelfth Plan.

India has witnessed voluminous increase in horticulture production over the last few years. Significant progress has been made in area expansion, resulting in higher production. Over the last decade, the area under horticulture grew by about 2.7 per cent per annum and annual production increased by 7.0 per cent. During 2013-14, the production of horticulture crops was about 283.5 million tonnes from an area of 24.2 million hectares. Out of the six categories e.g., Fruits, Vegetables, Flowers, Aromatic plants, Spices and Plantation Crops, the highest annual growth of 9.5 per cent is seen in fruit production during 2013-14. The production of vegetables has increased from 58,532 thousand tones to 1,67,058 thousand tonnes since 1991-92 to 2014-15(3rd AE).

India witnessed sharper increase in acreage in horticulture crops compared to food grains over the last five years (from 2010-11 to 2014-15) the area under horticulture crops increased around 18 per cent compared to an expansion of area under food grains by 5 per cent during the stipulated period. The production of horticulture crops have outpaced the production of food grain since 2012-13.

BIOTECHNOLOGY IN HORTICULTURE

Dr. Nagma Kausar, Dr. Shiva Jauhari

Use of bio-technology in agriculture is said to be a future strategy to solve the problem of poverty, malnutrition and hunger. A considerable progress has also been made in this regard. But still there are many issues in promoting R&D, extension, commercialization and bio-safety. Addressing these will go a long way in promotion of horticulture industry in the country and to enhance India's capability to compete globally.

The Horticultural crops comprise a major segment of agricultural production of our country. It covers the production of fruits, vegetables, medicinal and aromatic plants, flowers and ornamental plants and their management and marketing. The importance of horticultural crops can be justified with many advantages these crops have over other cereal crops like-high production and returns per unit area, high value low volume crop (medicinal and aromatic crops), waste land utilisation, high export value, providing of raw material for food industry and optimal use of undulations on lands. In addition, it provides employment opportunities for women and youth through processing, floriculture, nursery preparation, execution of landscaping plans, mushroom cultivation, etc. Apart from the economic growth, fruits and vegetables are valuable in providing vital nutrients and energy for human body. Thus, the nation will be healthy and wealthy by adopting horticulture.

With increasing population, the requirement of fruits and vegetables is increasing proportionally in the country. In spite of making considerable progress in the development of improved varieties, conventional plant breeding techniques have not been able to keep pace with the increasing demand for vegetables and fruits in the developing countries. Traditional breeding programs can improve some of these crops but the process can be slow. Also, in floriculture and ornamental crops, the success of variety depends on the

choice of individual, which keep on changing very fast as the conventional methods cannot compete the demand.

Therefore, an immediate need is felt to integrate biotechnology to speed up the crop improvement programmes. **Biotechnology is an innovative science in which, the living systems and organisms are used to develop new and useful products.** Biotechnological tools have revolutionised the entire crop improvement programmes by providing new strains of plants, supply of planting material, more efficient and selective pesticides and improved fertilizers. Many genetically modified fruits and vegetables are already in the market in developed countries. The major areas of biotechnology which can be adopted for improvement of horticultural crops are:

1. Tissue Culture.
2. Embryo Rescue is another area where plant breeders are able to rescue their crosses which would otherwise abort.



3. Genetic Engineering.
4. Molecular Diagnostics and Molecular Markers.
5. Development of Beneficial Microbes.
6. GM Crops.

Tissue culture has been one of the main technological tools that has contributed to the 'Second Green Revolution and Gene Revolution'. In tissue culture, whole plants can be developed from single cells under the proper stimuli of growth regulators, growing medium, and light. This technique is economical in time and space, provides greater output, disease free and elite offsprings. The Indian scenario of tissue culture industry clearly indicates that it is a flourishing industry with about 125 tissue culture units with a total production capacity of 300 million plants per annum at present. The Government of India has identified micropropagation industry as a priority area for further research, development and commercialisation. Department of Biotechnology, Government of India, will set up 50 Biotech Laboratories in Senior Secondary Schools of Arunachal Pradesh under the scheme Biotech Labs in Senior Secondary Schools (BLISS) to encourage young and dynamic students. At present most of the large commercial tissue culture laboratories are operative in states like Maharashtra, Karnataka, Kerala and Andhra Pradesh. Rural Technology Centre under CSIR support value added agriculture, medicinal and aromatic plant cultivation, mushroom and floriculture to promote rural technology. Dr. R. Krishnamurthy under National Horticulture Mission 2012-2015, developed Commercial Plant Tissue Culture Laboratory for supplying quality planting materials of Banana to the local farmers.



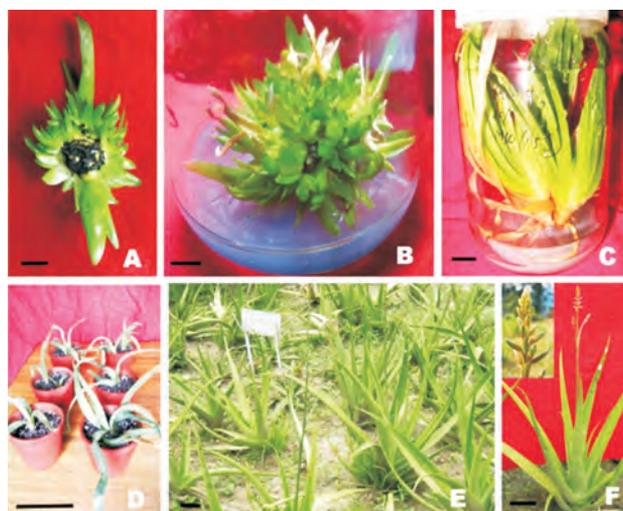
Fig: In vitro cultivation of some fruit crops, Deptt of Horticulture, GB Pant University of Ag and Tech, Pantnagar

Some horticultural crops where tissue culture techniques have been perfected

- a) **Fruit Crops:** Banana, citrus, grape, pineapple, sapota, strawberry etc.
- b) **Vegetables and Tuber crops:** Potato, sweet potato.
- c) **Ornamentals:** Anthurium, carnation, gerbera, lilies, orchids, syngonium rose, chrysanthemum, ficus etc.
- d) **Spices:** Black pepper, large cardamom, small cardamom, ginger, Kalazira, turmeric, saffron etc.
- e) **Medicinal and Aromatic Plants:** Aloe vera, dioscorea, geranium, neem, Pachouli, Stevia sp. etc.
- f) **Plantation Crops:** Tea

Tissue culture has been in practice for some time. For the year 2007-08, it was surveyed that the overall market demand for tissue culture plants was 145 million plants of the above species valuing Rs 136 crores, with a growth rate of 20-25 per cent. In 2002-03, the consumption of tissue cultured plants has been approximately 45 million plants with Banana constituting 41 per cent share followed by Sugarcane at 31 per cent, ornamentals at 14 per cent, spices at 6 per cent and medicinal plants at 4 per cent.

When it comes to the international demand, the foliage and ornamentals have a great potential. Major pot plants and landscaping ornamentals



Different stages of Micropropagation and field performance of Aloe vera

like Ficus, Spathiphyllums, Nerium, Alpenia, Rose, Statis, Lilies, etc. are routinely produced by various plant tissue culture laboratories in India. In countries like Australia and Central America, bananas are always cultivated with tissue cultured plants after indexing for virus. The productivity of Banana in India through conventional method was 15 kg /plant. The productivity can be enhanced to about 50 kg/plant from the same area by replacing the conventional methods of use of suckers with tissue cultured plantlets in Banana. Development of a Cardamom variety through tissue culture is yielding 250 kg/ha, which can be cropped in two years, compared to conventional grown plants yielding 70 kg/ha and maturing in 3 years. Similarly, micro tuber production in potato has been scaled-up using the bioreactor technology at Hindustan Lever Ltd., Mumbai. Developed countries are also using tissue culture extensively. For example, majority of all commercially produced strawberries are developed from plantlets produced in tissue culture labs in European countries.

Another aspect of plant tissue culture is to produce somaclonal variation which means to generate genetic variations that may be needed in breeding program. In different crops like Potato, improvement of tuber shape, colour and uniformity, and late blight resistance were developed. In the ornamental sector, 22 new cultivars of Syngonium were developed through variations. Similarly, Labland Biotech, Mysore has obtained one unique, stable variant of Spathiphyllum which is being registered as the new variety named 'Sona' and is being multiplied commercially for both domestic and overseas market in large numbers. The first transgenic crop to reach the market was the Flavr Savr tomato. Further, sweet corn, potato, squash and papaya varieties, engineered to resist insects and viruses have been approved for commercial use and marketed. Papaya is the only horticultural crop for which transgenic varieties have achieved a significant market share (About 70 per cent of the Hawaiian crop shipped to the continental United States is transgenic).

The Division of Biotechnology under Indian Institute of Horticultural Research (IIHR) focuses on research on specific areas which includes, gene discovery, regeneration and development of transgenic, molecular markers, marker assisted

selection, functional genomics and bioinformatics. Some major achievements of the Division are:

- Development of BT transgenic Brinjal and Tomato.
- Cloning of genes for fungal resistance and transgenic development.
- Development of embryogenic suspension of Banana and GM Banana for Fusarium wilt resistance.
- Development of GM Tomato, Papaya and Watermelon for virus resistance.
- Protocols for micropropagation of various horticultural crops which includes fruit crops, ornamentals and medicinal plants have been developed.
- Breeding Black Pepper for high yield, quality and resistance to stresses.
- Breeding Cardamom for high yield and disease resistance.

Role of Government in Plant Tissue Culture Industry:

To encourage the tissue culture industry, various departments under Central and State Governments have framed several schemes and incentives some of which are listed below-

- (a) **Department of Biotechnology (DBT):** DBT supports research and development projects across the country at various laboratories in the universities and research institutions for development and standardisation of tissue culture protocols. Under a scheme called Small Business Innovation Research Initiative (SBIRI), the private tissue culture units are entitled for expansion of existing units. To promote the adoption of tissue culture technology by the industry and the end user, the department has established two Micro-propagation Technology Parks (MTPs) which provide a large number of service packages and have an important mandate of training and generating skilled manpower. The MTPs have transferred about 10 technologies to the industry and have also provided consultancy and taken up turn-key projects for various end users and state

departments. The department has also set up a national facility for virus diagnosis and quality control of tissue culture raised plants, which are located at 6 different centres in India to ensure supply of disease free plants to the end users.

- (b) **Ministry of Agriculture:** The Department of Agriculture and Cooperation under the Ministry of Agriculture, Government of India provides financial assistance up to Rs. 21 lakhs for setting up tissue culture units (in public sector) and Rs 10 lakhs in private sector, subject to a maximum of 20 per cent of the project cost. Under Integrated Development of Fruits Scheme, financial assistance in the form of subsidy, up to 50 per cent is provided for purchase of tissue cultured banana plants by various state Governments. The Government of India has set up a national facility for virus diagnosis and quality control of tissue culture plants in New Delhi with 5 satellite centres catering to the needs of the tissue culture industries in various parts of the country.
- (c) **Agriculture and Processed Food Products Export Development Authority (APEDA):** Under the Ministry of Commerce and Industry, state-of-the-art airfreight trans-shipment centre has been set up for tissue culture plants (perishables) at New Delhi, Mumbai and Bangalore airports. Airfreight subsidy up to 25 per cent of the freight cost is provided to tissue culture plants. 50 per cent subsidy is given for the development of infrastructure like refrigerated van, packing, export promotion, market development, consultancy services, feasibility studies, organisation building and human resource.
- (d) **National Horticulture Board (NHB):** For setting up tissue culture lab, there is a provision for back-ended capital subsidy not exceeding 20 per cent of the project cost with a maximum of Rs 25 lakh per project. Such subsidies are also extended to build up greenhouse and climate controlled poly house/shade house.
- (e) **Small Farmers Agri-business Consortium (SFAC):** Under the Ministry of Agriculture, it provides soft loans up to Rs 50 lakhs for



setting up small tissue culture labs by cooperative societies formed by small scale farmers.

- (f) **State Level Incentives:** The states of Karnataka, Gujarat, Maharashtra and Andhra Pradesh are giving financial assistance for setting up tissue culture units under the new agro-industrial policy. Karnataka gives capital subsidy of 20 per cent on investments. All the above schemes have encouraged the establishment of tissue culture industry, which in turn, have tremendously improved the demand for tissue culture generated quality planting material. A concerted effort is being made by the Government and the Industries to ensure that plant tissue culture, a technology with enormous commercial potential, would be an important industrial activity during the 21st century.

Public and Private Sector Collaboration: PPP model can be very helpful in promoting new technologies in horticulture. The public institutions have the expertise while the private sector units have the commercial temper, money and mind set to market viable products. Together, they can ensure speedy delivery of technology.

Further, collaboration among countries can also prove very helpful in quick adoption of new technologies in horticulture. More importantly, there is an increasing need to address various concerns, share knowledge and experiences from major biotech countries that are reaping benefits, and also to create awareness about safety and benefits of biotechnology among farmers, consumers and the public alike.

Awareness and Education: Public awareness of risks and benefits of biotechnology is very low. As evident in some recent cases, there seems to be lot of confusion about the pros and cons of GM crops. So, a healthy and open debate is needed to weigh all aspects of genetically modified (GM) crops including their impact on environment, human health and on the food security of the nation. This would go a long way in addressing the concerns that have been raised from time to time about the safety of GM products. Discussions and awareness programmes would have to be organised in different states, at the district level and in the concerned local language. Farmer and consumer education should be an important component of this effort.

Need of Government Focus: The Ministry of Agriculture has a very important role to play in the deployment of biotechnology in agriculture. Government has taken several initiatives and steps to promote horticulture. It needs to pursue this policy with more rigour and focus.

Challenges and Suggestions: A number of technical, economic, regulatory and market factors have combined to create hurdles for the utilisation of biotechnology in horticultural crops, which are more diverse than field crops. The costs of gaining access to patented genetic-engineering methods and meeting the regulatory requirements for

testing and registration of biotech crops represent substantial economic hurdles for horticultural products. At the same time, consumer concerns about safety of such products and the related reluctance of food processors and marketers to accept new biotech commodities are delaying the introduction of horticultural products already developed. Further, there is a lack of trained man power and laboratories extension services in this field. Then, there is growing dominance of large supermarket chains in the area of fresh horticultural products. So, a clear policy and regulatory framework is needed for the use of genetically modified crops in agriculture.

Conclusion:

Use of bio-technology in agriculture is said to be a future strategy to solve the problem of poverty, malnutrition and hunger. A considerable progress has also been made in this regard. But still there are many issues in promoting R&D, extension, commercialization and bio-safety. Addressing these will go a long way in promotion of horticulture industry in the country and to enhance India's capability to compete globally.

(The Authors, Nagma Kausar is PhD in Genetics and Plant Breeding. Shiva Jauhari is PhD in Horticulture and Assistant Professor in SGRR PG College, Dehradun)

Pandit Deen Dayal Upadhyay Unnat Krihisi Shiksha Yojana

Ministry of Agriculture & Farmers Welfare has started this scheme for educating farmers about organic farming/natural farming/ rural economy. Objectives of this scheme are as follows-

- To build skilled Human Resource at village level for organic farming and sustainable agriculture.
- Provide rural India with professional support in the field of Organic Farming/Natural Farming/ Rural Economy/Sustainable Agriculture.

Action plan under the scheme is as follows-

- Promising village level trainers will be identified for establishing training centres for imparting knowledge related to Organic Farming/Natural Farming
- Establishment of 100 training centres across the country based on the involvement of trainers
- To organise different training programmes at the village level through established training centres in different fields

HORTICULTURE FOR NUTRITIONAL SECURITY

Dr. Anita Kumari

Nutrition, food security and sufficient family incomes are some of the major challenges in India for one's complete well being. Maximum population lives in rural areas. Hunger and malnutrition are often linked to poverty. Providing economic opportunities through horticultural production will not only help in providing promising family incomes, but would also address the problem of hunger through food security and nutrition. Training women to produce and market horticultural crops can also be helpful in nutrition security of India as well as in reducing burden of various nutritional deficiency diseases and can go a long way in improving the overall health scenario in India.

Nutritional security means all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and **quality** to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life." (Committee on World Food Security, 2012). The term 'horticulture' is derived from the Latin terms 'hortus' (garden) and 'cultura' (cultivation), which means garden cultivation. Horticulture is the science and art of gardening which is associated with the cultivation of fruits, vegetables, flowers, spices, ornamental plants, plantation crops, tuber crops, medicinal and aromatic plants. Horticulture is more or less a smaller version of agriculture. While agriculture deals with cultivation on a large scale, horticulture is gardening done on a smaller scale.

Horticulture for Nutritional Security :

India is currently producing about 283 million tonnes of horticulture produce. It has proven beyond doubt that productivity of horticulture crops is much higher compared to productivity of food grains. Productivity of horticulture crops has increased by about 34 per cent between 2004-05 and 2014-15. India is the second largest producer of fruits and vegetables globally. India is a leader in producing fruits like Mango, Banana, Pomegranate, Sapota, Lime and Aonla. Per capita availability of fruit to the

Indian population is 189 gm/ person/ day and has been helping in supplementing nourishment. Productivity of vegetables in India continues to be low compared to world average productivity. Per capita availability of vegetables in India is 357 gm/person/day, which is helping in fighting malnutrition. India is second largest producer of vegetables after China and is the leader in the production of vegetables like peas and okra. Besides, India occupies the second position in production of brinjal, cabbage, cauliflower and onion and third in potato and tomato in the world. India is the largest producer and exporter of spices in the world. (nhm.nic.in/Archive/Statewise-Horticulture-Status.doc). The growth of horticultural crops is economically rewarding. This sector is expected to grow and contribute to food and nutritional security, provided, the sector is nurtured with focused infrastructure development.



Importance of Fruits and Vegetables in Diet:

Many of the horticulture crops and their products find place in our meals and diet. Human body requires vitamins, minerals, proteins, energy etc. for its health. All these are supplied by horticultural crops. The carbohydrates, fats and proteins are the macro elements which are required in large quantities whereas vitamins and minerals are the micro elements which are required in small quantities. The carbohydrates provides energy which includes cereals, proteins are derived from animal sources (egg, meat and milk products) and plant sources like (pulses), fats are also required to provide energy and sources are (butter, ghee etc).

Fruits and vegetables are the chief sources of vitamins and minerals. They are recognized as protective foods as they are necessary for the maintenance of human health. Vitamins and minerals present in fruits and vegetables are rich in phyto-nutrients and contains Vitamin C, Iron Vitamin A, dietary fibre, pigments and many other nutrients.



Deficiency of any vitamin and mineral or nutrient is depicted by the human body by giving typical symptoms. Majority of people obtain most of their carbohydrates and proteins from cereals and pulses, but their diets must also contain significant amount of fruits and vegetables to ensure that they get the vitamins and minerals which are not provided by the staple cereal foods.

Major Nutritional Deficiency Diseases in India:

The major prevalent nutritional deficiency diseases are:

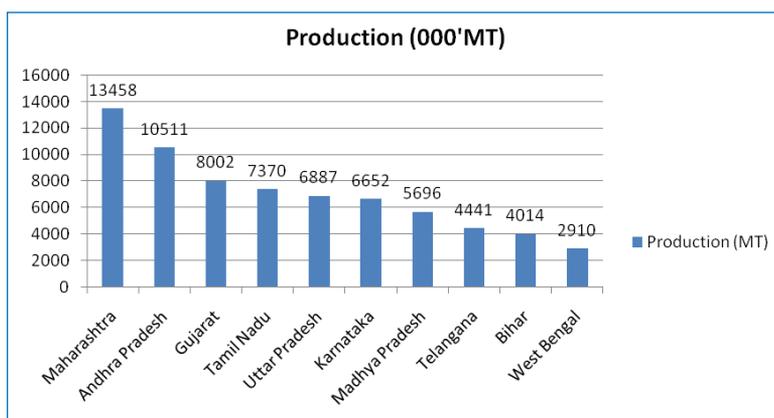
1. Protein Energy Malnutrition.
2. Iron Deficiency Anemia.
3. Iodine deficiency disease.
4. Vitamin A deficiency.

Protein Energy Malnutrition:

Malnutrition refers to the situation where there is an unbalanced diet in which some nutrients are in excess, lacking or wrong proportion. It is categorized as under-nutrition and over-nutrition. Some of the major causes for malnutrition in India is economic inequality. Due to the low social status of some population groups, their diet often lacks in both quality and quantity. Women who suffer malnutrition are less likely to have healthy babies. In India, mothers generally lack proper knowledge in feeding children.

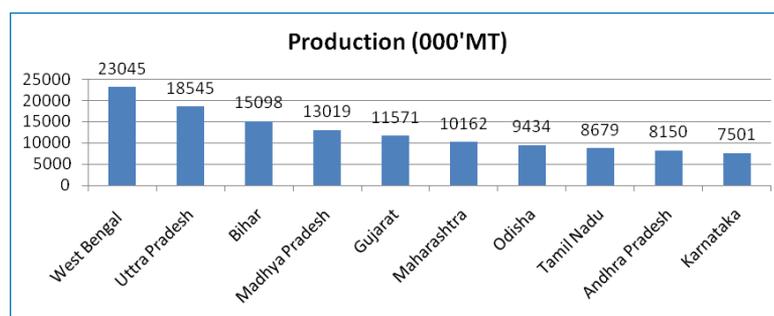
The prevalence of underweight children in India is among the highest in the world. The 2015 Global Hunger Index (GHI) Report ranked India 20th amongst leading countries with a serious hunger situation. The FAO of

Major Fruit Producing States (2013-14)



(nhm.nic.in/Archive/Statewise-Horticulture-Status.doc)

Major Vegetable Producing States (2013-14)



(nhm.nic.in/Archive/Statewise-Horticulture-Status.doc)

the UN declared 2014 as the year of family farming with the intention of making each family a farming unit to meet the nutritional requirement.. “There is a horticultural remedy for every nutritional malady” says Prof. M.S. Swaminathan. Fruits and vegetables are the reservoirs of much needed fibre, vitamins, minerals, anti-oxidants, lipids, flavourants, odourants and essential phyto-chemicals.

Iron Deficiency Anaemia : Adolescent girls and pregnant women are more prone to Anemia. The main causes are inadequate intake of iron, poor bioavailability (only less than 5 per cent is absorbed) Excessive loss of iron (menstruation, rapid pregnancies, hookworm infestations, other illnesses). Effects of anemia increases the risk of maternal and fetal mortality and morbidity Increase susceptibility to infection due to impaired cellular response and immune functions Reduction of work performance and productivity. The richest sources of iron are green leafy vegetables like spinach, amaranth, jaggery, pomegranate figs and apple. Fruits in diet help in combating iron deficiency anemia. By introducing these fruits and vegetables in diet help in reducing the iron deficiency anemia.

Iodine Deficiency Disorders (IDD): IDD refers to a spectrum of disabling conditions arising from an inadequate dietary intake of iodine. IDD affects the health of humans from fetal stage to adulthood. Consuming foods with low Iodine content, Crops grown in iodine depleted soil. Demand of Iodine is increased during the stage of rapid growth (Infancy, Puberty, pregnancy, lactation).

Vitamin A Deficiency: Vitamin A is a fat-soluble vitamin also known as retinol that is necessary for proper vision in the eye especially night vision. Vitamin A helps to prevent night blindness. It also helps keep the skin, lungs, intestine, and urinary tract healthy and protects against infections. Vitamin A also acts as an antioxidant. Vitamin A deficiency can affect the immunity, the vision and skin, lungs, urinary tract. It leads to night blindness which may ultimately lead to permanent blindness.

Vitamin A is available in food in two forms. Retinol which is preformed vitamin A occurs only in foods of animal origin. Fruits and vegetables have vitamin A in the form of carotenoids. Carotenoids are plant pigments, responsible for the red, orange, and yellow color of fruits and vegetables. Provitamin

A carotenoids are found in plants, mostly in green leafy vegetables like broccoli, spinach and carrots. Carotenoids are best absorbed from cooked or homogenized vegetables served with some fat or oil.

Challenges of Nutritional Security :

Although, India has the highest productivity with respect to some horticultural crops like grape and banana, much needs to be done for rest of the horticultural crops, The land resources available are shrinking day by day for agricultural related activities due to increasing urbanisation and industrialization. Major efforts are needed from different agencies to reclaim such marginal and degraded soils and bring them under productive cultivation. Focused efforts are required to promote container-growing and kitchen gardening in the urban areas to meet the nutritional requirements of families. The technology for container-growing of fruits and vegetables is available in a number of research organisations. Such technologies can be popularised among the urban population to ensure adequate nutritional supplementation. 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 that are otherwise found in inorganically grown produce. Growing awareness, therefore, about the organic fruits and vegetables would further enhance the supply of nutrients in a safer way.

Nutrition, food security and sufficient family incomes are some of the major challenges in India for one's complete well being . Maximum population lives in rural areas. Hunger and malnutrition are often linked to poverty. Providing economic opportunities through horticultural production will not only help in providing promising family incomes, but would also address the problem of hunger through food security and nutrition. Training women to produce and market horticultural crops can also be helpful in nutrition security of India as well as in reducing burden of various nutritional deficiency diseases and can go a long way in improving the overall health scenario in India.

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POST-HARVEST MANAGEMENT: REDUCING WASTAGE IN HORTICULTURE

Dr. Ivi Chakraborty

The production of food crop is of significance only when they reach the consumer in good condition and at a reasonable price. It is important to see what quantity of produce goes through different marketing channels and finally reaches to the end users in acceptable condition. Efforts should be made to integrate production with post harvest management since post harvest loss reduction and utilization have considerable bearing on net food availability.

A commendable success in horticultural sector has been witnessed in India since last two decades. Substantial changes in socio-economic as well as environmental condition lead to an increased demand for horticultural produce that may enrich the survival status of nation with sufficient bioactive molecules for ensuring better health protection. It is only possible with fine tuning of technologies to enhance the production of different horticultural crops and at the same time, efficient utilization of natural resources. However, inadequate storage facilities, lack of processing and defective marketing systems contributes to a huge amount of wastage varying between 10 and 40 per cent. Food loss and wastage is a moral issue negatively affecting the global economy mainly caused by the poor functioning of the production and distribution of the supply chain. Sustainable food systems must be backed by the right set of policies at multiple levels – International, national and regional level. Policy-making should account for the diversity of regions by enabling investments in infrastructure, transportation, food industries and packaging and ancillary industries. Both the public and private sector have a role to play in achieving this by creating an enabling environment. All efforts to reduce food loss and waste must pay special attention to the central role of small and marginal farmers, self help group (SHG) women and unemployed youth in growing and managing the food we rely on.

Introduction:

Horticultural crops play an important role in overcoming vitamin and micronutrient deficiencies and provide enormous scope to small and marginal farmers with higher return per unit of land than any other staple crops. Although India is one of

the leading producers of fruits and vegetable crops in the world, unfortunately, many Indians are still unable to avail the targeted daily dietary allowances and thus the Human Development Index (HDI) is very low resulting into a considerable gap between gross food production and net availability. The production of food crop is of significance only when they reach the consumer in good condition and at a reasonable price. It is important to see what quantity of produce goes through different marketing channels and finally reaches to the end users in acceptable condition. Efforts should be made to integrate production with post harvest management since post harvest loss reduction and utilization have considerable bearing on net food availability. As a matter of fact, food loss reduction is normally less costly than equivalent increase in food production. The success of production lies in the proper distribution of produce and its subsequent utilization by the consumer with least waste in the process.

Food loss and waste has a negative impact on environment and climate change and already scarce natural resources. Prevention of only one-fourth of



the global food loss would be sufficient to feed 900 million malnourished people i. e. almost 12 per cent of the world's current population. Consequently, reducing food loss is the key strategy towards ensuring food security for a projected 9 billion people in 2050. Around 30 per cent of available agricultural land is used to produce food that goes simply waste, of course, it does not happen only with land/soil but labour, capital and other natural resources like water, atmospheric gaseous composition etc also experience similar loss. Therefore, valorization of food loss and waste is a big challenge to the nation and also to the environment.

Causes for Post Harvest Losses:

Post harvest losses generally start from the field itself. The pre-harvest factors include varietal / genotype, abiotic factors (temperature, light, wind, salinity, hail damage, physiological disorders), biotic factors (insect infestation, diseases, noxious weeds), inappropriate and/or negligence in intercultural operations, maturity stages (if not harvested at correct stage of maturity as per requirement of target market and consumer), method (mechanical/manual) and time of harvest (morning/evening, immediately after rainfall or heavy irrigation), mechanical damage, early harvesting/delayed harvesting.

Post harvest losses are very high in most of the horticultural crops including fruits and vegetables as they are highly perishable due to the presence of excess moisture and plant metabolites, if care is not taken in their harvesting, handling and pack house operations (cooling, sorting, grading, post harvest treatments like wax coating, application of antimicrobial agents, packaging), storage, transport, they readily start to show unmarketable symptoms like desiccation, shrinkage, discoloration, spoilage and become unfit for consumption. Losses may also occur as a result of undesirable physiological and biochemical changes like excessive water loss causing shrinkage, increased rate of respiration, occurrence of physiological disorder etc.

Fresh produces are living plant parts and usually contain 65 to 95 per cent water. After harvest, the life processes continue at the expense of reserve or stored substances existing in the plant parts. When food and water reserves are exhausted, losses occur in the produce terms of its quality and quantity. Different factors are responsible for increasing



the rate of depletion of product's food and water reserves and consequently, increase the losses. The rate of deterioration of fresh produce is also related to the respiration rate. Generally, mature plant parts have low respiration and actively growing plant parts have high respiration. Common symptoms of senescence in horticultural produce are excessive softening, tissue breakdown, loss of colour, flavour and gloss, off-flavour, discolouration, fibrous, splitting etc. Socio-economic factors are also playing role in food losses, like wastage of food in festivals and ceremonies, over feeding that causes obesity trends in mostly urban and well to do families etc.

National Wastage: Status

India incurs post-harvest fruits and vegetable losses worth over two lakh crores each year largely owing to the absence of modern cold storage facilities and lack of proper food processing units. West Bengal is the one of leading producer of horticultural crops particularly vegetables and fruits in India. Unfortunately, the state incurs the highest post harvest losses worth over 13,600 crores annually followed by Gujarat (Rs.11,400 crores), Bihar (Rs 10,700 crores), Uttar Pradesh (Rs 10,300 crores) and Maharashtra (Rs 10,100 crores) according to recent estimates of the Associated Chambers of Commerce and Industry of India. The trend is almost similar in all places where farmers have to sell their produce at throwaway prices during peak season. The total storage capacity in India is over 300 lakh tonnes, and there is an additional requirement of cold storage of about 370 lakh tonnes for fruit and vegetable storage alone. The existing cold storage capacity in India is confined mostly for storing potato, while the majority of fruit and vegetables are sold at local or regional markets which do not have cold storage facility. The multipurpose storage facilities although

build up in some places are quite few in number and mostly used for storing flowers, eggs, sweets and confectionary, etc. along with limited so called high value fruits and vegetables like apple, carrot, capsicum, grapes etc.

Storage and handling facilities need to be strengthened in the fruit and vegetable in the farm gate as well as in the markets, thereby providing infrastructure facilities to promote increased productivity and to reduce post-harvest losses. A lot of positive steps have been initiated by the Government of India by launching the National Horticulture Mission. Different stakeholders like growers, entrepreneur, technologists, private sector, Government should come forward together to initiate a consolidated approach on storage, marketing, transportation, technological support and processing facilities for horticultural crops that no doubt, play an important role in the Indian economy.

Strategies to Solve the Food Loss:

To tackle food loss, what needs to be done? First, amount of loss need to measure. Then, the prevention and reduction programs and policies need to be successfully introduced. In recent years, Govt. of India has given a major thrust on managing post harvest wastage and trying to take up policies like mitigation of post harvest losses of horticultural crops giving major emphasis on fruit and vegetables, boosting food processing, encouraging export promotion, favourable tax regime, rejuvenating packhouses and mega food park scheme, skill development to focus on women, cold chain developments, drive to regulate and simplify governmental systems, processes and clearances that delay food processing projects causing huge losses to the companies putting up projects, accelerating the process of FSSAI approvals to the product and above all, promoting farmer-industry-government-education linkages. Apart from these, there are gaps like pesticidal and heavy metal residues on crops, pre and post harvest application of hazardous chemicals to the soil and crop, vagaries of weather condition, inadequate co-operatives and cold storage facilities, crop insurances, middlemen interference as a result of lack of market information and communication between producers and receivers. Moreover, sanitation must be of great concern to produce handlers, not only to protect produce against post harvest diseases, but also to protect consumers from

food borne illnesses. *E. coli* 0157:H7, *Salmonella*, *Chryptosporidium*, *Hepatitis*, and *Cyclospora* etc. are among the disease-causing organisms that are transferred via fresh fruits and vegetables. Use of a disinfectant like Sodium Hypochlorite in wash water can help to prevent both post-harvest diseases and food borne illnesses.

A convenient way out of food loss is probably the development of small and micro processing units at village block level with of course micro budget expenditure. Simultaneously, training (Processing and value addition of perishables) of educated unemployed youths who will act as master trainer to multiply their trained hands at the block level. This type of training may easily be organized at institutional, government and NGO level with minimum arrangements of cooking, drying, autoclaving and refrigeration facilities. Moreover, they must be educated about food safety, licensing, how to avail FSSAI approvals of prepared products etc. so that they may focus on product merchandizing at block level with small scale processing set up. It will encourage the entrepreneurs to take up food business in a more positive way.

Conclusion:

Different workers in India have investigated the extent of losses of horticultural produce at different stages of production system through sampling or interviews; of course, more explorations are quite essential as post harvest loss commonly occur in almost all horticultural crops even today. More interestingly, the rate of loss and waste prevention mechanism has also remained almost unchanged. Suitable post harvest handling protocols could not successfully be implemented in India probably owing to small and marginal resource poor farming community who are unable to timely market their produce, resulting considerable wastage. Our relatively unorganized co-operative sector should be organized with Government and NGO intervention. Care should be taken so that the farming community and self help groups may feel free to obtain the benefit of cooperatives and it should act beyond religion and political influences. Entrepreneurship development and rural employments must be encouraged to strengthen farming economy.

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INITIATIVES FOR HORTICULTURE PROMOTION IN INDIA

India has a wide and varied horticulture base, which includes fruits, vegetables, tuber crops, mushrooms, spices, medicinal and aromatic plants, flowers and foliage and plantation crops like coconut, areca nut, cashew nut, cocoa and bamboo. The horticulture sector has been an engine of growth for the rural economy while providing food and nutritional security to the people. Implementation of the Centrally Sponsored and Central Sector Schemes has provided necessary stimulus to the horticulture sector, which has enabled the achievement of a healthy growth rate in the sector.

To promote horticulture in the country and realise its full potential, Union and States Governments are implementing various schemes and initiatives. Some of these schemes/ initiatives are explained below-

Mission for Integrated Development of Horticulture (MIDH)

A Centrally Sponsored Scheme, Mission for Integrated Development of Horticulture (MIDH) has been launched for the holistic development of horticulture in the country since 2014-15. The interventions under MIDH have a blend of technological adaptation supported with fiscal incentives for attracting farmers as well as entrepreneurs involved in the horticulture sector. All States and Union Territories are covered under MIDH.

The Mission for Integrated Development of Horticulture (MIDH) subsumed six ongoing schemes of the Department of Agriculture and Cooperation on horticulture development. Out of these six schemes, three are Centrally Sponsored Schemes viz-

1. National Horticulture Mission,
2. Horticulture Mission for North East & Himalayan States,
3. National Bamboo Mission,

And the remaining three are Central Sector Schemes viz.

4. National Horticulture Board,
5. Coconut Development Board and
6. Central Institute for Horticulture, Nagaland

The Missions (MIDH) aims to promote holistic growth of horticulture sector, including bamboo and coconut through area based regionally differentiated strategies, which includes research, technology promotion, extension, post harvest management, processing and marketing. This is done in consonance with comparative advantage of each State/ region and its diverse agro-climatic features. Mission encourages active participation of all stake holders, particularly farmer groups and farmer producer organisations such as- Farmer Interest Groups (FIG), Farmer Producer Organizations (FPO), Farmer Producer Companies (FPC) to bring economy of scale and scope.

MIDH lays emphasis on enhancing horticulture production, augmenting farmers' income and strengthening nutritional security. It plans to improve productivity by way of quality germ plasm, planting material and water use efficiency through Micro Irrigation.

For adopting improved technologies, capacity buildings of farmers and technicians is also provided for through existing institutions like State Agriculture Universities, *Krishi Vigyan Kendras*, institutes with Department of Horticulture in States. The Mission also envisages rejuvenation of senile plantation and creation of infrastructure for Post Harvest Management (PHM). This includes

marketing infrastructure for better price realization so that horticulture emerges as a sustainable and a secure livelihood option for the people employed in this sector.

All six schemes subsumed under Mission for Integrated Development of Horticulture (MIDH) are described in detail, in following paragraphs.

National Horticulture Mission (NHM)

National Horticulture Mission (NHM) is one of the sub schemes of Mission for Integrated Development of Horticulture (MIDH) which is being implemented by State Horticulture Missions (SHM) in selected districts of 18 States and four Union Territories.



Background:

National Horticulture Mission was launched in 2005-06 as Centrally Sponsored Scheme to enhance the horticulture production and improve nutritional security and income support to farm households and others. It adopts area-based regionally differentiated strategies. The scheme has been subsumed as part of the Mission for Integrated Development of the Horticulture (MIDH) since 2014-15.

Coverage:

This scheme is not available Andaman & Nicobar, Lakshadweep and North East States, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand. (North East States, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand are covered under a separate scheme- Horticulture Mission for North East and Himalayan States)

National Horticulture Mission envisages productivity improvement of horticulture crops including fruits and vegetables through various interventions. Data shows that horticulture production in the country has been increasing since implementation of NHM. For holistic growth of horticulture sector, Mission emphasises on activities such as:

- ❖ Enhancing horticulture production (to double farmer's income).
- ❖ Strengthening nutritional security.
- ❖ Production of planting material.
- ❖ Vegetable seed production.
- ❖ Coverage of area with improved cultivars.
- ❖ Rejuvenation of senile orchards.
- ❖ Creation of water resources and improving water use efficiency.
- ❖ Adoption of Integrated Pests Management (IPM) and Integrated Nutrients Management (INM)
- ❖ Adoption of organic farming including in-situ generation of organic manure.

- ❖ Capacity building of farmers and technicians for adopting improved technologies.
- ❖ Creation of Infrastructure for Post Harvest Management (PHM).
- ❖ Horticulture marketing.

Horticulture Mission for North East and Himalayan States (HMNEH)

Horticulture Mission for North East and Himalayan States (HMNEH) is a part of the Mission for Integrated Development of Horticulture (MIDH) scheme. HMNEH is being implemented for overall development of Horticulture in North -Eastern and Himalayan states. The mission covers all North -Eastern States including Sikkim and three Himalayan states of Jammu & Kashmir, Himachal Pradesh and Uttarakhand. The mission addresses entire spectrum of horticulture from production to consumption through backward and forward linkages.

Background:

North- Eastern states of India are rich in biodiversity and hold immense potential for horticulture. So, with a view to improve livelihood opportunities and to bring prosperity to the North Eastern Region including Sikkim, Government of India launched a Technology Mission for North East for Integrated Development of Horticulture in 2001-02.

Considering the potential of Horticulture for socio-economic development, Technology Mission was extended to Jammu & Kashmir, Himachal Pradesh and Uttarakhand in 2003-04. With effect from 2014-15, this scheme has been subsumed under Mission for Integrated Development of Horticulture (MIDH) with name Horticulture Mission for North East and Himalayan States (HMNEH).

The NER is known for minimum use of chemical fertilizers and pesticides. This is proposed to be converted into a strength through appropriate technology-based development and adoption of organic management of horticulture development activities.

The programmes under the HMNEH have been evolved in consultation with all the stakeholders, including the State Governments. The HMNEH strives to address the following issues:

- Technology & Technological Development.
- Demonstration of Technologies.
- Production of quality planting material.
- Organic Farming.
- Efficient Water Management.
- Post Harvest Management.
- Marketing.



Objectives of the Mission:

- To improve the production and productivity of horticulture crops by harnessing the potential of the region.
- Special emphasis on “Low Volume, High Value, Less Perishable Horticulture Crops”.
- A horticulture based farming system to be developed, thereby providing viable and ample opportunities for employment, especially for women, besides improving productivity of land.

Monitoring Mechanism:

At National Level, the implementation of HMNEH will be reviewed and monitored regularly by Empowered Monitoring Committee (EMC) and Executive Committee headed by Secretary (A&C). In addition, there will be regular field review by Joint Inspection Teams (JIT). State Directorates will upload the monthly progress in HMNEH website by 5th of every month.

National Bamboo Mission (NBM)

National Bamboo Mission (NBM) is one of the sub schemes of Mission for Integrated Development of Horticulture (MIDH) which is being implemented by State Bamboo Development Agencies (BDA)/ Forest Development Agency (FDA) in all the States and UTs.



Background:

Bamboo is a fast growing, versatile woody grass found across the country. It is an economic resource having immense potential for improving the quality of life of rural and urban communities with environment regeneration qualities like carbon sequestering. Bamboo provides raw material for large industries like paper and pulp as well as for cottage and handicrafts industry. Some bamboo species can grow one meter in a day. Bamboo shoots are used in the preparation of vegetables and various other dishes and many other horticultural uses. It is grown like any other horticultural crop by tilling the land and is harvested annually, when grown commercially. Bamboo roots, leaves, sap and ash are being used since ancient times as a remedy for minor and major ailments, particularly in Ayurvedic health care.

The world market for bamboo is valued roughly at US \$ 20 billion (in 2015) of which, China's share alone is close to 50 per cent. The size of the domestic bamboo industry is estimated to be about Rs. 26,000 crores (in 2015). However, the domestic bamboo sector is faced with many constraints, such as:

- Lack of scientific methods for propagation and cultivation.
- Lack of post harvest treatment and technology for product development.
- Inadequate trained manpower.
- Inadequate infrastructure for large scale harvesting in the event of gregarious flowering.

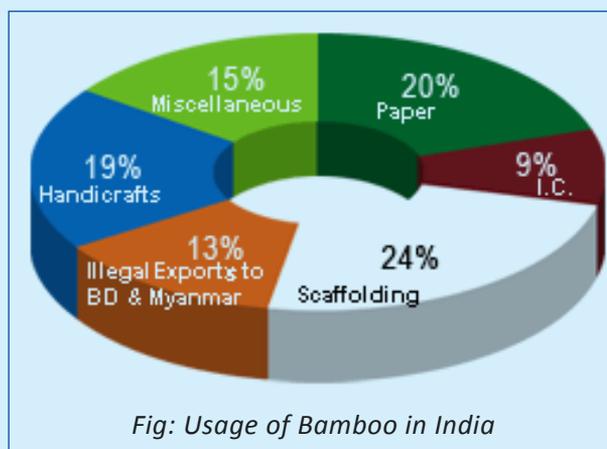


Fig: Usage of Bamboo in India

With a view to harness the potential of bamboo crop in the country through a multidisciplinary approach, erstwhile Planning Commission brought out a report titled National Mission on Bamboo Technology and Trade Development (NMBTTD) in 2001-02. The report brings out the country's future potential in bamboo development for the next two decades. Subsequent to this, a Detailed Project Report (DPR) for setting up a National Bamboo Mission was prepared.

Following this, a National Bamboo Mission (NBM) is being implemented as a sub scheme of the Mission for Integrated Development of Horticulture (MIDH) which is a 100 per cent Centrally Sponsored Scheme of Department of Agriculture & Cooperation. The Mission envisages promoting holistic growth of bamboo sector by adopting area-based, regionally differentiated strategy and to increase the area under bamboo cultivation and marketing. Under the Mission, steps have been taken to increase the availability of quality planting material by supporting the setting up of new nurseries and strengthening of existing ones. To take forward the integration, the Mission is taking steps to strengthen marketing of bamboo products, especially those of handicraft items.

Objectives of the Mission:

- To promote the growth of the bamboo sector through as an area based regionally differentiated strategy.
- To increase the coverage of area under bamboo in potential areas, with improved varieties to enhance yields.
- To promote marketing of bamboo and bamboo based handicrafts.
- To establish convergence and synergy among stake-holders for the development of bamboo.
- To promote, develop and disseminate technologies through a seamless blend of traditional wisdom and modern scientific knowledge.
- To generate employment opportunities for skilled and unskilled persons, especially unemployed youths.

Mission Strategy:

To achieve the objectives, the Mission would adopt the following strategies:

- Adopt a coordinated approach covering production and marketing to assure appropriate returns to growers/producers.
- Promote Research and Development (R&D) of varieties and technologies for enhanced production.
- Enhance acreage (in forest and non-forest areas) and productivity of bamboo through varietal change and improved agriculture practice.
- Promote partnership, convergence and synergy among R&D and marketing agencies in public as well as private sectors, at all levels.
- Promote where appropriate, cooperatives and self-help groups to ensure support and adequate returns to farmers.
- Set up National, State and sub-State level structures, to ensure adequate returns for the produce of the farmers and eliminate middlemen, to the extent possible.

The Mission document also envisages the integration different Ministries/ Departments for the holistic development of the sector. The Report, further, envisions an integrated programme expansion of plantations of bamboo species, its scientific management with the involvement of Joint Forest Management (JFM) committees, local initiatives and entrepreneurship for presenting this raw material for the Industries and assisting the Industry to access and apply modern technology for producing globally competitive new generation bamboo products.

The economic and social benefits from these activities are expected to create millions of job with the potential of pulling out a large number of families of artisans and farmers from poverty.

In Government forest lands, Bamboo Plantation Programme will be undertaken through the Forest Development Agencies (FDA) and the Joint Forest Management Committees (JFMCs). However, in case of Non-Forest Areas, the funds will be released by Ministry of Agriculture/ Horticulture to the Bamboo Development Agencies (BDAs) concerned for onward disbursement to the beneficiaries. The State Mission Director to be appointed by the State Government will be the Member Secretary. At the operational level, State Governments will have the freedom to nominate or create a suitable autonomous agency to be registered under the Societies Registration Act for implementing the Mission programmes at the State and District levels. The Panchayati Raj Institutions existing in the State would be fully involved in the implementation structure.

National Horticulture Board (NHB)

National Horticulture Board (NHB) was set up by Government of India in April 1984 on the basis of recommendations of the “Group on Perishable Agricultural Commodities”, headed by Dr M. S. Swaminathan, the then Member (Agriculture), Planning Commission. The NHB is registered as a Society under the Societies Registration Act 1860, with its headquarters at Gurgaon. The management of all the activities of NHB is undertaken by a body, ‘Board of Directors’, which is headed by the Union Agriculture Minister as its President. National Horticulture Board (NHB) is implementing various schemes under Mission for Integrated Development of Horticulture (MIDH) in all States and UTs.

Aims & Objectives of NHB Schemes:

The main objectives of the NHB are to improve integrated development of Horticulture industry and to help in coordinating, sustaining the production and processing of fruits and vegetables. Detailed objectives of the Board are as under:-

- Development of hi-tech commercial horticulture in identified belts and make such areas vibrant with horticultural activity, which in turn, will act as hubs for development of horticulture.
- Development of modern post-harvest management infrastructure as an integral part of area expansion projects or as common facility for cluster of projects.
- Development of integrated, energy efficient cold chain infrastructure for fresh horticulture produce.
- Popularization of identified new technologies/tools/ techniques for commercialization /adoption, after carrying out technology and need assessment.
- Assistance in securing availability of quality planting material by promoting setting up of scion and root stock banks / mother plant nurseries and carrying out accreditation / rating of horticulture nurseries and need based imports of planting material.
- Promotion and market development of fresh horticulture produce.
- Promotion of field trials of newly developed/imported planting materials and other farm inputs, production technology, and promotion of applied R&D programmes for commercialization of proven technology.
- Promotion of Farm Mechanization in Horticulture through demonstration and its uses at farmers field level to reduce labour cost and increase the productivity of Horticulture crops.
- Promotion of applied R & D, prescribing critical storage conditions for fresh horticulture produce, bench marking of technical standards for cold chain infrastructure etc.
- Transfer of technology to producers/farmers and service providers such as gardeners, nurserymen, farm level skilled workers, operators in cold storages, work force carrying out

post harvest management including processing of fresh horticulture produce and to the master trainers.

- Promotion of consumption of horticulture produce and products.
- Promoting long distance transport solution for bulk movement of horticulture produce through rail etc.
- Carrying out studies and surveys to identify constraints and develop short and long term strategies for systematic development of horticulture and providing technical services including advisory and consultancy services.

Coconut Development Board (CDB)

Headquartered at Kochi in Kerala, Coconut Development Board (CDB) is a statutory body established in 1981, under the Ministry of Agriculture, Government of India for the integrated development of coconut cultivation and industry in the country with focus on increasing productivity and product diversification. The Board has several Regional Offices, State Centers and Demonstration cum Seed Production (DSP) centers across India.

Functions of the Board

- Adopting measures for the development of coconut industry.
- Imparting technical advice to those engaged in coconut cultivation and industry.
- Providing financial and other assistance for the expansion of area under coconut.
- Encouraging adoption of modern technologies for processing of coconut and its products.
- Adopting measures to get incentive prices for coconut and its products.
- Recommending measures for improving marketing of coconut and its products.
- Recommending measures for regulating imports and exports of coconut and its products.
- Fixing grades, specifications and standards for coconut and its products.
- Financing suitable schemes to increase the production of coconut and to improve the quality and yield of coconut.
- Assisting, encouraging, promoting and financing agricultural, technological, industrial or economic research on coconut and its products.
- Collecting statistics on coconut and its products and publishing them.
- Undertaking publicity activities and publishing books and periodicals on coconut and its products.



Thrust Areas:

- Increasing the production of quality planting material.
- Creating future production potential by bringing more area under coconut.
- Improving productivity of existing coconut holdings.
- Integrated management of major pests and diseases.
- Strengthening coconut industry by promoting product diversification and by-product utilization.

Central Institute of Horticulture (CIH)

Headquartered in Medziphema, Nagaland, Central Institute of Horticulture was established in 2006 with an ambitious objective of holistic development of Horticulture sector in the North East Region (NER). CIH was mainly for providing technical capacity building and training of farmers and Field functionaries in the North Eastern Region. This Institute is under the Ministry of Agriculture, Govt. of India.

Objectives:

- Capacity building by training of trainers and farmers/beneficiaries
- Demonstration of improved production technologies.
- Accreditation and certification of nurseries in NER.
- Follow-on extension support in the field of horticulture.
- Promotion of organic cultivation of horticulture crops.
- Establishing convergence and synergy among programmes in the field of horticulture.
- Monitoring of centrally sponsored programmes in the area of horticulture.



Focus Areas:

- Training of State Govt. officials and farmers/beneficiaries of North Eastern Region.
- Production and supply of quality planting material.
- Transfer of technology through method and result demonstration and publication of folders, manuals, leaflets etc
- Post harvest, marketing and agri-business promotion through exhibition, seminars, workshop, exposure trip, buyers' seller meet.
- Coordination with state horticulture departments of NER and other National organizations.

'ARYA' (Attracting and Retaining Youth in Agriculture)

ARYA (Attracting and Retaining Youth in Agriculture) is an innovative program to check the migration of rural youth and retain their interest in agriculture through creation of new employment opportunities. This programme is being implemented by the Indian Council of Agricultural Research (ICAR).

The objectives of the ARYA project are:

- (i) To attract and empower the youth in rural areas to take up various Agriculture, allied and service sector enterprises for sustainable income and gainful employment in selected districts.
- (ii) To enable the Farm Youth to establish network groups to take up resource and capital intensive activities like processing, value addition and marketing; and
- (iii) To demonstrate the functional linkage with different institutions and stakeholders for convergence of opportunities available under various schemes/programme for sustainable development of Youth.

ARYA project is being implemented through Krishi Vigyan Kendras (KVKs) in 25 States, one district from each State, with technical partners from ICAR institutes and Agricultural Universities.

Skill development of rural youths will help in improving their confidence levels and encourage them to pursue farming as profession, generate additional employment opportunities to absorb under employed and unemployed rural youth in secondary agriculture and service related activities in rural areas.

HORTICULTURE IN INDIA: CONSUMPTION AT HOUSEHOLD LEVEL

Prof. Pinaki Acharya and Prof. Ankan Das

Horticulture is becoming increasingly popular and addressing various important aspects of the country in relation to nutritional safety, employment generation and poverty issues. Horticulture, because of its huge crop diversification provides an ample choice to the grower and also helps in developing a large number of agro-based industries which further enhance employment opportunities for a large scale of people. In the hilly areas, horticultural crops are even believed to be a definite alternative to Jhum (shifting cultivation) practices.

Horticulture can be defined as the art or practice of garden cultivation and management. According to GoI, (2001) horticulture encompasses production and cultivation of a wide range of crops including fruit crops, vegetables crops, ornamental crops, potato and tuber crops, spices and plantation crops, medicinal and aromatic crops.

Over the past decades, horticulture has developed into a potential enterprise of the agricultural sector, playing a vital role in accelerating the development of the economy of the country. Horticulture is becoming increasingly popular and addressing various important aspects of the country in relation to nutritional safety, employment generation and poverty issues. Horticulture, because of its huge crop diversification provides an ample choice to the grower and also helps in developing a large number of agro-based industries which further enhance employment opportunities for a large scale of people. In the hilly areas, horticultural crops are even believed to be a definite alternative to *Jhum* (shifting cultivation) practices. The research studies conducted in the region by Saha (1973) proved that returns from the horticultural crops are found to be quite encouraging as compared to shifting cultivation.

Singha and Chakravorty (2013) in their work on “Crop Diversification in India: A Study of Maize Cultivation in Karnataka”, highlighted that in present times, with the rapid flourish of urbanization, modernization and increase in disposable income of the community, pattern of food habits have also changed proportionately more towards non-cereal food as compared to cereals in the recent past in the country. Due to this, cropping pattern has also shifted greatly from conventional/traditional crop to high value cash crops in Indian agriculture. And also at the same time, horticultural crops received high market demand and fetched good economic returns. As per the reports of Economic Survey of 2015-16, percentage share of horticulture output in agriculture is more than 33 per cent.



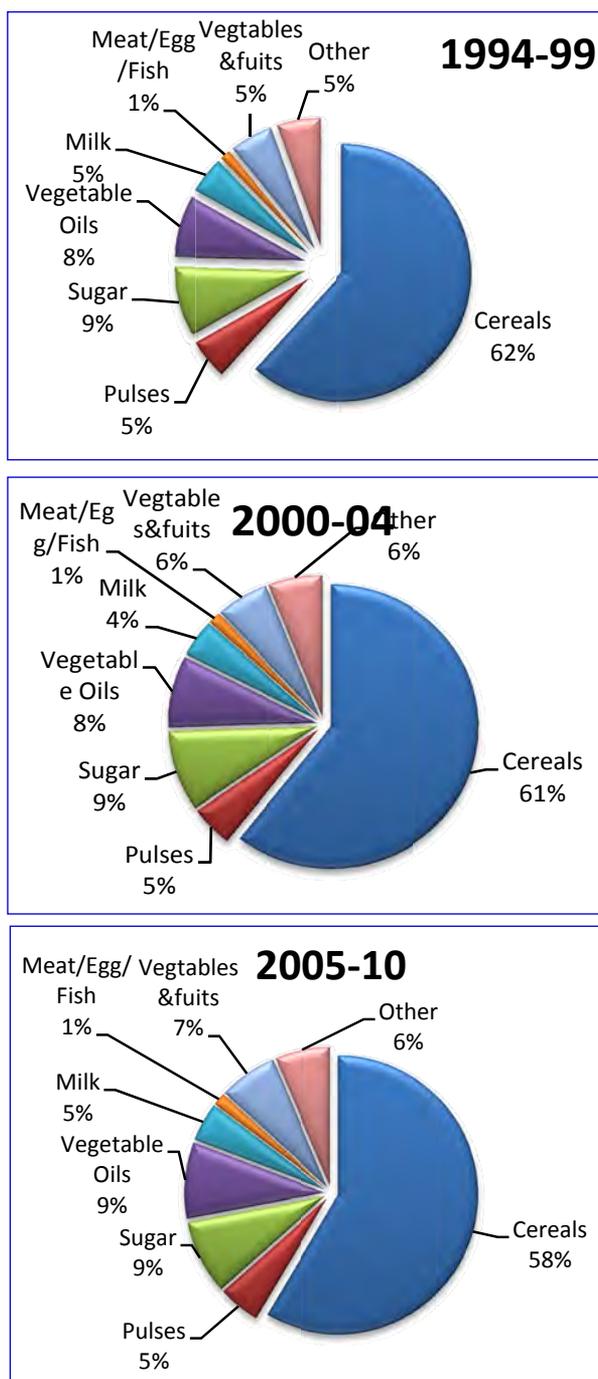
Thus, it is well understood that the production scenario with respect to horticultural crops, in both overall and domestic household sectors has increased. Individual farmers or growers in rural areas have increased the cultivation of horticultural crops. This production scenario can also be related to the changes in the literacy levels in the country. Compared to the past, the literacy rate has increased. More and more people from villages, cities and peri-urban areas are becoming educated. More education means more awareness among the people. Everyone is becoming conscious regarding their health. People are very much aware nowadays about the hazards of the pesticidal residue arising out of high volume sprays of insecticides and pesticides applied for cultivation of crops and how these chemicals in direct amount or in residual levels from the soil enter the food chain causing various types of health hazards. Consequently, many people in urban and rural areas are trying to grow crops in the vicinity of their households which they cultivate without or minimal utilization of any harmful chemicals. People today in the backyard of their houses are going for kitchen gardens where they cultivate various fruits, vegetables, spices and flowers. The commodities from this type of household gardening are mainly used for domestic consumption only. In urban areas, where there is a scarcity of space and kitchen gardening can't be done, people practice roof top cultivation. Nuclear families in urban areas can also be seen, growing many vegetables and flowers in pots in their balconies. The poison free harvest is becoming increasingly popular among people, no matter where they live.

Utilization of flower items in our country is always on a higher side from the earlier ages which has further increased. Functions, marriage ceremonies etc. become the requisite for implementation of more and more floral items. Nowadays, flowers are also used for decoration of hotels, auditorium for seminars. Many people go for purchasing of bonsai plants for decoration of their houses. Terrace gardening is increasing in metro cities which not only increases the aesthetic appearance of the building, but also helps in establishing a harmony with the nature.

Though, the production of horticultural crops has increased but the consumption levels of

horticultural items specially fruits and vegetables in the domestic household levels, is not quiet up to the mark. If we look at the per capita percentage of calorie intake from different types of food consumed, we can see that obtainment of calorie from the consumption of horticultural

Fig. 1 Per capita percentage of calorie intake from different types of food consumed



(Source: National Council of Applied Economic Research)

produce though has increased in the past years, but still, it is very less. Research activity on “Analysis of Changing Food Consumption Pattern in India” by National Council of Applied Economic Research, New Delhi reported that (Fig 1) the per capita percentage of calorie intake from fruits and vegetables has increased from 5 per cent in 1994-99 to only 7 per cent in 2005-10. Sachdeva *et al.*, (2013) in their work revealed that as per WHO, (2003) and FAO, (2010) the average recommendation for consumption of fruits and vegetables is at least 400g per person per day consisting of five serving of 80 g each day or can be said as about 146 kg per person per year. According to the National Institute of Nutrition, Hyderabad, (2011) their national nutrition guidelines gives an average daily recommendation of 300 g vegetables to be consumed where each sizeable portion should be of 100 g with 3 number of total portions and 100 g of fruits with one portion of 100 g size. The vegetables which are to be taken in the diet include 50g of green leafy vegetables, 50g of roots and tubers and 200g of other vegetables. Landon, (2007) said a glass of fruit juice (excluding sweetened beverages) is equivalent to a portion of fruit each day, however, eating the whole fruit is more encouraged where one can also receive the dietary fibre which is good for the human health.

It has been observed that the traditional Indian food habit has a special fascination towards the consumption of fresh fruits and vegetables and for the items which are processed at home. However, contradicting the statement, the surveys conducted by National Nutritional Monitoring Bureau, (2002); National Institute of Nutrition, (2006) and Ministry of Human Resource Development, (1998) indicates a consistent low consumption of fruits and vegetables among the Indian people. At present, the average consumption or intake of daily fruits and vegetables is as low as 149-152 g which is far less than the recommended intake of 400g per person per day. Mittal (2007) in her work “Can horticulture be a success story in India?” said that the annual intake for fruits per person was 9.6 kg for the people living in the rural areas and a higher amount of 15.6 kg for the people in the cities. The amount of vegetables for a person in a year was 74.6 kg for people of the villages and slightly higher amount

of 79.1 kg for the people dwelling in urban areas. The latest survey carried by National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation, Government of India 2012 revealed that out of every 1000 household in our country, the intake for vegetable was reported by 983 households in the rural areas with 932 in urban places and with respect to the consumption of fruits 608 households were recorded in the rural places and for urban regions, it was 777.

Therefore, it is very clear that at present, the emphasis has to be given on the consumption levels of basic horticultural amenities in the domestic or household levels as vegetables and fruits or horticultural crops are one of the best examples of the plant parts highly enriched with nutraceutical and functional ingredients which are extremely beneficial in providing protection against many diseases and ailments. So keeping in mind the rich nutritive status of the horticultural produce, it is pertinent that the diet pattern of the people dwelling in both rural and urban areas has to be changed. Innovative strategies like increasing awareness regarding the benefits of consumption of fruits and vegetables by advertisement campaigns, social media etc should be undertaken to increase the domestic consumption of horticultural items. Further, nutrition based mobile applications in simplified manner will help in improving our lifestyle.

National Programme of Nutritional Support to Primary Education (which later as per the Agenda note of 5th meeting of National Steering and Monitoring Committee meeting, was changed to National Programme of Mid Day Meals in Schools)





on 15th of August 1995 (*Mdm.nic.in, 2013*), introduced the Mid Day Meal Scheme which is an initiative to provide meals to the school children with an objective to increase the fruitfulness of education in the primary level by developing the health and the nourishment levels of children in primary levels, is an example of such innovative strategy undertaken by the Government of our country. Under this initiative, a cooked meal is given to the school children (containing 300 calories with 12 g of protein) who are enrolled in classes between one to five. Later in the month of October 2007, the programme further included students in the higher primary classes between six to eight in 3,479 educationally backward blocks (Garg et

al., 2013). The programme helped in increasing the nutrition awareness and also enlarged the consumption of agricultural and horticultural produces amongst school students.

Future Prospects:

Policy support is needed for continued intake of horticultural produce at optimum levels to ward off the malnutrition factors envisaged in our society. Desired level of diversification in food intake patterns should be encouraged through consolidation of supportive pricing, marketing and trade policies. Emphasis on organic produce through rigorous quality checks should be incorporated. Fiscal concessions on products manufactured from fruits and vegetables or their parts with improved processing, packaging and branding will help to win more customers. Lastly, an integration between farm level prices and retail prices needs to be addressed for better parity to enable a sizeable portion of the population to get benefitted in terms of a good and balanced diet.

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Student READY (Rural Entrepreneurship Awareness Development Yojana)

Being implemented by Indian Council of Agricultural Research (ICAR), 'Student READY' will integrate the 'Rural Work Experience Programme' as a major component in agriculture education. This is to reorient graduates of Agriculture and allied subjects for ensuring and assuring employability and develop entrepreneurs for emerging knowledge intensive agriculture.

Student READY gives a chance to have a hands on experience and practical training compulsory in all the Agricultural Universities. Also, the Union Government shall provide fellowship of Rs 3000 per month for a period of six months to all the under-graduate students of agricultural science. Following five components are part of the Programme-

1. Experiential Learning- This helps the student to develop competence, capacity building, acquiring skills and confidence to start their own enterprise and turn 'Job Creators instead of Job Seekers'. This is a step towards 'Earn while Learn' concept.
2. Rural Awareness Works Experience- Helps the students primarily to understand the rural situations, status of technologies adopted by farmers, farmers' problems and to develop skills and attitude of working with farm families for overall development in rural area.
3. In-Plant Training / Industrial attachment- Technology is changing at a rapid pace. To enrich the practical knowledge of the students, in-plant training shall be mandatory.
4. Hands-on training (HOT)/Skill development training- This aims to make conditions as realistic as possible. The biggest benefit of hands-on training is the opportunity for repeated practice.
5. Students Projects- Project work provides students several opportunities to learn several aspects that cannot be taught in a class room or laboratory.

SWACHHTA PAKHWADA UPDATE

MINISTRY OF WOMEN & CHILD DEVELOPMENT OBSERVES SWACHHTA PAKHWADA

The Ministry of Women & Child Development observed the Swachhta Pakhwada from 1st March 2017 to 15th March 2017, to raise awareness about Swachh Bharat Abhiyan among women and children. The Swachhta Pakhwada is observed by various Ministries of Government of India to achieve the goal of universal sanitation, hygiene and 'open defecation free' India by 2019.

As a part of nationwide activities, the Ministry had written to all the states to observe the Swachhta Pakhwada through the wide network of Anganwadi Centres (AWCs) across the country. The states had been asked to carry out the following activities at the AWCs:

- I. White-washing AWCs involving local communities;
- II. Pictures, local logos on walls by local people free of cost;
- III. Cleanliness in and around AWCs;
- IV. Weeding out of obsolete records etc;
- V. Divyang access to toilets may be reviewed;
- VI. Review of toilets constructed;
- VII. Involving private sector under CSR for Swachhta;
- VIII. Sketch competition, etc;
- IX. Swachhta drive in and around AWCs on the banks of rivers;
- X. Celebrating International Women's Day on 8th March, 2017.

Senior officials from the Ministry had undertaken activities such as Swachhta Pledge, slogan writing and poster making competition, street play and film screening on Swachh Bharat Abhiyan, demonstration and sessions on health, hygiene and sanitation for children, waste management etc. Cleanliness activities and pledges on Swachh Bharat were also undertaken at the WCD Ministry in Delhi and its associated organisations such as CARA, CSWB, NCPDR, NCW and RMK.

Kurukshetra

FORTHCOMING ISSUE

May 2017 : Transforming Rural India

MUSHROOM: SCOPE AND FUTURE IN INDIA

Dr. Sanjeev Ahuja and Dr. Purva Jaggi

The demand and production of mushrooms in India is increasing every year. With the concerted efforts of all those involved in mushroom research, development and extension, the Indian growers and consumers will have to be made aware of the qualities of mushrooms particularly the nutritional and medicinal values of the cultivated species, so the mushroom may occupy their due place in Indian diet in general and vegetable meals in particulars with increase in per capita consumption of mushroom.

Mushrooms have always fascinated man due to their sudden appearance in number, groups, rings, bunches and also in isolation as a single attractive and imposing structure. To meet the challenges and feed the ever increasing number of mouths, diversification in food portfolio in India is required. Button and Oyster (dhingri) are the main mushrooms grown all over India. Button Mushroom is grown primarily all over India. Mushroom cultivation in India was initiated for the first time at Solan in mid sixties when Dr. E. F. K. Mental from Germany started the work as the FAO consultant at Solan. He started the work on a small scale at the Dept. of Agriculture, H. P. Govt., Solan and successfully grew button mushrooms for the first time in India.

Till 1980, cultivation of white button mushroom was confined to the Northern Hill States of Jammu and Kashmir and Himachal Pradesh. However, there has been a remarkable change in its scenario and it has now spread its wings all over the country from Jammu and Kashmir in north to West Bengal and North-eastern region in the East. In recent years, medium sized projects were established with the indigenous machineries making projects cost-effective. Majority of such projects are near big cities. At present, button mushroom is being produced in HP, UP, Punjab, Haryana, Maharashtra, AP, Tamil Nadu and Karnataka. Seasonal mushroom cultivation is confined to Solan, Shimla, Kangra and other cooler regions in the state. In Punjab, several cold storages are reported to have been converted into mushroom growing units. The large/export oriented units are located in Dehradun, Gurgaon, Hyderabad, Madras, Ooty, Pune, Paonta Sahib/Nalagarh and at Goa. These large units have the growing capacity in the range of 200 to 5000 tonnes per annum. Medium sized

commercial units are located near Gurgaon, Panipat, Kalka and Hissar districts. The seasonal mushrooms are grown particularly in the areas of Saharanpur, Agra, Ghaziabad, Aligarh, Lucknow, Mumbai and Pune and some other places.

Button Mushroom (*Agaricus spp.*) is the most popular mushroom variety grown and consumed all over the world. In India, its production earlier was limited to the winter season, but with the development and adoption of different levels of technology, these are now produced almost throughout the year in small, medium and large farms.

Application in Daily Diet: White Button mushrooms are tiny thumbnail sized mushrooms with smooth rounded caps and short truncated stems. Depending on when they are harvested, they are either stark white in color or earthen brown like a Crimini mushroom. Their flavor is mild when raw, and more fragrant and meaty when cooked.

Mushrooms are one of the best sources of vitamins especially Vitamin B. The good thing is button mushrooms are available throughout the year are cheap and are an excellent source of nutrition as part of a healthy diet. Button mushrooms may be eaten fresh or cooked. Their small size makes them ideal for snacks, serving whole in soups, stews and salads. They take on the flavor of other ingredients well, pair with cheese, butter, herbs and various sauces. To store them, we can just simply refrigerate them in paper towel or in a paper bag, as they can not be stored in plastic.

Post Harvest Management :

Processing : Sun-drying of mushrooms is one of the simplest and oldest methods. Technologies

like cabinet drying, canning, pickling, freeze-drying and irradiation treatment of mushrooms have been developed to improve the shelf life and consumption of mushrooms. A variety of products are being prepared from mushrooms. These are mushroom pickles, mushroom powder for preparing mushroom soup, mushroom sauce, mushroom candy etc.

Nutritional Composition:

Nutrient	Quantity/100 gm of fresh Mushrooms
Energy	22 kcal
Water	90.1
Protein	3.09 gm
Fat(gm)	0.34 gm
Carbohydrate	3.26gm
Sugars	1.98 gm
Dietary Fibre	1 gm
Potassium	318 mg
Phosphorous	86 mg
Magnesium	9.0 mg
Iron (mg)	0.5 gm
Sodium	3 mg
Zinc	0.52 mg
Vitamin B1	0
Vitamin B2	0.10
Vitamin B3	0.52
Vitamin B5	5.85
Vitamin B6	0.104 mg
Vitamin B9	17µg
Vitamin B12	0.04 µg
Vitamin C	2.1 mg
Vitamin D	0.2 µg



Button Mushroom

Health Benefits of Mushrooms

- Mushrooms are 90 per cent water, and virtually calorie free. They are a low calorie food which makes them an ideal food for people who want to reduce their weight.
- They are also rich in potassium, selenium, protein, and cancer preventing antioxidants.
- Button mushrooms are rich in vitamin D.
- Button mushrooms are a rich source of powerful anti-oxidants which help to ward off illness and boost the body's immune system by acting as free radical scavengers and help to mop up cell damage caused by free radicals in the body.
- Button Mushrooms help in reducing the risk of cancer from high estrogen and play a positive, chemo-preventive role against prostate cancer.
- Mushrooms have anti-allergic, anti-cholesterol, anti-tumour and anti inflammatory properties.
- Button Mushrooms are also a prime natural source of the powerful antioxidant L-Ergothioneine, which scavenges free radicals and protects against DNA damage.
- Mushrooms are also useful in preventing heart attacks as they are a rich source of Potassium.
- They help to manage the stress levels in the body as well as maintaining water balance and strengthen the reflexes in the muscles.
- Mushrooms are also useful in maintaining a healthy skin and make digestive and nervous system function properly.

Production Technology of Button Mushroom:

Agro-climatic Requirements: In India, button mushrooms are grown seasonally and in environment controlled cropping houses. White button mushroom requires 20-28° C for vegetative growth (spawn run) and 12-18° C for reproductive growth. Besides that, it requires a relative humidity of 80-90 per cent and enough ventilation during cropping. Seasonally, it is grown during the winter months in the north-west plains of India, and for 8-10 months in a year on the hills.

The growers can take on an average 3-4 crops of white button mushrooms in a year depending upon the type and varieties cultivated. Factors affecting

the yield of the crop both in terms of quality and quantity are incidence of pests/pathogens and non-availability of pure quality of spawn.

Cultivation Technology: The whole process of mushroom production can be divided into the following steps:

- (i) Spawn production
- (ii) Compost preparation
- (iii) Spawning
- (iv) Spawn running
- (v) Casing
- (vi) Fruiting

Spawn Production : Spawn is produced from fruiting culture/stocks of selected strains of mushrooms under sterile conditions. Stock culture may be produced in the lab or may be obtained from other reputed sources. Fruiting culture is mainly imported from various places including foreign sources which give higher yield than Indian strains and the spawn is produced in the lab. The spawn should be of good quality in terms of flavour, texture and size apart from having potential for high yield and longer shelf life.

Compost Preparation: The substrate on which button mushroom grows is mainly prepared from a mixture of plant wastes (cereal straw/ sugarcane bagasse etc.), salts (urea, super phosphate/ gypsum etc), supplements (rice bran/ wheat bran) and water. In order to produce 1 kg mushroom, 220gm of dry substrate materials are required. It is recommended that each ton of compost should contain 6.6 kg nitrogen, 2.0 kg phosphate and 5.0 kg of potassium (N:P:K- 33: 10:25) which would get converted into 1.98 per cent N, 0.62 per cent P and 1.5 per cent K on a dry weight basis. The ratio of C: N in a good substrate should be 25-30: 1 at the time of staking and 16-17 : 1 in the case of final compost. The compost may be prepared using short/long method of compost preparation. The commercial units mainly prepare the compost using short method which is considered better than the long method being used by the seasonal growers.

Spawning: The process of mixing spawn with compost is called spawning. The different methods followed for spawning are given below:

- (i) **Surface Spawning:** The spawn is evenly spread in the top layer of the compost and then mixed to a depth of 3-5 cm. The top portion is covered with a thin layer of compost.
- (ii) **Layer Spawning:** About 3-4 layers of spawn mixed with compost are prepared which is again covered with a thin layer of compost like in surface spawning.

The spawn is mixed through the whole mass of compost at the rate of 7.5 ml/ kg compost or 500 to 750 g/ 100 kg compost (0.5 to 0.75 per cent).

Spawn Running: After the spawning process is over, the compost is filled in polythene bags(90x90 cm., 150 gauge thick having a capacity of 20-25 kg per bag)/ trays (mostly wooden trays 1x1/2 m accommodating 20-30 kg compost) / shelves which are either covered with a newspaper sheet or polythene. The fungal bodies grow out from the spawn and take about two weeks (12-14 days) to colonise. The temperature maintained in cropping room is $23 \pm 2^{\circ}$ C. Higher temperature is detrimental for growth of the spawn and any temperature below than that specified for the purpose would result in slower spawn run. The relative humidity should be around 90 per cent and a higher than normal CO₂ concentration would be beneficial.

Casing: The compost beds after complete spawn run should be covered with a layer of soil (casing) about 3-4 cm thick to induce fruiting. The casing material should be having high porosity, water holding capacity and the pH should range between 7-7.5. Peat moss which is considered to be the best casing material is not available in India, as such the mixtures like garden loam soil and sand (4:1); decomposed cow dung and loam soil (1:1) and spent compost (2-3 years old); sand and lime, Coco peat and sandy soil are commonly used.

After casing is done the temperature of the room is again maintained at 23-28^o C and relative humidity of 85-90 per cent for another 8-10 days. Low CO₂ concentration is favourable for reproductive growth at this stage.

Fruiting: Under favourable environmental conditions viz. temperature (initially 23 ± 20 C for about a week and then 16 ± 20 C), moisture (2-3

light sprays per day for moistening the casing layer), humidity(above 85 per cent), proper ventilation and CO2 concentration (0.08-0.15 per cent) the fruit body initials which appear in the form of pin heads start growing and gradually develop into button stage.

Pest & Diseases:

The insect pests mostly observed are nematodes, mites and springtails. The crop is suspect to several diseases like Dry Bubble (brown spot), Wet Bubble (White Mould), Cobweb, Green Mould, False truffle (Truffle disease), Olive green mould, Brown plaster mould and Bacterial blotch. Timely management of insect and pest should be done.

Harvesting and Yield:

Harvesting is done at button stage and caps measuring 2.5 to 4 cm. across and closed are ideal for the purpose. The first crop appears about three weeks after casing. Mushrooms need to be harvested by light twisting without disturbing the casing soil. Once the harvesting is complete, the gaps in the beds should be filled with fresh sterilized casing material and then watered.

About 10-14 kg fresh mushrooms per 100 kg fresh compost can be obtained in two months crop. Short method used for preparation of compost under natural conditions gives more yield (15-20 kg per 100 kg compost).

Economics of a Small Scale Model of Button Mushroom Costs & Returns:

The minimum viable production unit will require a land site of 1.5 acres. A summary of cost of components given in the figure below. Inclusive of contingencies, the project cost works out to Rs. 107 lakhs as below.

Project cost	Amount (Rs. In Lakhs)
Land & Site Development	5.15
Building	44.96
Plant & Machinery	47.00
Misc. Fixed Assets	0.75
Contingency	4.88
Pre-Operative Cost	4.25
Total	106.99

The major components of the model are:

- Cost of acquiring land and its development (Rs.5.15 lakhs): The land would have to be acquired in areas well connected to urban markets. On an average, the cost of land is put at Rs.3 lakhs per acre.
- Cost of levelling the site (including fencing etc.) would be Rs.0.15 lakhs and cost of putting up guard rooms has been estimated at Rs.50 thousand.
- Building (Rs.44.96 lakhs): The estimated cost of this component works out to around Rs.45 lakhs, major item being growing room at the cost of Rs.25.92 lakhs.
- Plant & Machinery (Rs.47.00 lakhs): The cost of equipping the production unit works out to be Rs.30 lakhs, that of compost and casing unit to Rs.7 lakhs and that of installing canning facilities, spawn lab and other equipments to Rs.10 lakhs.
- Miscellaneous Fixed Assets (Rs.0.75 lakhs): This is the estimated cost of building up a communication system and furnishing.
- Pre-operative Expenses (Rs.4.25 lakhs): These include professional charges, administrative expenses and other start up expenses.

There would be three sources of financing the project as below:

Source	Rs. Lakhs
Farmer's share	53.50
Capital subsidy	21.40
Term loan	32.10
Total	107.00

Returns from the Project: The yield from the Unit is estimated at 200 tonnes per annum. Valued at Rs.24,000 per tonne, the annual gross return would come to Rs.48 lakhs. It would be seen that after accounting for all costs including depreciation, interest, taxes and retained profit etc., there are net cash accruals every year from year 1 to year 10. These, however, decline slightly over the 10 year period from Rs.20.70 lakhs in the first year to Rs.16.10



Oyster Mushroom

lakhs in the final year. The entrepreneur would have to seek a term loan of Rs.32.10 lakhs. The repayment terms have been worked out with a moratorium of 8 months and 11 half yearly installments of Rs.2.92 lakhs each. The interest rate has been put at 12 per cent. The BCR works out to 1.3 and IRR (Internal Rate of Return) (Pre-tax) to 26.4

Advantages

1. There are good opportunities in India both for domestic and export market for button mushroom.
2. Seasonal production is possible in a big way in the areas where temperature remains below 20°C during winter season. In this situation, cost of production is even lower.
3. Raw materials are easily and cheaply available for compost and casing material.
4. Awareness about food and medicinal values is increasing in the country thus, creating better domestic market.
5. Transport facilities are available both by land and air.
6. There is increasing market for post harvest products like pickle and soup powder.

Challenges:

1. High cost of energy for year round production.
2. Unorganized production and sale particularly by seasonal farmers.
3. Lack of facilities to produce quality compost, casing material, spawn and processed products.

Mushroom Industry in India: Future Prospects

Mushroom industry has a bright future in India, mainly because of large quantity of agro-by products and agro-waste generated, as well as availability of large and cheap labour force. This will provide a gainful employment to our rural youths. The educated unemployed youth may be encouraged to adopt mushroom cultivation as their profession, by creating awareness about this 'health food'.

Conclusion:

The demand and production of mushrooms in India is increasing every year. With the concerted efforts of all those involved in mushroom research, development and extension, the Indian growers and consumers will have to be made aware of the qualities of mushrooms particularly the nutritional and medicinal values of the cultivated species, so the mushroom may occupy their due place in Indian diet in general and vegetable meals in particular with increase in per capita consumption of mushroom.

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FLORICULTURE: POTENTIAL SOURCE OF FARMER'S INCOME

Sushma Rawat

India has an immense potential to bridge the gap between demand and supply as global demand of floricultural products is growing at a faster rate. In India, floriculture covered an area of 2.55 lakh ha with a production of 17,54,000 MT of loose flowers and 5.43 lakh MT cut flower during 2015. During 2015-2016, a sum of Rs 306.95 crore from the floriculture sector has been achieved in terms of export earnings while annual trade of Indian flowers is worth Rs. 37,000 crores/annum.

Ancient literature such as Harsh Charita, Ramayana describes that India has a long history of use of flowering plants from eras on a large scale in religious purposes, social ceremonies, for making surrounding peaceful and a place ideal for meditation. Floriculture or flower farming is the branch of horticulture that deals with the cultivation of flowering and ornamental plants for sales and for use as raw materials in cosmetic, perfume industry and in the pharmaceutical sector. It also includes production of planting materials through seeds, cuttings, budding and grafting. In recent decades, there has been a sudden boom of the flower industry in India with increasing demand of floriculture products i.e. cut flowers, pot plants, cut foliage, seeds bulbs, tubers, rooted cuttings, dried flowers or leaves, and has emerged as a profitable agri-business due to improved living standards and growing awareness among the citizens across the globe to live in environment friendly atmosphere.

Though, India dominates in terms of area under cultivation compared with some leading countries which are relatively prosperous in floriculture like the Netherlands, Colombia, Ecuador and Belgium, yet India's yield per hectare is low. As a result, India's contribution to the global floricultural export market is very minimal. Since India is having a better scope in the future as there is a shift in trend towards tropical flowers and this

can be gainfully exploited due to presence of high amount of diversity in indigenous flora. However, in order to become sustainable, new strategies should be followed, which can give fruitful results on a long-term basis. Since, floricultural trade and consumption are increasing rapidly worldwide, there is a still an opportunity for India to achieve some consistent growth in its production and export, thus earning valuable foreign exchange.

Present Scenario:

India is enriched with diverse agro-climatic conditions such as fertile land, suitable climate, abundant water supply, low labour cost, availability of skilled manpower and the recent investment culture of Indian corporate etc., which are the strengths of Indian floriculture and are quite beneficial for growing a variety of flower plants throughout the year. Floriculture is also important from the economical perspective as cultivation of flowers in India provides an opportunity for rural



development owing to its higher returns per unit area and the new employment opportunities. It comprises the florist trade, nursery of plant-saplings, potted plant, bulb and seed production, micro-propagation material and extraction of essential oils from flower. India has an immense potential to bridge the gap between demand and supply as global demand of floricultural products is growing at a faster rate. In India, floriculture covered an area of 2.55 lakh ha with a production of 17,54,000 MT of loose flowers and 5.43 lakh MT cut flower during 2015. During 2015-2016, a sum of Rs 306.95 crore from the floriculture sector has been achieved in terms of export earnings while annual trade of Indian flowers is worth Rs. 37,000 crores/annum.

Nearly 77 per cent of area under floricultural crops is concentrated in seven states comprising Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal, Maharashtra, Haryana, Uttar Pradesh and Delhi. Among these, Tamil Nadu ranks first in the area under flower cultivation followed by Karnataka, West Bengal and Andhra Pradesh. 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 in the recent years. The Indian floriculture industries have been growing at a compound annual growth rate of 25 per cent over the past decade which is currently worth USD 230 million. Indian flower export markets are estimated at 11 billion US dollars at present and are expected to grow up to 20 billion US dollars by 2020. During last two decades, the production of both the loose and cut flowers has been growing at a Compound Annual Growth Rate (CAGR) of 9.92 per cent and 26.66 per cent, respectively. However, during the first decade, no substantial growth was observed in export of floricultural products from India but during the last decade, export increased at a CAGR of 4.33 per cent. At present, India's share of global floriculture trade is only about 0.6 per cent.

As per the National Horticulture Database published by the National Horticulture Board, during 2014-15, the area under floriculture production in India was 248.51 thousand hectares with a production of 1,685 thousand tonnes loose flowers and 472 thousand tonnes cut flowers.



Floriculture is now commercially cultivated in several states with Tamil Nadu (17 per cent), Karnataka (14 per cent) West Bengal (10 per cent), having gone ahead of other producing states like Madhya Pradesh, Mizoram, Gujarat, Andhra Pradesh, Orissa, Jharkhand, Haryana, Assam and Chhattisgarh. Indian floriculture industry comprises of flowers such as Rose, Tuberose, Glads, Anthurium, Carnations, Marigold etc. Cultivation is undertaken both in open farm conditions as well as in controlled conditions. India's total export of floriculture was Rs. 479.42 crores in 2015-16.

Floriculture Industry in India: Challenges

The present day floral industry is a dynamic, fast growing industry, which has achieved a significant expansion during the past few decades and has extended worldwide with the major paradigm shift of production centers from developed to developing nations. India is also paving its way to emerge as an important production base for floriculture products. In spite of an abundant and varied production base, India's export of floricultural product is not encouraging. The Indian floriculture industry is facing a number of challenges mainly associated to trade environment, infrastructure and marketing issues such as high import tariff, low availability of perishable carriers, higher freight rates and inadequate refrigerated and transport facilities.

At the production level, the industry faces challenges mostly related to availability of basic inputs including good quality seeds and planting materials, efficient irrigation system and skilled manpower. In order to overcome these problems, steps must be taken to reduce import duty on planting material and equipment, reduce air freight to a reasonable level, provide sufficient cargo space in major airlines and to establish model nurseries for supplying genuine planting material. Training centres should be established for training the personnel in floriculture and allied areas. Exporters should plan and monitor effective quality control measures right from production to post harvesting, storage, and transportation.

Enhancing Farmers' Income through Floriculture:

Floriculture is an age old farming activity in India and has emerged as an important agribusiness with immense potential for generating self-employment and entrepreneurship among small and marginal farmers in both urban and rural areas. Apart from these, floriculture activity has also evolved as a viable and profitable alternative for income generation and empowerment, helping in sustaining livelihood of farmers in changing climate by using every inch of their land for raising the flower and foliage crops.

The demand for flowers is seasonal as it is in most countries. The demand for traditional flowers comes from the use of flowers for religious purposes, decoration of homes and for making garlands and wreaths while institutions like hotels, guest houses and marriage gardens demands for modern flowers. In present times of increasing demand for cut flowers, protected cultivation in green houses is the best alternative for using land and other resources more efficiently because it provides favourable climatic conditions by controlling temperature, humidity and light intensity inside for plant growth which ultimately provides quality products. To meet this increasing demand, the government is now investing in setting up of auction platforms, as well as organized florist shops with better storage facilities to prolong the flower's shelf life. Apart from this, the government is also providing some assistance for buying refrigerated cargos and has

built up a large number of export oriented units with excellent facilities of pre-cooling chambers, cold stores and reefer vans.

Many developmental programmes have been initiated for enhancing and sustaining farmers' livelihood by the Government of India mainly through the schemes of Ministry of Agriculture (National Horticulture Board, National Horticulture Mission, Horticulture Mission for North East & Himalayan States etc.) and Ministry of Commerce (APEDA). National Horticulture Board (NHB), National Horticulture Mission (NHM) and Rashtriya Krishi Vikas Yojana (RKVY) have created awareness regarding practicing horticulture and related benefits in rural areas. National Bank for Agricultural Rural Development (NABARD) is providing financial assistance to the farmers to adopt the methods of protected cultivation and precision farming too. Integrated Development of Commercial Floriculture scheme also has been initiated by the Government to improve the production and productivity of traditional as well as cut flowers through availability of quality planting material, production of off-season and quality flowers through protected cultivation, improvement in post-harvest handling of flowers and training persons for a scientific floriculture.

Research activities on floriculture are being carried out at several research institutions under the Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR) and in the horticulture departments of state agriculture universities and under the All India Co-ordinated Floriculture Improvement Project. To meet the demand of flower seeds, several seed companies have developed production units in major flower growing states. Various training related programmes have also been introduced by the Indian government for farmers and entrepreneurs and also offers a range of concession on seeds, planting materials, various types of equipment and airfreight for export. It is anticipated that improved policies would enhance floriculture as well as the farmers' income level in the times to come.

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SENIOR GOVERNMENT OFFICERS CLEAN TOILET PITS IN WARANGAL VILLAGE TO PROMOTE SWACHH BHARAT MISSION

With an aim to promote twin pit composting toilets in rural areas, a team of senior Government officials from the Center and the States cleaned the toilet pits at Gangadevipally village of Warangal district in February, 2017. This admirable action under *Swachh Bharat Mission* comes in the backdrop of several news reports about the unused toilets in rural India.

India's cleanliness drive under *Swachh Bharat Mission* is encountering a peculiar problem of 'unused toilets' i.e. toilets are being constructed in rural households with the Government's help, but they are lying unused. One major reason for this has been the social stigma attached to the cleaning of toilet pits once they get filled up.

Under *Swachh Bharat Mission*, the Government is promoting WHO approved twin pit composting toilets as low-cost sanitation solutions in rural areas. As shown in the figure below, these toilets have two leach pits which are connected to one single pour-flush toilet. Initially, one leach pit is connected to the toilet. When this pit gets



Union Drinking Water and Sanitation Secretary Shri Parameswaran Iyer; OSD, Swachh Bharat Mission Shri Akshay Rout and other members of Swachh Bharat Mission team holding 'coffee powder' compost after emptying toilet pits in Gangadevipally, Warangal.

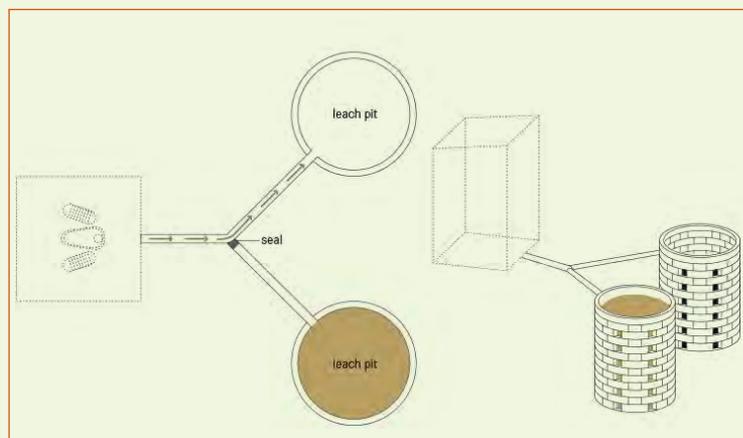


Fig: Diagram of a Twin Pit Composting Toilet

filled up, its pipe is blocked with a seal and other pit is connected to the flush of the toilet. When second pit is under use, excreta in first pit decomposes slowly during that period. After some months, excreta in first pit decomposes completely and a soil like harmless substance (called coffee powder compost) is left in the end. This 'coffee powder' compost is odourless and can be safely emptied from the pit with hands by anyone. This waste can also be used as manure in the farms.

DOUBLING FARMERS INCOME THROUGH HORTICULTURE

Dr. Ranjan Srivastava, Jaya Kumari, Satish Chand and B.D. Bhuj

On account of significant production increases in horticultural crops across the country, a Golden Revolution is in the offing and India has emerged as a leading player in the global scenario. We have emerged as one of the world's largest producers of coconut and the leading producer and exporter of tea, coffee, cashew, spices, fresh and processed fruits, vegetables, cut flowers and dried flowers. As a result of a number of thoughtful research, technological and policy initiatives and inputs, horticulture in India, today, has become a sustainable and viable venture for the small and marginal farmers.

In present times, India is at the highest rate of urbanisation and there has been a continuous and sizable shift from the primary sector to the industrial and services sectors. As a result, the share of agriculture sector to India's GDP has been falling continuously. Our Prime Minister has expressed the government's desire to double farmer's income by 2022. This has also evoked interest among a variety of stakeholders—farming community, scientists, economists, political commentators, besides the general public.

As per the recent census, the realistic picture for agriculture future is not much bright as out of the total agriculture workers, the fraction of cultivators has gradually gone down from 72 per cent in 1951 to 45.1 per cent in 2011. On the other hand, the fraction of agricultural labourers has gradually gone up from 28 per cent in 1951 to 54.8 per cent in 2011. This hints towards a disturbing trend that more and more people in India are losing their land and they are either becoming farm labourers or moving to other sectors.

Farmers' income can be improved if farm productivity goes up. Other way is to ensure that agricultural commodities get a remunerative price through a transparent price discovery mechanism. Also, improved income from allied activities to agriculture and non-farm sector or even wage employment during the agricultural off season can increase farmers' income. The strategy must be to integrate these all. Given the time horizon of six years, doubling of farmers' income must be attempted by creating a framework where all related agencies come together and work in harmony, with a maestro conducting that orchestra. In this direction, some of the major plans taken up by the government pertain to accelerating

crop diversification by involving the small and marginal farmers and empowering the farmer with advance agricultural practices like promotion of 'intercropping' and 'local-specific crop sequencing'. In this situation, horticulture can emerge as a game changer and can be a reliable agricultural income source for Indian farmers.

Over the years, horticulture has emerged as one of the potential agricultural enterprise in accelerating the growth of economy. Its role in the country's nutritional security, poverty alleviation and employment generation programmes is becoming increasingly important. It offers not only a wide range of options to the farmers for crop diversification, but also provides ample scope for sustaining large number of Agro-industries which generate huge employment opportunities.

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interventions are listed below which can help in the goal of doubling farmers income by 2022-

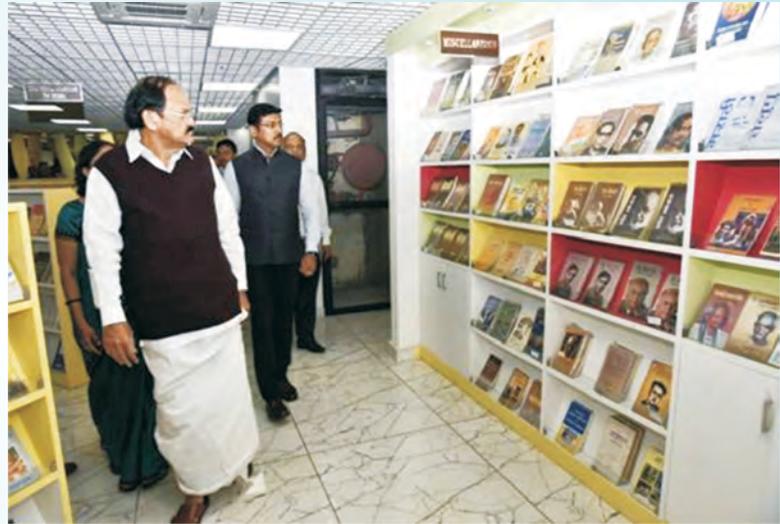
- Revisiting zones for different crops keeping into account the changing climate particularly in the hills.
- Ensuring availability of quality seed including hybrids of vegetables, flowers and planting material of fruit trees for better quality and yield of produce.
- Enhancing seed production of vegetable crops (especially temperate vegetables), flowers and nursery production of horticultural crops.
- Promoting cultivation flowers and medicinal plants.
- Rejuvenation of old and unproductive orchards.
- Post harvest management of horticultural crops through grading, packaging and on farm primary processing for value addition and product development.
- Diversification of horticultural crops along with other activities viz. bee keeping, mushroom cultivation, backyard poultry, sericulture, fish culture etc.
- Popularize bee hives in orchards, vegetable and flower production plots for enhanced production through pollination as well as secondary product (honey, jelly, etc.) production.
- Introduction of potential new varieties and replacing the old and low productive varieties.
- Introduction of pollinizer varieties for enhanced pollination and fruit set.
- Tree architecture management through training and pruning for enhanced quality and production of fruit crops.
- Crop regulation in guava, pomegranate and other fruits for quality and quantity of produce
- Promotion of organic farming practices in vegetables and fruit production.
- Promotion of high density orchards.
- Promotion of off-season vegetables and flowers in hills.
- Popularization of local/ indigenous or under-utilized horticultural crops (fruits, vegetables, floriculture crops, medicinal plants etc.)
- Promoting intercropping with vegetables, flowers, medicinal and aromatic plants and short duration fruit crops.
- Extraction of essential oils, dyes etc. for value-added products from flowers, vegetables and spices.
- Popularisation of cooperative farming in horticultural crops for round the year supply.
- Adopting drip irrigation cum fertigation system of irrigation for more crop, per drop.
- Weather forecasting advisory to be popularised for strategic planning of cultural practices for minimising losses.
- Site specific integrated nutrient and pest management.
- Promoting mechanisation in horticulture for enhanced efficiency and reducing losses.
- Promotion of contract farming and buyback arrangement for encouraging farmers to adopt horti-based farming .
- Facilitate on farm primary processing and cool chain management.
- Strengthening of horticulture support industry like logistics, packaging, etc.
- Promotion of nursery industry for increased income from less land holding.
- Promotion of horti-tourism in states like J&K, HP, Uttarakhand and north-eastern state.

The above mentioned strategies are meant to boost income of farmers and have found prominent place in the agriculture activities and research developments recently. The Finance Minister, in his budget speech, emphasised that “We need to think beyond food security and give back to our farmers a sense of income security.” Hence, by adopting the above mentioned horticultural interventions on a large scale, we can reorient our farm and non-farm sectors to double the income of farmers by 2022.

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New Book Gallery Becomes Operational at Soochna Bhawan

Shri M. Venkaiah Naidu, Minister for Information & Broadcasting visited the some of Media Units and their facilities at Soochna Bhawan to get a first-hand experience of their functioning. Complimenting the Publications Division on the recently opened New Book Gallery, Shri Naidu urged the people to visit the gallery and make use of the rich collection of books brought out by Publications Division. He added that youngsters should make use of the Digital Online Library which contains selected archival books that can be accessed in the Book Gallery free of cost. In the age of instant communication, it is important to nurture the habit of reading amongst all age groups. This initiative by the Publications Division was an important step in this direction. The Minister was accompanied by Minister of State for I&B, Col. Rajyavardhan Rathore, Secretary I&B, Shri Ajay Mittal and senior officers of Ministry of I&B.



A modern and attractive Book Gallery has been set up in Soochna Bhawan which has become operational since February, 2017. A separate section has also been created for children books to encourage children to read the interesting titles. There is a reading room in the Gallery where the visitors can sit and go through the books displayed in a relaxed environment before purchasing the book.

Shri Naidu also visited the DAVP Studio, Electronics Media Monitoring Centre and Social Media Cell of the Ministry of I&B.

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