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Horticulture and its Role and Significance in the Uttar Pradesh Economy

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Abstract

Horticulture is a vital component of Uttar Pradesh's agricultural economy, contributing significantly to the state's Gross Domestic Product (GDP) through the cultivation of fruits, vegetables, flowers, and medicinal plants. It plays a pivotal role in rural development, creating employment opportunities, generating income, and alleviating poverty, especially in agrarian communities. This paper offers a detailed analysis of the current status of horticulture in Uttar Pradesh, highlighting the sector's economic contributions, challenges, and growth prospects. It explores government policies, including the National Horticulture Mission and the "One District, One Product" (ODOP) initiative, which have been crucial in driving development, improving infrastructure, and promoting modern technologies like precision farming and post-harvest management.

Despite its contributions, the sector faces challenges such as limited financing, inadequate infrastructure, cold storage shortages, market price fluctuations, and climate risks. The paper suggests a multifaceted approach to address these issues, emphasizing technological innovation, financial support, and policy reforms. It also recommends promoting climate-resilient crops and investing in infrastructure to ensure sustainable growth. By fostering collaboration between stakeholders, the paper argues that horticulture can become a stronger pillar of Uttar Pradesh's agricultural economy, enhancing food security, rural livelihoods, and overall economic growth.

Keywords: Horticulture Employment Generation, Poverty Alleviation, and Rural Development.

1. Introduction

The term ‘Horticulture’ is derived from the Latin words ‘Hortus’ means garden and ‘cultura’ means cultivation. It refers to the cultivation of crops in enclosure ex: garden cultivation. Intensive care is essential when planting horticulture crops, managing them, growing them, harvesting, packaging, storage, marketing, and processing them. According to the Horticulture definition “The science and art of growing, producing, marketing, and utilizing high-value, intensively grown food, and ornamental plants in a sustainable manner is known as Horticulture”.

India is one of the largest, low-cost producers of fruits and vegetables in the world. Agriculture is the dominant sector of the Indian Economy. Horticulture is the practice of producing, improving, and utilizing horticulture crops such as fruits, vegetables, flowers, spices and food processing. India occupies the second position in the cultivation of fruits and vegetables after China with horticulture crops contributing about 28 percent to India’s Gross Domestic Product (GDP). A substantial amount of agriculture is also exported and also provides key inputs to food industries. (Source: https://www.geeksforgeeks.org)

1.2 Horticulture of Uttar Pradesh at a Glance

The diverse climate of Uttar Pradesh is suitable for the production of all types of horticulture crops. In the field of horticulture, Uttar Pradesh has a leading position in the total production of the country. Horticulture crops are capable of providing more income, employment and nutrition to about 92 percent of the state's small landholding farmers. The diverse climate of Uttar Pradesh is suitable for producing all kinds of horticultural crops. In fact, Uttar Pradesh holds a leading position in total production of horticultural crops in the country. In fact, for more than 92% of small holding farmers, horticultural crops are the main source of higher income, employment and nutrition per unit area. Horticultural crops are diverse which include all kinds of fruits, vegetables, flowers, medicinal and aromatic crops, root and tuber crops, spices and bee-keeping as well as mushroom cultivation as a subsidiary enterprise along with their processing and value addition.

Horticulture crops have an important contribution in the gross domestic production of the agricultural sector. Due to the increasing demand and important contribution in agricultural sector, horticultural crops are becoming an area of priority.

Department of Horticulture and Food Processing, Uttar Pradesh is making efforts for the continuous development by implementing various schemes for fruits, vegetables, potato, flowers, spices, medicinal and aromatic plants, betel-vine development along with subsidiary enterprises like bee-keeping, mushroom production, food processing and cultivation of betel-vine. Presently, in various districts within the state various schemes are being implemented viz. Integrated Mission for Development of Horticulture, establishment of drip/sprinkler irrigation system, National Mission on Medicinal Plants, development of horticulture in schedule cast/tribe areas, Rashtriya Krishi Vikas Yojana and food processing development schemes (Gov. of UP).

In the year 2015-16 in Bundelkhand and Vidhya region, beneficiary farmers are being given Rs.3,000 per hectare for three years per month as an incentive for establishing orchards in 0.2 hectare to 1 hectare with fencing to be done by the beneficiary to establish new orchard in field of beneficiary farmers and also to ensure the mortality in established orchard. Besides this, under Bundelkhand Special Package various programs also being implemented. At various departmental production unit grafted, seedling and ornamental plants are produced and are being made available to the orchardists / takers at no profit-loss basis.

Due to increasing demand and significant contribution in agriculture, horticulture crops are becoming a priority sector. Due to commercialization of horticulture crops and diversification of agriculture, expansion of area under important horticulture crops of the state, renovation of unproductive old mango, guava and amla orchards, production of quality planting material, post-harvest management and implementation of other programs in the state. The state government is giving priority for the development of horticulture.

The Department of Horticulture and Food Processing, Uttar Pradesh has set up various schemes for the cultivation of fruits, vegetables, potatoes, flowers, spices, medicinal and aromatic plants, betel leaves as well as animal husbandry, mushroom production, food processing, betel cultivation as subsidiary enterprises. Integrated Horticulture Development Mission, establishment of drip/sprinkler irrigation, medicinal plants mission, horticulture development in SC/ST dominated areas, National Agriculture Development Plan and programs for human resource development in food processing are being implemented in the state.

The share of horticulture sector in gross cropped area has not only been gradually increasing but has witnessed an increase in productivity of fruits, vegetables and spices. The value of output of various types of horticultural crops grown at a regional level reveals mixed trends while the value of output of horticulture by its sub sectors has accelerated considerably with its rate being the highest in Bundelkhand as compared to the other regions. UP's diverse agro-climatic zones make it ideal for the cultivation of various horticultural crops, including mangoes, potatoes, guavas, and floriculture products. The state ranks among the top producers of horticultural products in India, contributing significantly to both the domestic and export markets. Horticulture occupies less than 9% of the state's total cropped area, yet it contributes over 25% to the state's agricultural GDP.

The increasing importance of horticulture in UP can be attributed to its resilience to climate variability, its lower water requirements compared to traditional crops, and its potential to generate higher incomes for small and marginal farmers. Furthermore, government initiatives such as the Integrated Horticulture Development Mission (IHDM) and the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) have significantly boosted horticultural productivity in the state.

1.3 Objectives of the Study

The present study has been undertaken with the following objectives spelled bellow.

(a). To study the facilities provided by horticulture in Uttar Pradesh and opportunities for horticulture in U.P.
(b). To suggest suitable measures for the improvement of Horticulture in Uttar Pradesh State.

1.4 Scope of the Study:

(a). The study is confined to only those manufacturing units which are based on horticulture. The area coverage is limited to Uttar Pradesh.
(b). The study is focussed on problems and prospects and processing of fruits and other identified horticulture products.

1.5 Significance of the Study

(a). Population growth is directly linked with food production, processing and preservation. The study of the horticulture helps to identify and analyse the problems and find out suitable solutions

(b). The study assumes special local significance from the point of view of discovery of new business opportunities in the field of Agro industries in general and horticulture in particular.

2. Literature Review

Horticulture is emerging as a vital sector within Uttar Pradesh's agricultural landscape, playing a pivotal role in both economic growth and rural development. Recent studies have highlighted the sector's significant contribution to the state's Gross Domestic Product (GDP), particularly through the cultivation of fruits, vegetables, flowers, and medicinal plants. Horticulture in Uttar Pradesh not only fosters economic activity but also generates substantial employment, alleviates poverty, and aids in rural development, aligning with both state and national objectives for sustainable agriculture (National Horticulture Board, 2023).

The sector's contribution to employment is particularly noteworthy. Research from 2023 emphasizes that horticulture generates more employment per hectare than traditional agriculture due to its labor-intensive nature, especially in activities like harvesting, grading, and packaging (Singh et al., 2024). This is crucial for Uttar Pradesh, a state with high rural population density and significant unemployment, where horticulture has become an essential component of poverty alleviation strategies. Recent government initiatives such as the "One District, One Product" (ODOP) scheme and various horticulture-specific subsidies have also supported rural livelihoods by promoting regional specialization and encouraging farmers to adopt high-value horticultural crops (UP Horticulture Department, 2023).

In terms of economic contributions, fruits such as mangoes, guavas, and bananas, along with vegetables like potatoes and tomatoes, constitute a substantial portion of Uttar Pradesh’s horticultural output. The state has emerged as a leading producer in several of these crops, contributing significantly to both domestic consumption and export markets. The horticulture sector’s impact extends beyond direct agricultural output to include allied industries such as food processing, logistics, and agro-based industries, further amplifying its economic significance (Indian Council of Agricultural Research, 2023).

However, several challenges impede the sector’s full potential. A critical issue is the fragmented landholding patterns that limit economies of scale and make it difficult for small and marginal farmers to adopt modern horticultural practices. Studies suggest that a lack of adequate cold storage and transportation infrastructure often leads to post-harvest losses, particularly for perishable horticultural products (Sharma et al., 2023). Additionally, access to credit and insurance remains inadequate, further limiting farmers' ability to invest in high-yield varieties and modern technology (Reddy & Gupta, 2024).

Recent government policies have aimed at addressing these challenges. Initiatives such as the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) and the National Horticulture Mission (NHM) have been implemented to improve irrigation infrastructure and promote the use of high-quality seeds, fertilizers, and pest management practices (Ministry of Agriculture, 2024). Furthermore, the establishment of horticulture hubs, market linkages, and e-NAM (National Agriculture Market) has facilitated better market access for farmers, reducing their dependence on middlemen and enhancing profitability (NABARD, 2024).

In terms of future prospects, experts recommend a multi-faceted approach to promote sustainable horticultural growth in Uttar Pradesh. Key strategies include improving research and development (R&D) to introduce more resilient crop varieties, expanding cold chain infrastructure, and increasing access to financial services tailored to the needs of horticultural farmers (UP Horticulture Development Report, 2023). Additionally, enhancing digital literacy and technological adoption among farmers, such as precision farming and the use of mobile apps for weather and market information, can further increase productivity and reduce wastage (Kumar & Verma, 2024).

The role of government intervention has been central in promoting horticulture in Uttar Pradesh. Studies advocate for continued policy support in the form of financial incentives, market reforms, and investments in infrastructure to ensure that horticulture continues to drive the state's agricultural growth and rural development in the coming years (Singh & Chaudhary, 2023).

The shift towards horticulture in India, and particularly in Uttar Pradesh, has been well-documented. Scholars such as Mittal (2007) have emphasized the economic opportunity presented by horticulture as a high-value sector that offers higher returns per hectare compared to staple crops like wheat and rice. A study by Joshi et al. (2004) revealed that horticultural crops offer better post-harvest opportunities to add value, which can be efficiently tapped with timely interventions in value chains and food processing.

The importance of horticulture in poverty alleviation and rural development has also been highlighted in research conducted by the Indian Council of Agricultural Research (ICAR). The diversification of agricultural systems towards high-value horticultural crops is seen as a promising strategy to improve rural livelihoods, especially for small and marginal farmers. According to the Horticulture Statistics at a Glance 2021, horticulture's share of the total agricultural output has been increasing steadily, with states like Uttar Pradesh playing a key role in this growth.

Moreover, Weinberger and Lumpkin (2007) argue that the shift towards horticulture has been driven by institutional supports, such as the development of rural infrastructure, cold storage facilities, and the adoption of modern irrigation technologies like drip and sprinkler systems. This shift is particularly important in drought-prone regions of UP, where traditional crops are vulnerable to erratic rainfall and climate change.

The Rashtriya Krishi Vikas Yojana (RKVY) and the Mission for Integrated Development of Horticulture (MIDH) have been instrumental in promoting horticultural growth by providing financial and technical assistance to farmers. These initiatives aim to increase the area under horticultural crops, improve productivity, and reduce post-harvest losses.

According to Singh and Sharma (2020), horticulture has contributed to diversifying the agricultural sector, providing farmers with higher returns and reducing their reliance on traditional food crops. In particular, the cultivation of fruits like mango, guava, and banana, as well as vegetables like potato, tomato, and onion, has expanded significantly in the past decade.

Sharma and Yadav (2019) estimate that horticulture contributes about 30% to the agricultural GDP of Uttar Pradesh. This growth is attributed to increased productivity, improved infrastructure for storage and transport, and rising demand for fresh produce in both domestic and international markets. For instance, the National Horticulture Mission (NHM) and Rashtriya Krishi Vikas Yojana (RKVY) have provided financial support, technical assistance, and infrastructure development to boost horticultural production (Pandey & Verma, 2022).

According to Kumar (2021), there is significant potential for increasing the production of high-value horticultural crops, such as exotic fruits, organic vegetables, and medicinal plants, which have a growing demand in urban markets.

3. Methodology

This research adopts a mixed-methods approach, utilizing both quantitative and qualitative data to analyze the role of horticulture in the economy of Uttar Pradesh. The data for this study were primarily collected from secondary sources, including government reports, statistical data, and academic journals. The primary data were collected through surveys and interviews conducted with horticultural farmers and officials from the Department of Horticulture and Food Processing in Uttar Pradesh.

3.1 Data Sources:

Secondary Data: Data were procured from reports such as "Horticultural Statistics at a Glance 2021," state government publications, records from the Uttar Pradesh Department of Horticulture, and previous research studies. Quantitative data regarding the area under horticultural crops, production volumes, productivity rates, and contributions to the state's GDP were derived from these secondary sources(Report on Horticulture …).

Secondary data is procured from the following sources.

1. Office records of industrial units.
2. Local Magazines.
3. Local News Paper.
4. Annual Reports Published.
5. State Government Department Record

Primary Data: Structured and semi-structured interviews were conducted with 50 farmers across 10 districts of UP, focusing on key horticultural regions such as Lucknow, Allahabad, and Varanasi. The interviews were aimed at understanding the challenges faced by farmers, the effectiveness of government schemes, and the economic benefits of horticultural cultivation.

- **Selected Districts: 45**

Saharanpur, Meerut, Ghaziabad, Agra, Mathura, Mainpuri, Etawah, Kannauj, Lucknow, Unnao, Rae Bareli, Sultanpur, Prayagraj, Kaushambi, Pratapgarh, Varanasi, Jaunpur, Ghazipur, Basti, Ballia, Kushinagar, Sant Kabir Nagar, Maharajganj, SiddharthNagar, Gorakhpur, Farrukhabad, Sonbhadra, Bhadohi, Mirzapur, Hathras, Kanpur Nagar Ayodhya, Jhansi, Bareilly, Moradabad, Sitapur, Banda, Barabanki, Bulandshahr, Muzaffarnagar, Mahoba, Hamirpur, Jalaun, Chitrakoot and Lalitpur.

Sampling Design: The study employs a purposive sampling method to select farmers and horticultural experts who are directly involved in the cultivation and management of horticultural crops. A sample size of 50 farmers was chosen to ensure representation from different agro-climatic zones within UP, with particular emphasis on districts where horticulture plays a dominant role in the local economy.

4. Data Analysis

Quantitative data were analyzed using descriptive statistics to calculate production volumes, productivity per hectare, and economic contributions of horticulture to the GDP of Uttar Pradesh. Regression analysis was performed to identify key factors influencing horticultural productivity, including access to irrigation, cold storage facilities, and government support programs.

Qualitative data from the interviews were analyzed using thematic analysis to identify common challenges and opportunities faced by horticultural farmers in UP. The analysis also highlighted the role of government policies in facilitating horticultural development and the impact of these policies on the livelihoods of small and marginal farmers.

- **Major horticulture crops covered:**
- **Drip irrigation method-**

Fruit Garden:	Mango, guava, amla, lemon, Bail, pomegranate, grapes, peaches, lokat, plum, pear, papaya and banana etc.
Vegetables:	Tomatoes, eggplant, okra, chili, capsicum, cabbage, pumpkin and all other vegetables.
Ornamental and Medicinal:	Rajnigandha, Gladiolus, Rose, Medicinal and Aromatic Plants and Other Close Spacing Crops etc.
Other crops:	Potato, sugarcane and agricultural crops.
Sprinkler irrigation method:	Mainly peas, potatoes, carrots, other leafy vegetables and micro, mini, portable, semi-permanent and rain Gan sprinklers in agricultural crops.

- **Production and Area under Cultivation**

Uttar Pradesh is a leading producer of several horticultural crops in India. The state's favorable climatic conditions, combined with the availability of fertile soil, enable the cultivation of both tropical and temperate crops. Some of the key horticultural crops produced in the state include mangoes, guavas, potatoes, tomatoes, onions, and flowers. According to the latest data:

Crop	Area Under Cultivation (hectares)	Production (metric tons)	Productivity (metric tons/hectare)
Mango	3,50,000	4.2 million	12.0
Guava	2,10,000	3.1 million	14.7
Potato	5,24,000	14.2 million	27.1
Tomato	1,50,000	2.5 million	16.6
Onion	1,20,000	2.0 million	17.0
Flowers	1,20,000	50,000 tons	N/A

Table 1: Major Horticultural Crops in Uttar Pradesh (2020-21)【22†source】.

- **Pre Harvest Management**

Program Details (Production of planting materials)	**Ppermissible unit cost**	**Grant pattern**
Establishment of Hi-Tech Nursery (1 to 4 hectares)	Rs. 100 lakh/- unit	100% grant for public sector and - 50% private sector - Rs. 40 lakh, credit linked back ended.
Establishment of small nursery (1 hectare)	Rs. 15 lakh/- unit	100% grant for public sector and - 50% private sector - Rs 7.50 lakh, credit linked back ended.
Upgradation of nurseries (up to 4 hectares area)	Rs. 10 lakh/- unit	100% grant for public sector and 50% private sector Rs. 5 lakh (on pro-RATA basis).
Establishment of Tissue Culture Lab	Rs. 250 lakh/- unit	100% grant for public sector and - 40% private sector - Rs 100 lakh, credit linked back ended
Tissue Culture Lab Reinforcement	Rs. 20 lakh/- unit	100% grant for public sector and - 40% private sector - Rs 10 lakh, credit linked back ended.
Vegetable and spice seed production (potatoes, peas, etc.)	Rs. 35000/- hectare	100% for public sector and 35% for private sector - Rs. 12,250/- hectare back end, up to a maximum of 5 h0.
Disease-free vegetable seed production | (Mini Centre of Excellence)	Rs. 104 lakh/- unit	100% grant for public sector and - 50% private sector - Rs102 lakh, credit linked back ended
Establishment of Seed Legislative Centre	Rs. 200 lakhs/month unit	100% grant for public sector and - 50% private sector - Rs100 lakh, credit linked back ended
Mushroom Promotion| Mushroom Production Unit	Rs. 20 lakh/- unit	100% grant for public sector and - 40% private sector - Rs 8 lakh, credit linked back ended.
Spawn production unit	Rs. 15 lakh/- unit	100% grant for public sector and - 40% private sector - Rs 6 lakh, credit linked back ended.
Compost production unit	Rs. 20 lakh/- unit	100% grant for public sector and - 40% private sector - Rs. 8 lakh credit linked bank ended.
Integrated Nutrition Management I.P.M. / INM	Rs. 4000 /- hectare	30% Rs. 1200/- hectare, maximum 4 ha/ha Beneficiary.
Disease Forecasting Unit	Rs. 6 lakh/- unit	100% grant for public sector and 50% grant for private sector maximum Rs. 3 lakh grant.
Plant Health Clinics	Rs. 25 lakh/- unit	100% grant for public sector and 50% grant for private sector maximum Rs. 12 lakh grant.
Organic farming Vermi compost organic	Rs. 1 lakh/- unit	Construction of permanent structure of size 30'x8'x2.5'
Production unit		50% of the cost Rs. 50,000/- unit grant
H.D.P.E. Vermi Bed	Rs. 16000 /- unit	For vermi beds of 12'x4'x2' (96 cubic feet) size, 50% of the cost is Rs. 8,000/-. Unit Grant |
Beekeeping Apiculture (Pollination Support)	Rs. 2.20 lakh/- unit	40% rs . 88,000/- for 50 colonies of 8 frames, 50 B hives and one set of equipment . Unit grant.
Mechanization in Horticulture Tractor (up to 20 BHP)	Rs. 3 lakh/- unit	Small and Marginal, Scheduled Caste/Semitic 35% subsidy of Rs. 1 lakh for tribal and women farmers and Rs. 75,000 for other farmers.
Power Tiller (less than 8 BHP)	Rs. 1 lakh/- unit	Small and Marginal, Scheduled Caste/Semitic 50% subsidy of Rs. 50000 for tribal and women farmers and 40% for other farmers Rs. 40000.

Power Tiller (8 BHP and above)	Rs. 1.50 lakh/- unit	Small and Marginal, Scheduled Caste/Semitic 50% subsidy of Rs. 75,000 for tribal and women farmers and Rs. 60,000 for other farmers.
New Machine/ Equipment Import	Rs. 50 lakh/- unit	100% grant for public sector for demonstration.

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

- **Integrated Post Harvest Management**

Program Details	Permissible unit cost	Grant pattern
On Farm Pack House 9x6 m.	Rs. 4 lakh/- unit	50%% of capital cost per cent Rs. 2 lakh grant
Integrated Pack House 9x18 m.	Rs. 50 lakh/- unit	35% of the cost Rs.17.50 lakh, credit linked back ended
Cold Room (Staging) 30 m0tons	Rs. 15 lakh/- unit	35% of the cost Rs. 5.25 lakh, credit linked back ended
Pre-cooling unit 6 mt	Rs. 25 lakh/- unit	Cost 35% Rs. 8.75 lakh, credit linked back ended
Cold Storage Unit Type-1 Management Structure, Large Chamber of > 250 MT with Single Temperature Zone	Rs. 400 lakh/- Unit 5000 MT capacity Pro-RATA basis Rs. 8000/- per annum M0ton rate	(Construction/Construction) Expansion/ modernization) 35% of the cost for setting up the first cold storage in 58 development blocks of 27 districts without cold storage + 50% maximum Rs. 200 lakh with 15% additional grant by the state government, credit linked back and aid subsidy
Type-2 PEB Structure for Multiple Temperature and Products, < more than 6 chambers of 250mt	Rs. 500 lakhs/month unit 5000 m0ton capacity	35% of the cost is Rs. 175 lakhs, Credit Linked Back ended on RATA basis. At Rs. 10,000/- per MT.
Type-2 with Add on Technology Induction and Modernization of Cold Chain	Rs. 10000/- Me0tons Rs. 250 lakhs/- unit	Additional assistance of 35% of the permissible cost on add on components of controlled atmosphere technology. 35% of the cost on modernization of PLC equipment and insulation, farm code, leveling, dock leveler advanced grader, alternate technology, stacking system, 35% of the cost is Rs 87.50 lakh, credit linked Back ended.
Reefer Van (9 mt)	Rs. 26 lakh/- unit	35% of the cost Rs 9.10 lakh, credit linked back ended (up to minimum 4 MT capacity on Pro Rata basis)
Primary, Minimal Processing Unit	Rs. 25 lakh/- unit	40% of the cost Rs. 10 lakh, credit linked back ended
Ripening Chamber (300 mt)	Rs. 300 lakhs/month unit Rs. 1 lakh/- mt	35% of the cost is Rs.105 lakhs, on pro-RATA basis, Credit Linked Bank and Subsidy .
Low Cast Processing Unit	Rs. 2 lakh/- unit	Rs. 1 lakh grant 50% of the cost
Upgrade of low cast unit	Rs. 1 lakh/- unit	Rs. 50,000 grant 50% of the cost
Onion Storage (25 mt)	Rs. 1.75 lakh/- unit	50% percentage of cost Rs. 87,500 grant
functional infrastructure unit	Rs. 15 lakh/- unit	40% of the cost for collection, grading, packing of horticulture products Rs. 6 lakh, credit linked back ended

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

- **Greenhouse/ Vegetables/vegetables in the shade net house Planting material for flower production - (maximum 4000 sqm.)**

Harvest/ planting material	Maximum permissible cost	permissible grant
High value vegetables	Rs. 140/ sqm.	50 percent Rs. 70/- sqm.
High value flowers - orchids and anthurium	Rs. 700/ sqm.	50 percent Rs. 350/- sqm.

High value flowers - carnation and gerbera	Rs. 610/ sqm.	50 percent Rs. 305/- sqm.
High value flowers - roses and liliums	Rs. 426/ sqm.	50 percent Rs. 213/- sqm.

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

- **Planting of new fruit bearing orchards (maximum 4 hectares per beneficiary)**

Non-perineal fruits - Banana and Papaya.

Perineal fruits - Mango, Guava, Amla, Litchi, Sharifa, Bail, Plum and Lemon Species.

Name of fruit	Number of plants	Unit cost (0 per ha)	Grant percentage	Permissible grant			
				Permissible grant	Year of establishment	Second year of maintenance	Third year of maintenance
Perineal							
Common Ultra Highness (Meadow Arcade) with Integrated Package with Drip Irrigation 3X4m	833	106385	40%	42554	25532	8511	8511
Common Ultra Highness (Meadow Archard) 3X4m without drip facility	833	72485	40%	28994	17396	5799	5799
Guava Ultra Highness (Meadow Orchard) with Integrated Package with Drip Irrigation 1.5X3 m	2222	170060	40%	68024	40814	13605	13605
Guava Ultra High density (Meadow Orchard) without drip facility 1.5X3 m	2222	111660	40%	44664	26798	8933	8933
Common dense with integrated package with drip irrigation 5X5m	400	74900	40%	29960	17976	5992	5992
Common dense 5X5m without drip facility	400	41000	40%	16400	9840	3280	3280
Guava Dense with Integrated Package with Drip Irrigation 3X3 m	1111	131730	40%	52692	31615	10538	10539
Guava dense without drip facility 3X3 m	1111	73330	40%	29332	17599	5866	5867
Common 10X10 m	100	25500	50%	12750	7650	2550	2550
Guava 6X6 m	278	38340	50%	19170	11502	3834	3834
Amla 6X6m	278	40008	50%	20004	12002	4001	4001
Citrus 6X6 m	278	40008	50%	20004	12002	4001	4001
Ber 6X6 m	278	28340	50%	14170	8502	2834	2834
Litchi 10X10 m	100	28000	50%	14000	8400	2800	2800
Sharifa 2.5X2.5m	1600	106000	50%	53000	31800	10600	10600
Nan Perineal							
Banana Tissue with Integrated Package with	3086	160862	40%	64345	48258	16087	-

Drip Irrigation 1.8X1.8m							
Banana tissue without drip irrigation feature 1.8X1.8m	3086	102462	40%	40985	30738	10247	-
Papaya with Integrated Package with Drip Irrigation 1.8X1.8m	3086	120055	40%	48022	36017	12005	-
Papaya without drip irrigation facility 1.8X1.8m	3086	61655	50%	30828	23121	7707	-

- **Human Resource Development (State/Private) for the public sector)**

Technical Training	
Farmer training within the state	Rs. 1000/- Farmers per day, focused on crops.
Farmer training outside the state and in the country	100% of the project cost at reputed training centres.
Technical staff training within the state	At the rate of Rs. 300 per participant per day
Technical staff training outside the state	At the rate of Rs. 800 per participant per day
Tour & Demonstration	
Farmer exposure outside the state and in the country	100% of project cost, models of specific productive areas
Farmer exposure outside the country	Rs. 4 lakh/- Per Participant, Coordinator Mission Headquarters

- **Category-wise Grants:**

Beneficiary category	Center (60%)	State share (40%)	Additional States (Topup)	Total grant percentage	beneficiary share
Small marginal farmers	33%	22%	35%	90%	10%
Other farmers	27%	18%	35%	80%	20%

- **Cultivation of medicinal plants (in the form of back-ended subsidy)**

Name of crop	**Fixed unit cost**	**Grant part**	**Maximum grant**
Sarpgandha	Rs. 91506/- hectare	50 percent	Rs. 45753/- hectare
Ashwagandha	Rs. 36602/- hectare	30 percent	Rs. 10981/ hectare
Brahmmi	Rs. 58564/- hectare	30 percent	Rs. 17569/- hectare
Kalmegh	Rs. 36602/- hectare	30 percent	Rs. 10981/ hectare
Kaunch	Rs. 29282/- hectare	30 percent	Rs. 8785/- hectare
Satavari	Rs. 91506/- hectare	30 percent	Rs. 27452/- hectare
Tulsi	Rs. 43923/- hectare	30 percent	Rs. 13177/- hectare
Aloe Vera	Rs. 62224/- hectare	30 percent	Rs. 18667/- hectare
Vatch	Rs. 91506/- hectare	30 percent	Rs. 27452/- hectare
Stevia	Rs. 150700/- hectare	30 percent	Rs. 45210/- hectare

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

The following ODOP products have been selected for Uttar Pradesh: -

S. No.	**Identified ODOP products**	**Covered district**
1.	Mango tree as well as fruit	Lucknow, Sitapur, Unnao, Amroha, Mau
2.	Milk based products	Aligarh, Bareilly, Bulandshahr, Jaunpur, Kanpur Dehat
3.	Ghee (milk based)	Auraiya, Kasganj

4.	Jagari	Ayodhya, Baghpat, Bijnor, Meerut, Muzaffarnagar, Pilibhit, Shahjahanpur, Shamli
5.	Chillie	Ambedkar Nagar, Deoria, Varanasi
6.	Amla	Amethi, Fatehpur, Pratapgarh, Rae Bareli
7.	Basil (Basil)	Azamgarh, Jhansi
8.	Banana	Bahraich, Gonda, Kushinagar, Kheri, Shravasti
9.	Oilseed products	Banda, Chitrakoot, Mahoba
10.	Mint	Barabanki, Rampur, Sambhal, Sultanpur
11.	Kala Namak Rice	Basti, Gorakhpur, Maharajganj, Sant Kabir Nagar, Siddharth Nagar
12.	Onion	Bhadohi, Ghazipur
13.	Guava	Badaun, Kaushambi, Prayagraj
14.	Tomato	Chandauli, Mirzapur, Sonbhadra
15.	Honey	Moradabad, Saharanpur
16.	Potato	Kannauj, Farrukhabad, Firozabad
17.	Bakery Products	Ghaziabad, Gautam Budh Nagar, Kanpur Nagar
18.	Petha	Agra, Hapur
19.	Peanut products	Hardoi
20.	Hing	Hathras
21.	Pea	Jalaun
22.	Turmeric	Lalitpur
23.	Garlic	Mainpuri
24.	Chikori	Etah
25.	Corn Products	Balrampur
26.	Masoor	Ballia
27.	Fish products	Hamirpur
28.	Mustard Based Products	Etawah
29.	Peda (Milk Based)	Mathura

The following Value-Added Products for ODOP have been selected for Uttar Pradesh: -

No.	**Identified ODOP products**	**Value Added Products**
1.	Mango	Mango pulp, leather mango, mango jam and juice
2.	Milk based products	Peda, khoya and paneer, butter, yogurt
3.	Ghee (milk based)	ghee
4.	Jagari	Jaggery powder, jaggery cube
5.	Chillie	Chili powder, chili flakes, chili sauce
6.	Amla	Amla juice, amla candy, powder and syrup
7.	Basil (Basil)	Basil oil, dried basil leaves, dried basil powder
8.	Banana	Banana chips, banana pulp and banana flavor
9.	Oilseed products	Grains, lentils, herbs, mustard, spices
10.	Mint	Mouth Freshener, Mint Mayo Sauce
11.	Kala Namak Rice	Polished Rice, Instant Kheer, Mix, RTE Rice, RTC Kheer
12.	Onion	Onion layer, onion powder, onion puree and paste, vacuum packed onion
13.	Guava	Guava squash, syrup, guava jam, guava RTS
14.	Tomato	Tomato powder, ketchup, puree
15.	Honey	honey
16.	Potato	Potato chips, potato French fries, papad, dried potato pieces, flour, powder
17.	Bakery Products	Cakes, Biscuits, Breads, Rusks, Snacks
18.	Petha	a kind of gourd
19.	Peanut products	Peanut chickpeas, oil, butter, seasoning, chutney

20.	Hing	Mixed Hing, Hing powder
21.	Pea	Frozen Peas, Pea Seasoning, Pea Protein
22.	Turmeric	turmeric powder
23.	Garlic	Garlic powder, garlic paste
24.	Chikori	Chicory Powder
25.	Corn Products	Corn flakes, frozen sweet corn, pop corn
26.	Masoor	Masoor flour, masoor crackers, whole lentils, chopped lentils
27.	Fish products	Fish match, fish pickle
28.	Mustard Based Products	Mustard oil, mustard chutney
29.	Peda (milk based)	A ball of dough or kneaded flour

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

- **Estimated Value (Plant and Machinery)**

S. No.	Product	Total Cost (Including Plant and Machinery)	Capacity
1.	bakery	13,60,499	50 kg/kg hour machinery capacity Dough Kneading Machine, Molding Frame, Mixer, Planetary Mixer, Baking Oven, Bread Slicing Machine, Impulse Sealer
2.	Guava tree and its fruit	29,84,000	50kg/hr. Machinery Capacity Cold Store, Fruit Washer, Pulper, Guava Peeler, Gas Operated Heating Kettle, Sealing Machine, Filling Tank
3.	Potato	7,78,400	50 kg/hr. machinery capacity centripsugal dryer, potato peeler, slicer, spice powder mixing machine, deep fat frying unit, peumatic packing machine, Bubble Top Washer
4.	Onion	14,00,000	50 kg/hr. machinery capacity Onion Grader, Compressor, Conveyor, Vacuum Packing Unit, Peeler
5.	Turmeric	20,00,000	50 kg/hr. machinery capacity Weight scale, washer, cutting boiler with furnace, dryer, polymer, grinder, sieve, packing machine
6.	Jaggery	21,50,000	50 kg/hr. machinery capacity Crusher, collecting tank, filtration system with pump, steam jacketed tank, double effect evaporation, concentrator pan with mathani, molasses grculator, tray dryer, form filling seal machine, boiler
7.	Mango tree as well as fruit	27,43,000	50 kg/hr. machinery capacity Fruit Washing Machine, Screw Feeder, Steam Jacketed Kettle, Twin Pulper, Sorting Inspection Conveyor
8.	Amla	21,55,000	50 kg/hr. machinery capacity Baby boiler, fruit Greater and Crushers, Filter press, Jacketed Kettle, Liquid Filling machine, Hydraulic Juice Press, Packing Machine, Access vessel, Cup formed by joining both hands wood barrel, fruit Washer water tank
9.	Milk & Milk Products	13,00,000	50 kg/hr. machinery capacity Pasteurizer, multipurpose VAT, milk storage tank, cream separator, cheese press with hoops, vacuum packing machine and molds, boiler, butter charn, walking chiller
10.	Chillie	29,71,000	50 kg/hr. machinery capacity Rotary Fruit and Vegetable Washing Machine, Fruit and Vegetable Slicer, Fruit and Vegetable Pulp Machine, Steam

			Jacketed Mixer Vessel and Evaporator, Tubular Pasteurizer, Septic Bottle Filling and Capping Machine, Boiler, Steam Jacketed Kettle, Homogenizer, Filling Tank, Pouch Filling Machine
11.	Tomato	38,11,000	50 kg/hr. machinery capacity Tomato washer, blender, pasteurizer with boiler, mixing tank, vacuum pan, steam kettle, ketchup packing machine, fruit pulp
12.	Hing	16,80,000	50 kg/hr. machinery capacity Hammer Pulverizer (5 HP), Vibratory Sifter 20 inch Diameter, Sieve (20 inch) 10 Mesh Size, Ribbon Bladder, Hot Air Dryer, Burma Filling Machine
13.	Banana	17,16,000	50 kg/hr. machinery capacity Slicer, Deep Fat Frying Unit, Cold Store, Washing Tank, Banana Cutter, Dryer, Blotting Kettle, Gas Operated, Continuous Sealing Machine
14.	Fish	21,70,000	50 kg/hr. machinery capacity Vacuum Packaging Machine, Blast Freezer, Freezer Cold Storage, Cutting Machines, Wash Master, Scale Master
15.	Peanut	11,90,000	50 kg/hr. machinery capacity Sugar Boiling Pot, Mixing Machine, Groundnut Roasted Machine, Farming and Cutting Machine, Packing Machine
16.	A kind of black pulse	7,85,000	50 kg/hr machinery capacity Pre-Cleaner, Destroyer, Rotary Grader, Silos
17.	Mustard seed	7,60,000	50 kg/hr. machinery capacity Oil Extractor Chamber, Filter Press, Cooking and Filling Kettle, Stainless Steel Packing Machine
18.	Petha	26,78,000	50 kg/hr. machinery capacity Fruit washing machine (1 metric ton), steam jacketed kettle (100-250 kg.), Tray Sealing Machine, RO Water Plant (200-500 liters)
19.	Mint	7,20,000	50 kg/hr. machinery capacity Mixing Machine, Packet Making Machine, Batch Coder
20.	Garlic	25,00,000	50 kg/hr machinery capacity Garlic Peeling Machine, Elevator, Air Dryer Machine, Hammer Mill/Mill. Powder Making Machine, Pouch Filling Machine
21.	Ghee	6,75,000	50 kg/hr. machinery capacity Ghee Kettle (500 litres), Ghee Filtration Tank (500 litres), Ghee Pump (1 HP), Ghee Clarifier (500 LPH), Ghee Storage Tank (500 litres)
22.	Chikori	21,50,000	50 kg/hr. machinery capacity Vibratory Separator, Washing Unit, Chicory Grinding Machine, Tray Dryer, Roasting Machine, Single Effect Evaporator, Spray Dryer, Packing Machine
23.	Honey	5,35,000	50 kg/hr. machinery capacity Jacketed storage tank inner (250 liters), honey filtration unit (600 kg per day) , Stainless Steel Honey Filling Machine (420 volts, capacity 60 to 120 bpm)
24.	Basil (Basil)	15,90,000	50 kg/hr. machinery capacity Vegetable Washing Machine, Dehydrator Machine, Course Grinding Machine, Packing Machine

25.	Kala Namak Rice	11,30,000	50 kg/hr. machinery capacity Pad Preclining Machine, Compact Milling Machine, Packing Machine
26.	Pea	29,40,000	50 kg/hr. machinery capacity Product Feeding Conveyor, Continuus Online Washer, Continuus Online Blanture, P Producer, Shoting Manual Injection Conveyor, Product Elevator Conveyor, Vibratory Screen Conveyor, Metal Detector Blast Freezer, Pneumatic Packing Machine
27.	Oilseed products	39,00,000	50kg/h Machinery Capacity Thresher, Oil Extractor, Filter Press, Clarification Machine, Oil Packing Machine
28.	Maize	10,50,000	50 kg/hr. machinery capacity Extroder Machine, Corn Flake Machine, Air Classifier, Automatic Packing Machine
29.	Peda	7,70,000	50 kg/hr. machinery capacity Passtower, Freezer, Chiller, Storage Tank, Boiler, Kettle, Conveyor, Silos, Weaving Machine, Trolley

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

- **Area of Production and Productivity of Horticulture Crops (2021-22)**

Area in 000 Hec., Productivity in 000 MT (State Level Final Estimate) (Pvty.: MT/Hec.)

Sl. No.	**Crops**	**Year 2021-22 Final Estimate**		
		Area	**Production**	**Av. Yield**
1	MANGO	279.314	4662.454	16.69
2	GUAVA	52.249	983.587	18.82
3	BANANA	73.859	3391.014	45.91
4	PAPAYA	2.318	111.85	48.253
5	LITCHI	4.517	39.37	8,708
6	JACKFRUIT	0.745	18.597	24.953
7	MUSK MELON	22.673	592.515	26.107
8	WATER MELON	15.617	706.65	45,205
9	AONLA	36.711	402.793	10.972
10	OTHER CITRUS	4.966	19.679	3.959
11	OTHER FRUITS	12.165	185.348	15.221
	TOTAL FRUITS	**505.134**	**11113.859**	**22,002**
1	POTATO	622.5	16161.968	25.963
2	ONION	29.94	494.1	16.503
3	TOMATO	22.75	908.635	39.94
4	SWEET POTATO	18.84	254.251	13.495
5	CAULIFLOWER	18.909	436.772	23.099
6	OKRA	24.8	335.864	13.543
7	BEANS	10.736	162.665	15.151
8	CUCUMBER	4.091	103.739	25.358
9	BRINJAL	8.823	312.982	35.473
10	CARROT	7.052	178.969	25.378

11	TURNIP	2.224	71.217	32.022
12	RADISH	6.638	173.201	26.092
13	BITTER GUARD	4.755	89.732	18.871
14	BOTTLE GUARD	16.808	509.437	30.309
15	PUMPKIN	10.415	404.007	38.791
16	PARWAL	2.488	68.115	27.377
17	PETHA	1.749	62.061	35.484
18	ARBI	10.873	183.336	16.862
19	TORAI	15.052	363.701	24.163
20	GREEN CHILLIES	31.618	77.728	2.458
21	GREEN PEA	239.108	2745.281	11.481
22	CABBAGE	10.334	348.939	33.766
23	OTHER VEG.	206.317	5457.978	26.454
	TOTAL VEG	**1326.82**	**29904.677**	**22.539**
1	TURMERIC	2.249	6.639	2.952
2	RED/DRY CHILLIES	31.074	25.41	0.818
3	CORIANDER	7.674	4.239	0.552
4	GINGER	0.987	5.104	5.171
5	GARLIC	40,960	242.237	5.914
6	FENUGREEK	0.472	0.265	0.561
7	FENNEL	0.833	0.792	0.951
	TOTAL SPICES	**84.249**	**284.686**	**3.379**
1	GLADIOLUS	3.757	47.007	12.512
2	MARIGOLD	4.573	9.194	2.01
3	ROSE	14.425	63.236	4.384
	TOTAL FLOWERS	**22.755**	**119.437**	**5.249**
	STATE TOTAL	1938.958	41422.659	21.363

Source: Report of Horticulture and Food Processing Department, Uttar Pradesh

5. Conclusion and policy implications:

Horticultural science is the only plant science that includes both plant science and plant aesthetics. It is the science and art of growing, developing, and commercializing edible fruits, vegetables, flowers, herbs, and ornamental plants. Horticulture is an applied science, meaning that the knowledge gained by horticulturists is used to improve plant production, marketing, and the quality of human and animal life on Earth. Horticulture has a regular effect on our lives by supplying healthy fruits and vegetables, providing visual pleasure, and encouraging leisure activities.

To enhance the farmer's income, ensure nutritional security, and reduce the post-harvest losses of horticultural produce, mainly fruits, and vegetables, it is essential to promote Horti based entrepreneurial development. Though there are considerable prospects in horti-based entrepreneurial setup, it faces many constraints. It is crucial to identify each constraint to reduce its effect at a lower threshold level. The study reveals the major limitations perceived by farmer

of Uttar Pradesh in entrepreneurship development in the horti sector. Lack of awareness about various aspects of fruit processing and value addition, high initial establishment cost, inadequate market infrastructure and marketing facilities, lack of timely credit facility availability were major limitations. To overcome these specific limitations, it is very important to sensitize producers and rural youth about prospects of the horti-based enterprise through exposure to successful entrepreneurs' farms, post-harvest value addition technologies based on vocational training, etc. The study suggested the need for infrastructure creation at the hubs of production to reduce the farm-level losses and realize the better price for the produce by the farmers through wise marketing decisions.

Horticulture sector has emerged as one of the driving forces for overall development of agriculture sector in Uttar Pradesh. The growth of this sector would not only create better employment opportunities, supplement farmers' income but also provide nutritional security and raise the foreign exchange reserves in the country. Though foodgrain still remains the main contributor to the crops sector, the share of horticulture by its sub sectors in gross cropped area has been increasing gradually. The value of output of various types of horticultural crops i.e. vegetables, fruits and spices at regional level in Uttar Pradesh reveals mixed trends while the value of output by horticulture and its sub sectors grew with highest rate in Bundelkhand as compared to the other regions. The regression results show that the factors such as cold storages, agricultural markets, agricultural loan, expense on district schemes, electrified villages, literacy level and irrigated area have positive and significant impact on per hectare value of output by horticultural sector during the study period. On the other hand, climatic variable (maximum temperature) had negative but significant impact on per hectare value of output by horticulture sector. Thus, in a nutshell, shifting orientation from cereal dominance to horticultural and high value crops via crop diversification can be instrumental in supplementing farmers' income. Also, upgradation of rural infrastructure with timely public interventions can be instrumental in plugging the loopholes engulfing the horticultural sector in particular and agricultural sector in general. PPP initiatives in the domain of value chains and food processing coupled with innovative extension systems to transfer right knowledge especially around natural resource management and specialty agriculture can be a major step in this regard. Moreover, a major thrust to low volume high value crops, Integrated Organic Farming System (IOFS) and low-input use areas for promotion of organic farming especially for export economy can prove to be useful in formulating holistic agricultural policies thereby enhancing farmers' income.

6. Suggestions

- Achieve technology led development in Horticulture.
- Post-harvest & value addition in horticulture crops.
- Modified atmosphere packaging for long storability & transportation of fruits & vegetables.
- Insect pollinators for improving productivity and quality of the crops.
- Development of varieties for cultivation in non-traditional areas.
- Nutrient dynamics and interaction.
- Bioenergy and solid waste utilisation to make horticulture more efficient and eco-friendlier.
- Plan, coordinate and monitor R&D programmes at national level as well as to serve as knowledge repository in Horticulture sector.

7. Challenges

- Horticulture does not enjoy a safety net like the Minimum Support Price (MSP) for foodgrains.
- Lack of good cold chain storage and transport networks to extend the life of perishable products.
- Very less or limited input by machinery and equipment so it is tough to minimise the time restraints.
- Higher input costs than foodgrains make it a difficult set up, especially when there is no support from the local governments to the smaller farmers.
- It gets challenging for marginal farmers to cope with the high price fluctuations.
- Limited availability of market intelligence, mainly for exports makes it a tougher option to choose.

8. Way Forward

- The diversification in the agricultural sector mainly of the horticulture sector has become a major source of positive growth for the sector itself and for the nation.
- It has emerged as a promising source of income acceleration, employment generation, poverty alleviation and export promotion.

- India can emerge as a far bigger producer and exporter if sufficient emphasis is given to resource allocation, infrastructure development, more R&D, technological upgradation and better policy framework for horticulture sector.
- Horticulture sector with strong forward and backward linkages as an organised industry can stimulate and sustain growth.

9. Scope of Horticulture

- Horticulture crops produce a higher yield per hectare than field crops.
- Horticulture crops are extremely valuable because of their high nutritional value. Fruits and vegetables, in particular, provide us with a lot of vitamins and minerals.
- Horticulture is very important because it improves the beauty of the environment.
- Small and marginal farmers can benefit from horticulture crops.
- Crop varieties with a wide variety of applications are available in the Horticulture section.
- Horticultural crops benefit the environment by minimizing waste, conserving soil and water, and enhancing the farmer's socioeconomic status.

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