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Vegetables for better nutrition and safe environment

Vegetable crops are a vital component of agriculture for ensuring food and livelihood security owing to their higher yield potential and better nutrient contents. Enormous diversity in vegetables cater to the dietary nutrient requirements of humans and therefore vegetables make a very important constituent of food for fulfilling nutritional security as well. Most of the vegetables are short duration crop easily adjusted in crop diversification, provide higher biomass and return leading to nutritional and economic security to resource-poor farmers. Vegetables are also economic engines for productive, profitable agricultural economies. Intensified vegetable production has the potential to generate more income and employment than other segments of the agricultural economy, making vegetables an important element of any agricultural growth strategy. Vegetable production provides a promising economic opportunity for reducing rural poverty and unemployment in rural areas, and is a key component of farm diversification strategies.

INDIA ranks second after China in vegetable production in the world and India's contribution to the total vegetable production of the world is 14%. Vegetable cultivation in India is done from the mountainous regions of the Himalayas in the north to the coastal parts of the sea located in the south. Due to more income from vegetables throughout the year, the more number of growers are adopting vegetable farming. Carbohydrates, proteins, mineral salts, amino acids and many vitamins are found in vegetables, which not only make our food tasty but also make the body active by giving it the strength to fight diseases. According to the Indian Council of Medical Research, 300 g of vegetable is necessary per person per day in which 100 g of leafy vegetables, 100 g of root vegetables and 100 g of other vegetables should be included, but at present this prescribed quantity is not available to everyone. On one hand, vegetables are being wasted in India due to lack of storage and processing while on the other hand, the problem of malnutrition is widespread in the country. The recently published National Family Health Survey data showed that 79.2% of the 6-35 months old children in our country are suffering from anaemia. The problem of malnutrition in our country can be tackled by including more vegetables in the diet. According to an estimate, by the year 2030, the population of the country will be around 145 crore and more than 263 million tonnes of vegetable production will be required to cater the demands of growing population. With more production of vegetables, we will be able to consume more vegetables to fulfill the requirements of essential nutrients in our food, and also get more foreign exchange than ever before by selling the surplus produce abroad. Therefore, to ensure the nutritional and income security of the growing population of the country, it is very necessary to increase the production of vegetables.

Current status

India's diverse climate ensures availability of a wide variety of vegetables. It ranks second in vegetables production in the world, after China. India produced 191.77 million metric tonnes of vegetables from 10.35 million ha area as per National Horticulture Database 2019-20 (Second Advance Estimates). Besides, India is the largest producer of ginger and okra amongst vegetables and ranks second in production of potatoes, onions, cauliflowers, brinjal, cabbages, etc.

India has achieved enormous growth in terms of area,

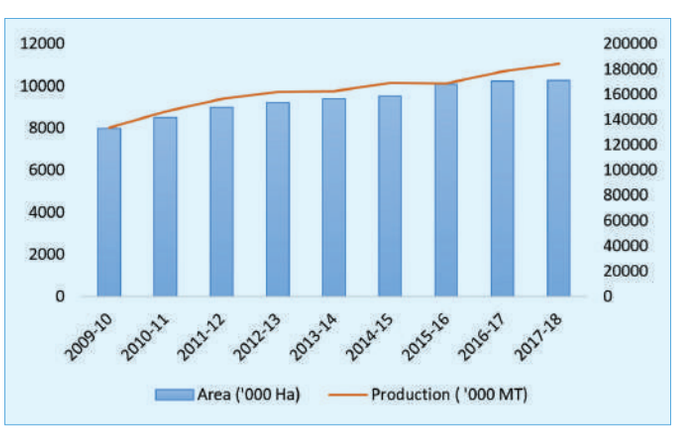

Fig. 1. All India area, production and productivity of vegetable crops

production, productivity and consumption of vegetables from last decade. The production of vegetables has increased from 133.73 MT in 2009-10 to 184.39 MT in the year 2017-18. Similarly, the productivity has also increased from 16.75 t/ha to 17.97 t/ha (Fig. 1).

Uttar Pradesh is the largest vegetable producing state in India, where 283 lakh metric tonnes of vegetables were produced from a total area of 14 lakh ha during the year 2017-18. According to the latest estimates, West Bengal will become the largest vegetable producing state in the country in 2019-20 (Fig. 2).

Although more than 50 types of vegetables are grown in India, potato, onion, tomato, brinjal, chilli etc. are the main vegetable crops here (Table 1). If we look at the global level, India ranked at second place in the world in the production of brinjal, cabbage and cauliflower, while India ranked first in both the area and production of lady finger. But when it comes to productivity, we are ranked third, sixth, eighth and ninth in the world in okra, cauliflower, brinjal and cabbage respectively. India is also an exporter of fresh vegetables in the world. The country has exported 682,085.85 MT of fresh vegetables other than onion to the world for the worth of ₹ 2,143.21 crore/ 289.09 USD millions during the year 2020-21. The major importing countries are United Arab Emirates, Nepal, Bangladesh, UK and Qatar. However, compared to countries like USA, Korea, Spain, the productivity of vegetables in our country is very low and serious policy efforts need to be implemented to overcome this situation.

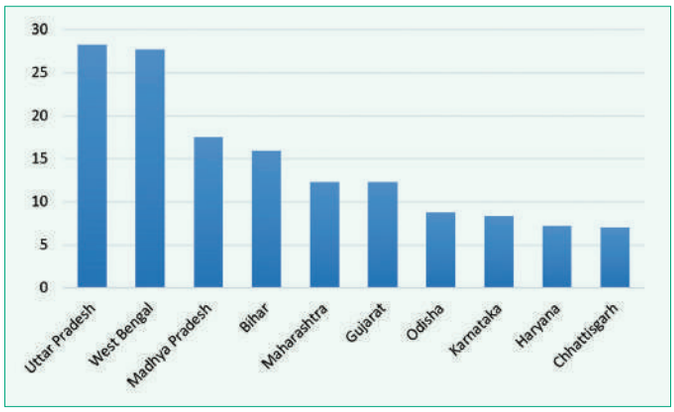

Fig. 2. State-wise production of vegetables

Table 1. All India area and production of horticulture crops

Vegetable	2017-18		2018-19		2019-20	
	Area ('000 ha)	Production ('000 MT)	Area ('000 ha)	Production ('000 MT)	Area ('000 ha)	Production ('000 MT)
Beans	228	2277	236	2356	239	2269
Bitter gourd	97	1137	99	1205	107	1268
Bottle gourd	157	2683	187	3011	189	3106
Brinjal	730	12801	727	12680	744	12682
Cabbage	399	9037	400	9127	401	9272
Capsicum	24	326	34	497	34	534
Carrot	97	1648	109	1893	105	1828
Cauliflower	453	8668	465	9083	467	8941
Cucumber	82	1260	105	1588	112	1656
Chillies (green)	309	3592	377	3783	387	4119
Elephant foot yam	30	774	33	817	31	724
Mushroom	198	487	0	182	-	211
Okra	509	6095	513	6176	521	6355
Onion	1285	23262	1220	22819	1431	26091
Pointed gourd	20	310	55	757	59	754
Pea	540	5422	552	5562	568	5848
Potato	2142	51310	2173	50190	2051	48562
Radish	209	3061	200	3143	207	3184
Pumpkin	78	1714	94	2043	104	2183
Sweet potato	131	1500	110	1156	108	1141
Tapioca	173	4950	163	4976	173	6060
Tomato	789	19759	781	19007	811	21173
Others	1580	22320	1441	21118	1453	20945
Total vegetables	10259	184394	10073	183170	10303	188907

Source: Ministry of Agriculture and Farmers Welfare, GoI

If we look at the export of vegetables, then it contributes only 5% to the total agriculture and 0.23% to the total national export. Similarly, at the international level, India is ranked 24th in vegetable exports.

Vegetable production: problems and solutions

Vegetable based industry is developing rapidly in India. In this decade, work has been done on many dimensions of vegetable variety improvement and production techniques, but to fight the challenges of the future, it is absolutely necessary to make efforts in this area. There are many challenges before the vegetable farmers in India, some of which are as follows:

- Non-availability of quality seed
- Lack of multi-stress resistant varieties to deal with climate change
- Lack of location-specific technical recommendations related to production
- Lack of awareness about modern methods of vegetable farming like protected farming and non-seasonal farming
- Lack of special varieties for processing
- Lack of market facilities for marketing of vegetables
- Lack of facilities for storage, packing and transportation for export
- Lack of targeted extension and training programs for vegetable growers.

At present, climate change due to increase in the concentration of greenhouse gases and high temperature, increase in drought, flood, cyclone etc. is a reality and the effect of climate change is clearly visible on various ecosystems, especially, vegetable production. Various strategies for mitigation and adaptation have been suggested like development of vegetable crop varieties which are tolerant to high temperature, low rainfall, drought, submergence etc., conservation of natural resources (water, energy etc.) through adoption of drip and sprinkler irrigation method, suitable cropping system modules, balanced use of organic manures and chemical fertilizers etc. Adaptation can be accomplished by adopting crop rotation and suitable vegetable crop production practices. There is also a need to give priority to specific under-exploited vegetable crops in varietal development programmes. In addition, it will be necessary to strengthen training programs on various aspects of vegetable and its seed production and postharvest technologies for members of cooperatives, government officials and farmers.

Major accomplishments in vegetable production

Biofortified varieties

Biofortification of different vegetable varieties offers a sustainable and long-term solution in providing nutritionally-rich crops to people. Intensive breeding efforts have resulted in development of some exceptionally nutrient-rich vegetable varieties. Some of the biofortified vegetable varieties, developed in India, and their characteristics are presented in Table 2. Breeding for such varieties in other crops are also underway at ICAR-IIHR, Bengaluru and ICAR-IIVR, Varanasi.

Hybrid varieties

Recognizing the prospects of heterosis breeding in development of improved vegetable hybrids, Indian Council of Agricultural Research (ICAR) initiated a network project on Promotion of Hybrids in Vegetable Crops in 1995-96. At present, heterosis breeding is being taken up in crops like tomato, brinjal, chilli, capsicum (bell pepper), sweet pepper, okra, cauliflower, cabbage, carrot, cucumber, bitter gourd, bottle gourd, muskmelon, and watermelon etc. with the aim to (i) promote hybrid research in order to increase productivity *per se* of the country, (ii) incorporate biotic stress resistance in the hybrids, and (iii) to strengthen hybrid seed research and hybrid seed production technology. Screening and development of vegetable varieties resistant to specific pathogen has been an integral component of research programmes. The impacts of vegetable breeding programmes made major strides in the development of varieties resistant to leaf curl virus and bacterial wilt in tomato, YVMV in okra, powdery mildew in pea, bacterial wilt in brinjal, downy mildew and CGMV resistant in muskmelon.

Development of off-season varieties

Past few years have witnessed large scale adoption of off-season varieties, especially, of radish, tomato, onion,

Table 2. Biofortified varieties of vegetable crops developed by ICAR institutions

Crop	Variety	Special features
Cauliflower	Pusa Beta Kesari 1	Developed by ICAR-IARI, New Delhi in 2015; country's first biofortified cauliflower; contains high β-carotene (8.0-10.0 ppm) in comparison to negligible β-carotene content in popular varieties; curd yield: 40.0-50.0 t/ha.
Potato	Bhu Sona	Developed by ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala in 2017; high β-carotene (14.0 mg/100 g) content as compared to 2.0-3.0 mg/100 g β-carotene in popular varieties; tuber yield: 19.8 t/ha; dry matter: 27.0-29.0%; starch: 20.0%; total sugar: 2.0-2.4%.
Sweet Potato	Bhu Krishna	Developed by ICAR-Central Tuber Crops Research Institute in 2017; high anthocyanin (90.0 mg/100g) content in comparison to popular varieties which have negligible anthocyanin content; tuber yield: 18.0 t/ha; dry matter: 24.0-25.5%; starch: 19.5%; total sugar: 1.9-2.2%; salinity stress tolerant.
Radish	Pusa Jamuni	Developed by ICAR-IARI, New Delhi in 2012; first purple fleshed unique trait nutritionally rich radish variety. Distinct advantage in root size, shape, yield and consumer preference over the existing varieties. Higher anthocyanins and ascorbic acid.
	Pusa Gulabi	Developed by ICAR-IARI, New Delhi in 2012; first entire pink fleshed unique trait nutritional rich radish variety. Medium root size, cylindrical shape, optimal yield and consumer preference over the existing varieties. High total carotenoids, anthocyanins and optimal ascorbic acid.

cabbage and carrot amongst the growers that has resulted in ever-higher vegetable production. Tomato cvs. Pusa Sheetal and Pusa Hybrid 1 have been identified for fruit set at low and high temperature, respectively. Likewise, development of cvs. like Pusa Chetki and Pusa Desi in radish has made it possible to grow it throughout the year. Onion, which is a *rabi* season crop, traditionally, can now be grown in *kharif* as well with the advent of cvs. like N-53, Agrifound Dark Red, Arka Kalyan and Baswant 780. Furthermore, rescheduling the planting season has also extended the availability period of carrot. For instances, carrot cv. Pusa Vrishti and Pusa Meghali can be sown during July-August and made available during October-December. On the other hand, cv. Pusa Yamdagini can be sown during December-February to make roots available during March-May. Similarly, cv. like Pusa Nayanjyoti can be sown in March-April and roots are available for harvest in June-July.

Protected cultivation

India being a country blessed with diverse agro-climatic regions has displayed an overall growth of around 2.15 lakh ha area under protected cultivation in different forms in the last two decades. Protected cultivation is rendering opportunities for improving quality, productivity and remunerative prices to the vegetable growers by protecting crop from the vagaries of nature. Insect proof net houses can be used to reduce pest and pesticide levels in addition to virus-free cultivation of tomato, chilli, sweet pepper and other vegetables during the rainy season. Parthenocarpic cucumber production under protected cultivation gives very high yield with quality fruit. Low cost greenhouses can be used for high quality vegetable cultivation for long duration (6-10 months) to obtain appropriate price of produces. Basically the growth of protected cultivation technology in the country happened mainly due to government policies providing handsome subsidies under various schemes launched by government of India under MIDH (NHM), TM, NHB, RKVY etc., but merely due to the technical beauty of the technology. Initially, most of the varieties suitable for protected cultivation were from private sector; however, at present many varieties developed by public sector research organizations, such as tomato – Pusa Rakshit, Arka Meghali, Arka Saurav, Pant Poly House Tomato-1, Pant Poly House Tomato Hybrid-1; cucumber - Pant Parthenocarpic Cucumber-2, Pusa Parthenocarpy Cucumber 6 and 3; capsicum - Arka Gaurav, Arka Basant etc. have shown promise for cultivation under protected environment. Pusa Seedless cucumber-6 first extra early variety has been developed which is a parthenocarpic, gynoecious cucumber and suitable for protected conditions. Likewise, Swarna and Shonima have been developed by crossing a stable tetraploid line of watermelon KAU-CL-TETRA-1(4×) with diploid males (2×) namely, CL-4 (red fleshed) and CL-5 (yellow fleshed), respectively.

Vegetable grafting

Grafting is the union of two or more pieces of living plant tissue, which grow as a single unified plant. Grafting vegetable scion plant onto desirable rootstocks is an effective tool to mitigate targeted soil-borne diseases, environmental stresses (moisture imbalances; extremes of temperatures; salt stress) and enhancing yield and quality of vegetable. In India, researches on vegetable grafting to combat abiotic stresses, particularly moisture imbalance, are underway at ICAR-IIHR, Bengaluru; ICAR-CAZRI, Jodhpur, and ICAR-IIVR, Varanasi, in solanaceous and cucurbitaceous crops. NBPGR regional station, Thrissur, Kerala have done work on *Momordica cochinchinensis*. The female plants were grafted on to the male plants to increase its production. CSKHPKV, Palampur, initiated work on grafting and identified more than 22 rootstocks of brinjal, chilli, tomato and cucurbits for importing resistance to bacterial wilt and nematodes. Amongst private sector, some companies are producing grafted vegetable seedlings resistant to bacterial wilt for farmers.

Vertical farming

Soilless hydroponic/aeroponic vertical vegetable production is mainly adopted under the controlled environment or greenhouse conditions and offers appropriate alternatives to traditional soil-based vegetable culture. Ideal management of plant growth gives higher yield and better quality produce in comparison to conventional greenhouse production in soil. Vertical farming in India is still in infancy stage. Very few research institutions are working on this area of future farming. Researchers at the Bidhan Chandra Krishi Viswavidyalaya, Nadia had initial success in working on vertical farming hydroponically on a small scale. Likewise in Himachal Pradesh and Punjab, scientists have attained initial success in growing potato tubers in soilless conditions. The micro-tubers production through aeroponics have been developed by ICAR-CPCRI and the technology of the same has been licenced to more than two-dozen private companies. At commercial level, a project 'Nature Fit', Panchgaon, Manesar commissioned by the Haryana Department of Horticulture is supplying safe, chemical-free fruit and vegetables to residents of Delhi and Gurugram, and encouraging a new generation of urban farmers in India. Indo-Israel Centre of Excellence for Vegetables, Gharaunda, Haryana and Uttarang, Uttar Pradesh are also imparting training to interested farmers on vertical farming. Similarly many students from various fields, especially, of engineering had successfully ventured in the area of vertical farming and heading their companies successfully. However at present, the private sectors are leading and have developed significant expertise. For instance, leading Lab Consumable manufacturer HiMedia is dealing vertical farming by hydroponics. Other big players are based in Ahemdabad, Chennai etc.

Promotion of indigenous vegetables

Indigenous plant species provide a variety of products like food, medicines and raw materials, and are also an important source of renewable energy. The Indian subcontinent has been one of the rich emporia of 2,500 plant species used in indigenous treatments and utilized as food sources. The Indian subcontinent represents one of the richest diverse genetic resources.

Of the estimated 250,000 species of flowering plants at global level, about 3,000 are regarded as food source, in which only 200 species have been domesticated. Global diversity in vegetable crops is estimated at about 400 species, with about 80 species of major and minor vegetables are reported to have originated in India. The UN Food and Agriculture Organization (FAO) reports that approximately 75% of the Earth's genetic resources are now extinct, and another third of plant biodiversity is predicted to disappear by the year 2050.

Indigenous (traditional) vegetables are best defined as species that are locally important for the sustainability of economies, human nutrition and health, and social systems - but which have yet to attain global recognition to the same extent as major vegetable commodities. In general, vegetables are the key component of balanced human diet and are also the main drivers in achieving nutritional security by providing essential micronutrients, vitamins and minerals such as potassium, vitamin C, vitamin-B_6. In addition to this, vegetables are important sources of an array of phytochemicals that play important role as antioxidants, phytoestrogens and anti-inflammatory agents, and through various protective mechanisms protects the human body from a number of lifestyle diseases. Spectacular growth in vegetable production has been achieved, which was possible due to development of improved varieties/hybrids/production and protection technologies through systematic research coupled with large scale adoption by the farmers. However, this remarkable production was contributed by only few major vegetables. Endowed with a wide diversity of agro-climatic conditions, India is virtually a herbarium of the world. This diverse agro-climate in the country permits to grow more than 60 cultivated and about 30 lesser known vegetable crops which are not all indigenous. Many rural households including people residing in the tribal areas still depend on the traditional leafy vegetables to a great extent for their food security strategies. Traditional leafy crops are important fresh crops during the rainy season and are especially important in dried form during winter and spring seasons as a source of low cost protein. Bitter gourd, despite its distinctive appearance and bitter taste, originally from the Indian subcontinent, is popular in a number of Asian countries. The triterpenoid momordicin, responsible for the bitterness of this vegetable, has been demonstrated to have anti-diabetic activities. Another triterpenoid from wild bitter gourd has been shown to inhibit breast cancer cells.

Although, some of these indigenous vegetables are widely harvested and consumed, but there is an increasing concern that their use is declining in the rural areas. The importance of these indigenous vegetables in the food security strategies is being limited due to loss of the biodiversity and the associated indigenous knowledge. Their potential contribution to food security, nutrition, health, income generation, and ecosystem services for the wellbeing of mankind is still largely under-exploited.

Indigenous vegetables are primary candidates for greater use of crop biodiversity in horticulture as they are already consumed and enjoyed locally, and can be produced profitably in both rural and urban environments. Conservation and sustainable use of the genetic resources of indigenous vegetable crops offer a tremendous tool for addressing the problem of food security–both inadequate quality and quantity–at both national and household levels. The food base for the rural population, especially in the marginal and semi-arid areas, has become narrower, leaving communities more vulnerable to food shortages and nutrient-deficiency diseases. Wild and weedy species, commonly used as vegetables in the past, are disappearing as a result of changes in customs and land use. Local knowledge about the cultivation and management of these species is on decline as well. At the same time, producers lack knowledge of more efficient, intensive production and management techniques. There is also a lack of knowledge about nutritive value and cooking methods that minimize nutrient leaching during food preparation.

Thus there is a need to promote the use of indigenous vegetables, and hence their production, by carrying out research on nutritive value, agronomy and value addition, in particular focusing on the role of vegetables in alleviating malnutrition among certain vulnerable groups in the community.

Promotion of underutilized aquatic vegetables

Integrated approach to diversify aquatic underutilized resources need thorough and systematic exploration to harness multifunctional benefits to the growers of Eastern India. Aquatic vegetables are predominantly grown in water bodies like lakes, ponds, ditches and marshy wet places. Present food habits indicate that most of consumers are fond of rhizomes (Kamal kakadi) of lotus, fruits of Singhara (water chestnut), and young leaves and stem of Kalmi saag (water spinach) are eaten, as common vegetable. Singhara is one of the submersed plants, used as edible nut. In general, yield of fresh nut range between 2,500-3,800 kg/ha area of water pond. The integration of water chestnut with mangur fish could offer a surface cover protection besides adding income. This shallow waterlogged areas of eastern Uttar Pradesh and Bihar, where surface drainage is not possible, and water stagnates with depth of more than 50 cm for about six months, this technology is farmer-friendly and a cost-effective option. The successful implementation of the technology has led to the spread of water chestnut cultivation technology in the tribal areas. Top of Form Fruits of water chestnut are usually sold in the market at the rate of ₹ 50-200/kg and an amount of ₹125,000 to 190,000 could be generated from 1 ha pond with minimal input cost. Lotus is a well-known flower, for which there is a good business opportunity, Rhizome (Kamal-Kakadi) of lotus is edible. Rhizomes yield potential varies from 50-70 q/ha pond. Kamal kakdi sold as vegetable in the market at the rate of ₹150-180/kg. On an average ₹ 825,000-1,1 55,000 could be obtained from 1 ha area pond of lotus with least cost of cultivation. Kalmi Saag (Water spinach) is commonly used as a food plant. The leaves are a good source of minerals and vitamins especially carotene. The plant serves as a green fodder of high nutritive value. It is also used as feed of fish and broilers. Upland field water spinach is an excellent vegetable, worth promoting in lowland areas. The popularization of improved line

VRWS-1 developed by ICAR-Indian Institute of Vegetable Research, Varanasi, of upland water spinach might be successful especially in areas where sweet potato leaves are traditionally consumed. Locally, conditions are suitable for seed production. Crop becomes ready for harvest 25-30 days after planting. Two to three harvests per month can be taken if shoots are cut above ground level, allowing secondary shoots to grow from nodes below the cut. About 130-140 t/ha can be harvested from two or more cuttings in a year. Leaves are usually sold in 500 g bunches in the markets at the rate of ₹ 35-40/kg. Income of ₹ 12-15 lakh could be generated from 1 ha area of water spinach with minimum crop care and input cost.

Safe and sustainable pest management

Farmers often identify crop pests and diseases as their main sources of risk because they reduce yields and negatively affect the marketability of the produce. Indications are that the intensity of pest and disease pressures may increase due to climate change so methods of mitigation will assume even greater importance. Interventions like use of biocontrol methods, grafting high-yielding seedlings on to resistant rootstocks, and investing in protected cultivation systems can be taken up. Bio-control methods (i.e. the use of living organisms such as predator insects or parasites to control pests) have much potential to replace chemical pesticides, thereby improving food safety and lowering production risks.

Reducing post-harvest losses and improving market access

Post-harvest losses in vegetable value chains are typically large, estimated to be in the range of 15-30%. Reduction of these losses begins on-farm with appropriate selection of varieties and the use of good agricultural practices. Simple on-farm innovations such as harvesting at the right time of the day and sorting and grading of produce, combined with the use of appropriate packaging near the farm, can reduce economic losses. However, investments in logistics, like pack houses, refrigerated vehicles for transport, cold storage, and market information systems are needed to improve market functioning for high-value perishable vegetables. Increased access to domestic, regional and international markets for vegetables can provide important income incentives for farmers to enter vegetable production.

The expansion in the vegetable area and use of improved inputs are expected to lead to qualitative improvement in the production of these crops thereby restoring the processing industry to its competitive levels. This institute has developed a number of value addition technologies in vegetables including ready-to-eat convenience vegetables, easy-to-cook leafy vegetables, steeping preservation of vegetables with hurdle concept, protein rich instant vegetable soup mix, instant mushroom whey soup powder, protein rich instant moringa soup mix, protein rich instant corn vegetable soup mix, instant moringa-jaljeera drink mix, low calorie instant moringa drink, instant bottle gourd kheer mix and dry chilli powder. ICAR-IIVR have patented some of these technologies and sharing them same through FPO's for their commercialization.

Home garden/ kitchen garden and school meals

Studies across countries suggest home/kitchen gardens as an option to enhance food security and nutritional status of households. Home garden interventions have been successful in delivering positive nutritional outcomes in Asia. Nutrition gardens are a micro-solution and an affordable way of ensuring healthy food and balanced nutrition. Vegetables from the kitchen gardens are good source of micronutrients especially in the poor households. Rural areas have ample space and establishing a kitchen garden is far simpler as farm families are involved in agriculture. Such interventions simultaneously address vegetable availability, access, demand and utilization. This multipronged approach is especially effective at increasing vegetable consumption among poor rural households vulnerable to micronutrient deficiencies. Home garden interventions are often targeted at women as they are typically in control of meal choice and preparation. School meals provide a good entry point for influencing children's diets; recent studies provide sound evidence for their nutritional impact. Nutritional benefits can be increased when school meal programs include fresh vegetables alongside food staples, pulses, vegetable oil, dairy and meat. School garden programs-involving a combination of nutrition and health education with hands-on experience in vegetable gardening, is one such integrated approach to influence children's food behaviour toward healthier food choices, including vegetables. School garden interventions aim to expose children at a young age to vegetables and to develop eating habits and food attitudes during childhood that may persist through to adulthood.

Transforming young yegetable farmers into entrepreneurs

A vegetable selling business is an excellent business opportunity as it deals with commodities that are essential for survival and needed on a daily basis. Also, the increased awareness regarding healthy eating, consuming fresh foods and preferably eating local produce has risen and so has the demand for freshly sourced farm produce. Vegetable business hubs bring young farmers together in a community and focuses on three major components-training youth on improved vegetable production practices; connecting young farmer groups to markets to increase household incomes; and strengthening the cohesion within and between the farmer groups. Their skills and confidence grow as they learn new vegetable production and postharvest methods, find ways to solve problems together and learn collective saving methods to enable group investments.

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