



Research Article

STRATEGIES FOR DOUBLING OF FARMERS INCOME THROUGH HORTICULTURE BASED INTERVENTIONS IN DIFFERENT AGRO-CLIMATIC ZONE OF UTTAR PRADESH

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Abstract: The small and marginal farmers are dominated in agriculture. Raising productivity is likely the single most important factor, if incomes of farmers group are to be doubled. To overcome the problem, there is need to focus on irrigation, seeds/ planting materials, reduction in input cost and new technological based interventions coupled with a shift into high-value commodities such as horticulture. Despite the scope and importance for cultivation of various horticulture crops, farmer in mass are not adopting the latest production technologies comprising of Precision Horticulture Practices related to soil, water and selection of planting material. The various districts of Uttar Pradesh classified under nine different agro-climatic zones viz. Central Plain Zone, South Western Semi Arid Zone, Bundelkhand Zone, Eastern Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Bhabhar & Tarai Zone, Western Plain Zone, Mid western Plain zone. To increase the income with horticultural crop, there is need to adopt the horticulture based interventions with agro-climatic zone wise strategic action plans e.g. Establishment of new orchard, Management of old and unproductive orchards-Mango, Guava, Hi-tech horticulture nursery management technologies, Production technology of tissue culture banana, Improved production technology of vegetable crops, Flower production, Production of medicinal, aromatic and spices, Resource conservation technologies for enhancing production of horticultural crops and Role of ICT in doubling income of farmer through horticultural crops.

Keywords: Agro-climatic zone, Horticultural Interventions, Doubling of farmers income, Strategic action plan for U.P., Income through Horticultural crops

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Introduction

Indian horticulture has emerged as one of the major agricultural income generating activities as there has been lots of value additional operations with a substantial increase both in area and production of horticulture crops. Horticultural crops have the inherent advantage of providing higher productivity per unit area of land under different agro-climatic situations as compared to other crops, resulting higher income and employment generation scopes in rural areas. For the last 5 years, horticultural produce is surpassing the produce of other agricultural commodities, which stood at 271 million tonnes this time. 25.1 million hectare of horticultural land produced 299.85 million tonnes of produce, which is a good trend. Export in Indian horticulture section has been gaining heights. In the year, 2014-15 the export reached at a worth Rs.28,628 cr. Fruits and vegetables alone accounted for Rs. 7.7 cr export [1]. UP is the most populous and 4th largest area wise state in India. The districts of UP have been grouped in to 18 divisions. The state UP is bordered by Rajasthan to the west, Haryana and Delhi to the northwest, Uttarakhand and the country of Nepal to the north, Bihar to the east, and Jharkhand to the southeast, Chhattisgarh to the south and Madhya Pradesh to the southwest. It has a population 199,812,341 [2]. Population and Development includes the issues related to many variables, such as demography, economics, urbanization, gender, religion, politics, food and nutrition etc. [3]. The various districts of Uttar Pradesh classified under nine different agro-climatic zones viz. Central Plain Zone, South Western Semi Arid Zone, Bundelkhand Zone, Eastern Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Bhabhar & Tarai Zone, Western Plain Zone, Mid western Plain zone. To increase the income with horticultural crop, there is need to adopt the horticulture

based interventions with agro-climatic zone wise strategic action plans.

The different Agro-climatic zones in Uttar Pradesh are classified as follows

Central Plain Zone - This zone constitutes the districts of Hardoi, Farrukhabad, Kannauj, Etawah, Auraiya, Kanpur Nagar, Kanpur Dehat, Unnao, Lucknow, Sitapur, Raebareilly, Fatehpur, Pratapgarh, Kaushambi and parts of district Lakhimpur Kheri and Allahabad. It is the largest zone of highly productive alluvial soils, high fertility with intensive irrigation and increased cropping intensity (155 %). The soils of this region vary widely from sandy loam to clay loam. The average annual rainfall of the zone is 863 mm and the temperature ranges from 5.5°C to 45°C. Monthly mean relative humidity ranges from 33% to 86% (annual mean 67%). Potato, tomato, vegetable pea and cucurbits are the major vegetables and mango, guava, aonla, banana and citrus are the major fruits grown in the zone. Flower cultivation is also popular in some areas. Usar soils in the zone is a major limitation.

South Western Semi Arid Zone

This zone comprises the districts of Aligarh, Etah, Mainpuri, Mathura, Agra, Mahamaya Nagar and Firozabad. The soils are alluvial in nature and affected by salts. Average annual rainfall is 662, and the temperature ranges from 4°C to 47°C. The average relative humidity ranges from 32 to 82%. The ground water of Agra, Mathura and Aligarh districts is brackish. Cropping intensity of the zone is 146%. Potato, ash gourd, vegetable pea, garlic, onion, spices and flowers are also cultivated. The major limitations of the zone are underground brackish water, alkalinity and undulating ravines.

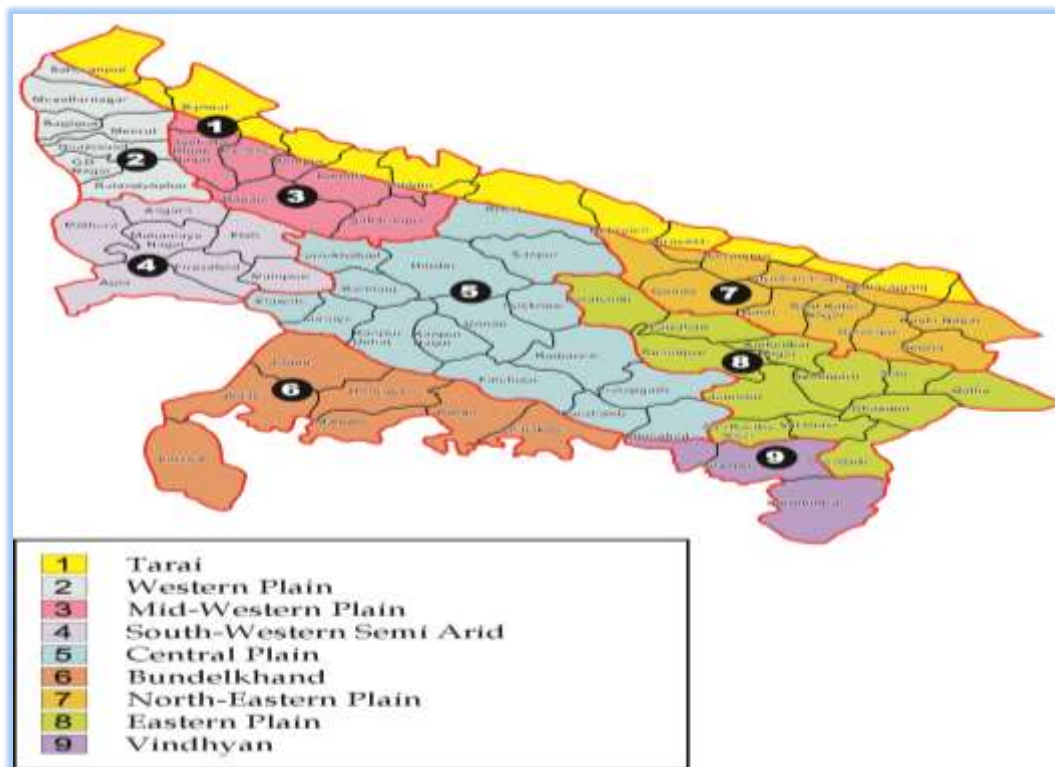


Fig-1 Agro-Climatic Zone of Uttar Pradesh

Bundelkhand Zone

This zone comprises the districts of Jhansi, Lalitpur, Banda, Hamirpur, Jalaun, Mahoba and Chitrakoot. Hot climate, undulating topography, residual and low depth of soil and exploitation of groundwater because of land impermeable rock on the surface characterize the zone. It has semi arid climate with average annual rainfall of 800 mm and the temperature ranging between 3.0°C to 47.8°C. The relative humidity in this zone ranges from 26% to 88%. The zone has 4 broad soil groups, namely, Rakar, Parwa, Kabar and Mar. Cropping intensity is about 111%. Ginger and beetle vine cultivation is prominent in this zone. Amongst fruit, citrus fruits, are cultivated. Tomato and brinjal are the main vegetables. The major limitations are inferior soils, lack of irrigation resources and improved implements.

Eastern Plain Zone

The zone consists of Sultanpur, Mau, Ballia, Varanasi, Ghazipur, Azamgarh, Chandauli, Jaunpur, SantRavidas Nagar, Barabanki districts. The Zone has plenty of ground water; however, the surface water is scanty. Three types of soils, namely, alluvial, usar and diara land are found in this zone. Usar soils are found in Sultanpur, Ballia and Azamgarh districts. Average annual rainfall is between 803mm of which about 96% is received during June to September. The temperature ranges from 5.7°C to 41.4°C and the relative humidity ranges from 30% to 86%. Vegetables are also cultivated at large scale. The prominent vegetables are potato, tomato, chillies, radish, vegetable pea, brinjal, oca and capsicum. Mango, aonla, Ber, Guava, Citrus and Jack fruit are the major fruits. Commercial flower cultivation is also practice in few districts of this zone. Large areas are affected with alkalinity and salinity.

North Eastern Plain Zone

The zone consists of Bahraich, Balrampur, Basti, Deoria, Gonda, Gorakhpur, Kushinagar, Maharajganj, Santkabirnagar, Sravasthi, Siddharthnagar districts. The Zone comprises 39% of the total area of eastern Uttar Pradesh, which has abundant surface and ground water. Two main soil types are found, namely alluvial and calcareous. The annual average rainfall is 1240 mm and the temperature ranges from 4.9°C to 44.2°C. Potato, chillies, banana, litchi, jackfruit, cucurbits especially parwal and few spices are also cultivated. This is flood prone zone and water congestion is a major problem.

Vindhyar Zone

The zone consists of Mirzapur and Sonbhadra districts. It is the driest of all three zones of eastern Uttar Pradesh. Most of the land is undulating and rocky. Soils are black, heavy red and coarse soils. The soils are alluvial in plain area. The average annual rainfall of the zone is 1134 mm and the temperature vary from 5.0°C to 45.2°C About 33% is under cultivation. Mostly single cropping is practiced except for the areas with irrigation facilities, primary canals. The brinjal, chillies, citrus fruits, aonla and guava are cultivated. Undulating and rocky area is one of the limitations.

Bhabhar&Tarai Zone

There is a narrow strip of land just below the foothills of Himalayas known as Bhabhar covering part of Saharanpur and Bijnor districts of the state. Tarai comprises the central part of Saharanpur district, northern portion of Bijnor, Moradabad, Rampur, Bareilly, Pilibhit, Shahjahanpur and LakhimpurKheri. Tarai has a dry season from early October to mid June and a wet season from mid-June to early October. Temperature is the highest in May-June (48.4°C) and lowest in December-January (4.3°C). Relative humidity is highest in July (81.7%) and lowest in may (39%) the average rainfall is 1400mm. Soil of tarai zone are alluvial in nature, low to medium in Phosphorus, medium to high in potassium and high in organic matter. Bhabhar soils are mixed with coarse gravel and stones. Cropping intensity of the zone is 146%. Potato, Tomato, colecrops, vegetable pea and cucurbits are major vegetables and mango, leachi, papaya and guava are the major fruits grown in this zone. The major relevant of Bhabhar soils is drought prone on account of rapid infiltration of water.

Western Plain Zone

The zone includes districts of Muzaffarnagar, Meerut, Baghpat, Ghaziabad, Gautam Buddha Nagar, Bulandshahr and parts of Saharanpur located between the Ganga and Yamuna river and their tributaries. The zone is highly productive with light coloured loam soil. The average annual rainfall is 795 mm. Relative humidity ranges from 32 to 85% and the temperature ranges from 32 to 85% and the temperature ranges from 1.5°C to 4.3°C. Potato, onion, tomato, vegetables and mango, litchi, grape, guava and papaya are the major fruits cultivated are also practiced in this zone. Water logging and salinity are important limitations in the zone.

Mid-western Plain zone

This region embraces the districts of Badau, Bareilly, Shahjahanpur, JyotibaPhule Nagar and Moradabad. Rainfall in this region is received during mid June to mid October. Annual rainfall is 1032mm and the temperature ranges from 4.5°C to 45.4°C. The soils of the region are mostly alluvial and have been developed to alluvial deposited by the Ganga and its tributaries. Soils are natural to moderately alkaline and in medium in organic content. Cropping intensity in the zone is 150%. Potato, tomato, cauliflower, cabbage, vegetable pea, cucurbits are the major vegetables. Mango guava, ber jackfruit and lemon are the major fruits. Cultivation of mentha is becoming popular. The major limitation in the zone is salinity and alkalinity of soils.

Strategies for Doubling of Farmers Income for Different Agro-Climatic Zone of Uttar Pradesh

Establishment of new orchard

- High density planting: Mango (1,4,5,7,8,9), guava (1,2,4,5,7,8,9), Citrus (4), Litchi (7), Peach (7), Ber (9), Jackfruit (9), Lemon (9).
- Multi-tier cropping system in problematic soil: Aonla (1,2,3,4,5,6,9)/bael-ber (1,2,3,4,5,6,9)/guava-karoda/ phalsa (1,2,3,4,5,6,9), Pomegranate (2,3,6), Citrus (3,6), Custard apple (3,6).
- Establishment of orchard: bael (4), ber (4), jackfruit (4,5), jamun (4), mahua (4), Litchi (5), Kinnow, Guava, Citrus, Pomegranate (3,6).
- Inter cropping of leguminous vegetables (1-9), cucurbits (1-9), seed spices (1-9), Arvi (7), Onion (7), Garlic (7), Chilli (7), Tomato (7), Tuber crops (9).
- Promotion of gyno-dioecious cultivars of papaya (1,4,5,9).

Management of old and unproductive orchards-Mango, Guava

- Rejuvenation (1-9)
- Window opening in mango (1,4,5,7,8,9)
- Canopy management in other fruit crop (1,3,4,5,6,7,8,9)
- Inter cropping of leguminous vegetables, cucurbits, seed spices (1,2,3,4,5,6,7,8,9), Tomato, chilli, cole crops (8), Tuber crops (9)
- Promotion of inter cropping – Turmeric (1,2,3,5,6,7,9), Elephant foot yam (Suran)/ Colocasia (Arvi) (1,4,5,7,9), Ginger (3,6)

Hi-tech horticulture nursery management technologies

- Standardization of root stock – Mango (1,4,5,7,8,9), guava (1-9), Kinnow (3,6), Custard Apple (3,6), Citrus (4), Litchi (7), Peach (7), Ber (9), Jackfruit (9), Lemon (9)
- Establishment of mother block on newly released variety of fruit crops viz. Mango (1,4,5,7,8,9), guava (1-9), aonla (1,3,4,5,6,8,9), bael (1,2,3,4,5,6,9), ber (1,2,3,4,5,6,9), citrus (1,2,3,4,6,9), Custard apple (2), Pomegranate (2).
- Use of nursery growing structures viz. mist chamber, net house, etc. (1-9).

Production technology of tissue culture banana

- Establishment of tissue culture laboratory (1,4,5,9)
- Entrepreneurship development through hardening and supply of saplings of tissue culture banana (1,4,5,9)
- Double row planting system of banana (1,4,5,9)
- Inter cropping of off season vegetable crops in banana (1,4,5,9)

Improved production technology of vegetable crops

- Commercial nursery production (1-9)
- Off & on season vegetable production technology viz. Cucurbits (1,3,4,5,6,7,8,9), cole crops (1,2,4,7,8), okra (1,2,4), cow pea (1,2,4,7), tomato (1,3,4,6,8,9) brinjal (1,3,4,6,7), chilli (1,3,4,5,6,8), moringa (1,3) Vegetable pea (2,7,9), Potato (1,2,4,5,7,9), Ash Gourd (2), Onion (2,3,6,7), Garlic (2,3,6), Water Chest nut (5), Moringa (6), Carrot (8), Radish (8), Leafy vegetables (8), Cauliflower (9), Cabbage (9).
- Vegetable production under protected condition viz. high value low volume crops (capsicum, cucumber and exotic vegetables) in peri-urban areas (1,2,4,5,7,8)
- Technologies for promotion of secondary horticulture in peri urban areas (1,2,3,4,6,7,8)
- Value addition (1-9)
- Seed production technology of vegetable crops viz. vegetable pea (1-9), cow

pea (1,4,6,7,8,9), cucurbits (1,4,5), tuber crops (1,2), Potato (2,8,9), Ash Gourd (2), Okra (3,4,6), Broad bean (3,6), Guar (3,6), Chilli (5).

- Production of Water chest nut (3, 6).

Flower production

- Commercial nursery production (1-9).
- Cut flowers/ house plants/ ornamental plants production under protected cultivation in peri metro areas viz. gerbera, rose, etc. (1,2,8,9).
- Cut flowers cultivation in peri metro areas viz. Tuberose, gladiolus, etc. (1,2, 7)
- Production of cut flowers viz. gladiolus, tuberose, rose, etc (4)
- Production of loose flowers in peri spiritual cities viz. Rose (1,2,4,8,9), marigold (1-9), jasmine (1,2), bela(1), etc. (1,2,3), Chandani (3, 6), Hibiscus (3, 6), Galardia (3, 6)
- Value addition (1,2,3,4,6,7,8,9).

Production of medicinal, aromatic and spices

- Commercial nursery production (1-9).
- Cultivation technology viz. menthe (1,4,5,9), satavar (1,3,6), lemon grass (1), Artimicia, (1,4,7), Aloe vera (2,3,6,7,8), Ashwagandha (2,3,6,8), Sarpagandha (2,3,6,8), Vinca (3,6), Basil (1,3,4,6,7,9), Shankhpushpi (4), Acorus (Bach-4,5,7,9), Opium (4,5), Stevia (8), Tulsikhas (9).
- Waste land development through cultivation of M&AP viz. Alovera (1), ashwagandha (1), sarpagandha (1), Citronella (2,3,6), Lemongrass (2,3,4,6), Khas (2,9), Artimicia (3,4,6,8), Geranium (4), Kevada (9), Acorus (9), Water chest nut (9).
- Establishment of horti-medicinal-aromatic cropping system in waste land (1,2,4,8,9)
- Establishment of agro-forestry system/ bamboo production in waste land (3,6).
- Value addition and small scale industry (1,2,3,4,6,7,8,9).

Resource conservation technologies for enhancing production of horticultural crops

- Micro-irrigation system (1-9)
- Rain water harvesting (1-9)
- Mulching (1-9)
- Farm mechanization (1-9)
- Recycling of farm/ processing industry waste (1-9)
- Role of ICT in doubling income of farmer through horticultural crops (All Zone 1-9)

Conclusion: It may be concluded that as per the agro-climatic conditions, the technological intervention should be adopted for the technological viability, suitability and sustainability in context of doubling of farmers income.

Application of research: Research is applicable for Horticultural planning and its implementation for doubling of farmer's income. It is also very helpful to extension workers, KVK personnel's, and farmers while implementing horticulture based interventions.

Research Category: This is research study for horticulture and horticulture based interventions in the different agro-climatic conditions of Uttar Pradesh, India

Abbreviations: for 1-9

- 1- Central Plain Zone
- 2- South Western Semi Arid Zone
- 3- Bundelkhand Zone
- 4- Eastern Plain Zone
- 5- North Eastern Plain Zone
- 6- Vindhyan Zone
- 7- Bhabhar & Tarai Zone
- 8- Western Plain Zone
- 9- Mid western Plain zone

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