

Himachal Pradesh Subtropical Horticulture, Irrigation & Value Addition Project Readiness Financing (HPSHIVA PRF)

CS03: Himachal Pradesh Horticulture Development Strategy and Investment Plan 2023-2030

Learnings



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List of Abbreviations

ADB	Asian Development Bank
AMI	Agriculture Marketing Infrastructure
APEDA	Agricultural and Processed Food Products Export Development Authority
APMC	Agricultural Produce Market Committee
APFEPS	Agriculture and Processed Food Export Promotion Scheme
ATMA	Agricultural Technology Management Agency
CA	Commission Agent
CA Storage	Controlled Atmosphere Storage
CAGR	Compounded Annual Growth Rate
CFTRI	Central Food Technological Research Institute
CHF	College of Horticulture and Forestry
CHPMA	Community Horticulture Production and Marketing Association
CISH	Central Institute for Sub-tropical Horticulture
CoE	Centre for Excellence
DoH	Department of Horticulture
EA	Executing Agency
e-NAM	Electronic National Agriculture Market
EY	Ernst & Young
EU	European Union
FAO	Food and Agriculture Organization (of UN)
FICCI	Federation of Indian Chambers of Commerce and Industry
FGD	Focus Group Discussion
FLD	Front Line Demonstration
FPO	Farmer Producer Organizations
FRE	First Round Estimate
FSSAI	Food Safety and Standards Authority of India
GAP	Good Agricultural Practice
GI	Geographical Indicator
GoHP	Government of Himachal Pradesh
Gol	Government of India
GSP	Generalised System of Preference
GST	Goods and Services Tax
GVA	Gross Value Added
Ha	Hectare
HIMCU	HP Fruit Canning Unit
HIMFED	HP State Cooperative Marketing Federation
HP	Himachal Pradesh
HPHDP	Himachal Pradesh Horticulture Development Project
HPMC	Horticulture Produce Marketing and Processing Corporation

HPSAMB	Himachal Pradesh State Agriculture Marketing Board
HPSHIVA	Himachal Pradesh Subtropical Horticulture, Irrigation and Value Addition
HP HSDSIP	Himachal Pradesh Horticulture Sector Development Strategy and Investment Plan
HYV	High Yielding Varieties
IA	Implementing Agencies
INM	Integrated Nutrient Management
INR	Indian Rupee
IPM	Integrated Pest Management
IQF	Individual Quick Freezing
ISO	International Organization for Standardization
ISO	International Standards Organization
J & K	Jammu & Kashmir
JICA	Japan International Cooperation Agency
JNPT	Jawaharlal Nehru Port Trust
KCC	Kisan Credit Card
KII	Key Informant Interview
KUSHY	Krishi Utpaad Sanrakshan
KVK	Krishi Vigyan Kendra
LLP	Limited Liability Partnerships
MC	Market Cost
ME	Marketing Efficiency
MIDH	Mission for Integrated Development of Horticulture
MI	Millilitre
MM	Marketing Margin
MMGRS	Mukhyamantri Green House Renovation Scheme
MMKSY	Mukhya Mantri Khet Sanrakshan Yojna
MNRE	Ministry of New and Renewable Energy
MOEF&CC	Ministry of Environment Forest & Climate Change
MP	Madhya Pradesh
MRL	Minimum Residue Limited
MSME	Micro, Small and Medium Enterprise
MSAMB	Maharashtra State Agriculture Marketing Board
NABARD	National Bank for Agriculture and Rural Development
NAFED	National Agricultural Cooperative Marketing Federation of India Ltd.
NBFC	Non-Banking Financial Company
NCDC	National Cooperative Development Corporation
NICSI	National Informatics Centre Services Inc.
NRCIPM	National Research Centre for Integrated Pest Management
NHB	National Horticulture Board
PAGREXCO	Punjab Agri Export Corporation
PAC	Project Appraisal Committee
PAM	Project Administrative Manual
PAN	Permanent Account Number

PCDO	Progeny cum Demonstration Orchard
PCMU	Project Consultancy and Management Unit
PLISFPI	Production Linked Incentive Scheme for Food Processing Industry
PMU	Project Management Unit
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMKSY	Pradhan Mantri Krishi Sinchayi Yojana
PoP	Package of Practices
PPM	Parts per Million
PPP	Public Private Partnership
PRF	Project Readiness Financing
PS	Price Spread
RKVY	Rashtriya Krishi Vikas Yojna
R-WBCIS	Restructured Weather Based Crop Insurance Scheme
SAARC	South Asian Association for Regional Cooperation
SCCC	State Climate Change Centre
SDG	Sustainable Development Goal
SFAC	Small Farmers Agribusiness Consortium
SFURTI	Scheme of Fund for Regeneration of Traditional Industries
SHC	Soil Health Card
SME	Small and Medium Enterprise
SOP	Standard Operating Procedures
SPS	Sanitary and Phytosanitary Measures
SQ	Service Quality
SRE	Second Round Estimate
SWOT	Strength, Weakness, Opportunity, and Threat
TBT	Technical Barriers to Trade
ToR	Terms of Reference
TSS	Total Soluble Solid
UAPCC	Uttarakhand Action Plan on Climate Change
UHF	University of Horticulture & Forestry
UIDAI	Unique Identification Authority of India
UNDP	United Nations Development Programme
UP	Uttar Pradesh
USA	United State of America
UV Rays	Ultra-violet Rays
VCA	Value Chain Analysis
VRA	Vulnerability Risk Assessment
WBCIS	Weather Based Crop Insurance Scheme
WHO	World Health Organization
WUA	Water User Association



Executive summary

Overview

The horticulture and allied industries embrace a diverse spectrum of sectors, which includes fruit and vegetable production, ornamental plant production (including floriculture) and novel crops along with mushroom and bee-keeping. Whilst representing a diverse range of interests, there are common issues and considerations that need to be addressed and opportunities to be garnered and harnessed. Over the years, horticulture has emerged as one of the potential agricultural enterprises in accelerating the growth of the economy. Its role in the country's nutritional security, poverty alleviation and employment generation programs are becoming increasingly important. It offers not only a wide range of options to the farmers for crop diversification, but also provides ample scope for sustaining large number of horticulture industries which generate huge employment opportunities.

The estimated population of Himachal Pradesh (hereinafter referred to as "HP") is 7.43 million as on March 2022¹. About 90 percent of the state's population lives in rural areas, most of which are dependent on agriculture in some way or another, for their livelihoods². The agriculture and allied sectors, as a key sector, have been supporting about 60% of the population. It registered a growth of 18.3% in 2019-20 (First Revised Estimate or FRE) with a Gross Value Added (GVA) of INR10,583 crores as compared to INR8,949 crores during 2018-19 (Second Revised Estimate or SRE)³. In Himachal Pradesh, horticulture is no longer a sub-sector of agriculture but is recognized as a separate sector. Horticulture has thus crossed agriculture in terms of value addition.

Out of the total geographical area of the state (55.67 lakh hectare), the area of operational holdings is about 9.44 lakh hectares and is operated by 9.97 lakh farmers with an average holding size of about 0.95 hectare⁴. Horticulture in HP has been responsible for many of the positive outcomes in employment, wages, poverty reduction and allied industries. The present report focuses on the overall development of horticulture crops in the state with the following vision, mission, and objectives.

Vision

To envision Himachal Pradesh as the "Fruit Bowl of India."

Mission

To double the state GDP share of the horticulture sector from 3.6% to 7.2% by 2032; by focusing on diversification, sustainability, developing entrepreneurship and doubling farmers' income in the sector.

Approach and Methodology

In order to fulfill this vision and mission, a comprehensive approach and methodology was adopted, which included field visits to each district/cluster to gather ground level information. The visits in each district

¹"Aadhaar Saturation Report", Unique Identification Authority of India website, https://uidai.gov.in/images/Aadhaar_saturation_report-as_on_31-03-2022.pdf

² "States", Census India, <https://www.censusindia.co.in/states/himachal-pradesh>

³ "State Economy, Public Finance and Taxation", Government of Himachal Pradesh Economic Survey, 2020-21, pp.10 (accessed via <https://himachalservices.nic.in/>)

⁴ "Agriculture, Horticulture and Allied Services", Government of Himachal Pradesh Economic Survey, 2020-21, pp. 74 (accessed via <https://himachalservices.nic.in/>)

covered focused group discussions and interviews with stakeholders from PRF clusters, FLD clusters, district department officials, agricultural produce market committees, Krishi Vigyan Kendra, public and private processing units, public and private nurseries, universities, research institutions.

The visit was followed by a crop selection study based on area under cultivation and CAGR from 2014-15 to 2021-22, stakeholder workshop on 27 April 2022, for forming a comprehensive development program. Approach and methodology also included benchmarking study of progressive horticulture states and states with similar geography.

Benchmarking study: The states selected for the benchmarking study are Maharashtra (Rank 1 in Pomegranate), Uttar Pradesh (Rank 1 in Guava), Bihar (Rank 1 in Litchi), Uttarakhand (similar terrain and work on climate change), Punjab (neighboring state with similar horticulture production area expansion aspiration). The key learnings from the benchmarking studies of five states are:

- ▶ Promotion of a collective organization like MAHAANAR, MAHAMANGO, etc. Brand building initiatives like “Five Rivers” and implement Geographical Indications(GI) certification for fruits
- ▶ Policy support to incentivize the PHM and food processing sector, Incentives for establishment of hi-tech nurseries, centers of excellence etc.
- ▶ Development of infrastructure- pack houses, integrated export facilities, required to boost fruit exports
- ▶ Promote research and development of latest technology like technology to increase shelf life of fruits, government facilitation to initiate online sale of litchi fruits by associating with the postal department in Bihar, involvement of FPOs in marketing, knowledge sharing, inputs supply etc.
- ▶ Establishment of fruit estates to provide state-of- the-art world class equipment, machinery, technical know-how and other services in a package, from nursery production to processing under one umbrella
- ▶ Establishment of fruit nutrition gardens in collaboration with academic institutions
- ▶ Set up of State Climate Change Centre for knowledge management related to climate change and Strengthening State Strategies for Climate Actions (3SCA) project implementation.

For implementation of the project a comprehensive training program, convergence of the scheme with the central and the state government, roles and responsibilities of different stakeholders, facilities, and infrastructure, at the apex, district and block level, additional income-generating activities, introduction of new crops and a comprehensive development framework is considered.

The HSDSIP 2023-2030 has two main components:

1. Horticulture Development Strategy
 - a. This part entails the reason for development of the horticulture sector in the state.
 - b. It sets vision for the horticulture sector of the state and suggests ways to achieve the same.
 - c. It suggests ways to engage community actively in the horticulture sector and thereby stop population out-migration from the state.
 - d. The strategy sets forward the path for development by suggesting changing planting/agriculture scenario in the state, thereby increasing acreage of horticulture crop in the state of Himachal Pradesh
 - e. It also entails ways of adopting an end-to-end holistic approach covering pre-production, production, post-harvest management, processing, and marketing to provide appropriate returns to growers/producers
 - f. The plan suggests a way to collectivize farmers to create sustainable business models for farmers/growers.

- g. Helps in understanding the perceived impact of climate change and adoption strategies
 - h. Promote R&D technologies for nursery development, cultivation, post-harvest management and processing.
 - i. Infrastructure development strategies for the sector
 - j. Capacity building measures at all levels.
2. Investment plan for horticulture sector in the state of Himachal Pradesh
- a. Strategies for driving investments at each level, i.e.,
 - i. Planting material procurement and production
 - ii. Pre-harvest level (cultivation of crop and protection of crop)
 - iii. Harvesting level
 - iv. Post-harvest level
 - v. Marketing level
 - vi. Branding and communications
 - vii. Capacity building and knowledge transfer
 - viii. Research and development
 - ix. Any other infrastructure development level
 - b. This entails understanding investment possibilities from
 - i. Public funding options like state government's initiatives/projects/schemes for development of the sector or to support farmers/growers of HP. Central government grants for various programs providing inputs at each level/segment.
 - ii. Suggest arenas for Public-Private Partnerships in the horticulture sector including but not limited to infrastructure development, marketing efforts and capacity building.
 - iii. Institutional framework including financing model for providing required push for the sector.
 - c. It may be noted that "Horticulture Sector Policy - Himachal Pradesh" Horticulture Policy is proposed as an outcome to provide constitutional support to the sector.

Crop categorization

For identifying the strategy and interventions proposed, the fruit crops have been categorized into four groups based on CAGR and 50 percentile crop list in terms of average area under cultivation (2014-15 till 2020-21). The top 50% crops in terms of average area under cultivation with positive CAGR are placed under category A and those with negative CAGR are placed under Category B. Similarly, among bottom 50% crops in terms of average area under cultivation, fruit crops with positive CAGR are placed under Category C and the other crops under Category D. The crops in category A are apple, mango, citrus, plum,

Figure 1: Crop categorization

Categories	Positive CAGR		Negative CAGR	
Top 50% crops in terms of average area	Category A Apple Mango Citrus Plum Litchi Pomegranate	Aonla Guava Jackfruit Pecan nut Persimmon	Category B Pear Peach Almond Walnut Apricot	
Bottom 50% crops in terms of average area	Category C Jamon Kiwi Sapota Karonda		Category D Cherry Papaya Banana Grapes Loquat Strawberry	Olive Ber Bael Hazelnut Fig

litchi, pomegranate, aonla, guava, jackfruit, pecan nut, persimmon. Similarly, pear, peach, almond, walnut and apricot come under category B, jamun, kiwi, sapota and karonda are in category C and cherry, papaya, banana, grapes, loquat, strawberry, olive, ber, hazelnut and fig in Category D. In addition, two new crops, avocado and Dragon fruit are proposed in each 5-ha area.

Further to the categorization, area expansion is proposed as follows:

- ▶ Fruit crops area expansion has been proposed for 36,905 ha: 10,000 ha for HPSHIVA, 16,800 ha under HPHDP and 10,105 ha for other crops. The total area expansion proposed is about 16% of current area under fruit cultivation (2.35 lakhs ha in 2020-21). Out of 10,000 ha under HPSHIVA, area expansion of 4,000 ha is already in progress.
- ▶ Floriculture area expansion has been proposed for 1,200 ha, for honey production an increase of 2,400 MT has been proposed and for mushroom 14,000 MT additional production is presumed by 2030.

The strategy for development of Horticulture has been covered under following aspects: emphasis on infrastructure development, augmentation of value chain through technological inputs, capacity building and institutional strengthening, development of marketing, branding and outreach strategy, implementation of quality standards and export market facilitation, focus on research and development and other interventions. The summary of all these interventions is provided herein below:

Summary of Strategy and Investment plan

A. Infrastructure development

i. Irrigation infrastructure

- ▶ It includes drip irrigation component, such as dripper, laterals etc. The estimated unit cost of drip irrigation is INR1.2 lakh per hectare. Therefore, for total area of 36,905 ha, the total cost of drip irrigation is INR44,286 lakhs (INR442.86 crores).
- ▶ The estimated average cost of sprinkler irrigation for flowers is INR60,000 per hectare. Therefore, for a total area of 1,200 ha, the cost of irrigation is INR720 lakhs (INR7.20 crores).
- ▶ For lifting and storage, an additional provision of INR10,000 lakhs (INR100 crores) is proposed. Therefore, the total cost of irrigation infrastructure will be INR55,006 lakhs (INR550.06 crores) with INR49,505 lakhs (INR495.05 crores) from government and INR5,501 lakhs (INR55.01 crores) from private contribution.

ii. Integrated laboratory

- ▶ Integrated laboratory with plant tissue analysis labs may also include soil, water, Maximum Residual Limit analysis (MRL), Heavy Metal Analysis labs. One such facility may be developed in every district at either 100% assistance to the public sector or 60% to the private sector, subject to maximum project cost norm of INR2 crore/unit. Hence, for 12 labs, the estimated investment is about INR2,400 lakhs (INR24 crores).

iii. Input shops

- ▶ A total of 24 input shops have been proposed at a unit cost of INR10 lakhs and the total cost being INR240 lakhs (INR2.40 crores). The distribution is as follows: 13 under the HPSHIVA project proposed to be set up by FPOs at a 80% support from the government @ INR104 lakhs (INR1.04 crores) and FPO share @ INR26 lakhs and the remaining 11 by entrepreneurs at 50% support by the government at INR55 lakh (INR0.55 crores) and their share is INR55 lakhs

(INR0.55 crores). Thus, the total government share is INR159 lakhs (INR1.59 crores) and private/FPO contribution is INR81 lakhs (INR0.81 crores).

iv. Post-harvest infrastructure

a. Collection centers

- ▶ A total number of 247 collection centers at a total cost of INR7,396 lakhs (INR73.96 crores).
- ▶ 65 collection centers under HPSHIVA, 175 collection centers covering crops under HPHDP and other fruits, 7 collection centers for flowers are proposed.
- ▶ The unit cost for establishment of fruits collection center is considered as INR30 lakhs (INR0.30 crores), whereas for establishment of flower collection center is INR28 lakhs (INR0.28 crores).
- ▶ The government support is estimated at INR5,917 lakhs (INR59.17 crores) (80%) and private contribution of INR1,479 lakhs (INR14.79 crores).

b. Pack houses

- ▶ A total of 38 pack houses at a total cost of INR15,914 lakhs (INR159.14 crores).
- ▶ The unit cost for the pack houses for fruits is INR426 lakhs (INR4.26 crores).
- ▶ As part of the HPSHIVA project, it is proposed to establish 13 pack houses. The pack houses are proposed to be established at a 55:45 basis, in which DoH can subsidize 55% of the project cost as back ended subsidy and 45% should be the promoter contribution with a maximum project cost norm of INR400 lakhs (INR4 crores). The subsidy can be linked to the progress of the project and can be released in installments.
- ▶ In the HPHDP project, a total of 11 pack houses are proposed to be established/upgraded. The details are as follows. Upgradation of six pack house at existing facilities of HPMC at Gumma, Jarol Tikker, Oddi, Rohru, Patlikuhl and Tutupani and green field investment of five grading and packing houses at Chamba, Kinnaur, Mandi, Kullu and Shimla districts.
- ▶ In addition to these, 13 packhouses are proposed for other area, similar to the assistance under HPSHIVA.
- ▶ One pack house is also proposed to be constructed for handling flowers at the cost of INR152 lakhs (INR1.52 crores).
- ▶ Out of total cost for establishment of pack houses- INR15,914 lakhs (INR159.14 crores), the government share is INR8,224 lakhs (INR82.24 crores) and remaining INR7,690 lakhs (INR76.90 crores) by private contribution.
- ▶ 13 automated packaging lines at unit cost of INR15 lakh per unit and 13 hi-tech material handling equipment at unit cost of INR17 lakh per unit (max 2 units) with cost of INR637 lakhs (INR6.37 crores) with 100% government support are proposed.

c. Processing units

- ▶ A total of 10 processing units are proposed for processing of various commodities into value added products.
- ▶ Three processing units under HPSHIVA, one pecan nut processing unit, three units under HPHDP, one processing unit in temperate region, one freeze drying plant and one oleoresin extraction plant are proposed.
- ▶ As part of HPHDP, upgradation of two HPMC processing facilities in Solan and Mandi districts, establishment of one new processing facility in Shimla are proposed.

- ▶ The unit cost of processing facility is considered as INR224 lakhs (INR2.24 crores), INR10 lakhs for Pecan nut processing unit, INR50 lakhs for freeze dehydration unit and INR750 lakhs (INR7.5 crores) for Oleoresin extraction plant, with assistance of 55% from the government.
- ▶ The total cost of establishment of processing unit comes to INR2,378 lakhs (INR23.78 crores) with government portion of INR1,308 lakhs (INR13.08 crores) and private contribution of INR1,070 lakhs (INR10.70 crores).

d. Ripening chambers

- ▶ In total, four ripening chambers are proposed which cost about INR300 lakhs (INR3 crores) each for Mango, Banana, Papaya. The total cost for establishment of ripening chamber comes to INR1,200 lakhs (INR12 crores) with government contribution of INR810 lakhs (INR8.10 crores) and private contribution of INR390 lakhs (INR3.90 crores) where 2 units by FPOs at 80% assistance from government and remaining 2 units by entrepreneurs at 55% assistance from government. The proposed chamber size for ripening is 10 MT/chamber with a maximum of 300 MT capacity.

e. Controlled atmosphere storage

- ▶ Two multi crop controlled atmosphere storages are proposed to be established at a total cost of INR1,500 lakhs (INR15 crores) @ INR750 lakhs (INR7.5 crores) per CA storage for 1,000 MT. These can be utilized for pomegranate, apple etc. (1 unit by FPO at 80% assistance from government and 1 unit by an entrepreneur at 55% assistance from government).
- ▶ Therefore, INR1,012.5 lakhs (INR10.125 crores) contribution by government and remaining amount of INR487.5 lakhs (INR4.875 crores) by FPOs/entrepreneurs for establishment of controlled atmosphere storage.

f. Hitech markets

- ▶ DoH, in association with HPSAMB, may facilitate development of Hi- tech markets and strengthening of existing markets on PPP mode.
- ▶ At least 1 existing market in every district may be strengthened with an amount of INR5,000 lakhs (INR50 crores) per market with the proposed total amount of INR600 crores.
- ▶ In addition, two hi- tech markets dedicated to the horticulture produce shall be developed each of worth INR200 crores. Thus, the total amount of investment for Hitech Markets is INR1,000 crores, with 70% by the government (INR700 crores) and 30% by private contribution (INR300 crores).

g. Export hubs

- ▶ Three export hubs with facilities for loading, unloading, packaging, storage, transport, and quality analysis of produce to be set up at a unit cost of INR5,000 lakhs (INR50 crores) each have been proposed with total investment of INR15,000 lakhs (INR150 crores), with 70% by the government and 30% by private contribution.

h. Material ropeways

- ▶ The total cost for proposed 14 material ropeways of 10 km each with unit cost of INR18 lakh/km is INR2,520 lakhs (INR25.20 crores) with 50% government assistance of INR1,260 lakhs (INR12.60 crores) and the remaining 50% by private contribution.

B. Augmentation of value chain

The augmentation of value chain includes formation of FPOs, establishment of nurseries and orchards, protective structures, insurance, and rewards, supported by IPNM and promotion of organic, natural farming and green technology.

v. Formation of FPOs

- ▶ Collectivization and formation of FPOs is one of the first steps towards the development of sustainable and robust supply chain.
- ▶ It is proposed to develop 500 FPOs in the state, out of which 217 FPOs under the new areas proposed for expansion with following breakup as per commodity groups: 189 for fruits, 7 for flowers, 14 for honey and 7 for mushroom.
- ▶ Additional formation and promotion of 283 horticulture FPOs by mobilizing farmers from the existing area under horticulture (Only 30 are formed to date) is proposed.
- ▶ Member size for each FPO should be a minimum of 100.
- ▶ FPOs may be supported in the following three steps:
 - ▶ Extra 3% interest subvention to FPOs, in addition to existing 3% interest subvention by the central government as per Agriculture Infrastructure Fund (AIF) for any term loans taken up to INR2 crores.
 - ▶ Matching equity grant of about INR2,000 per farmer subject to INR15 lakh per FPO.
- ▶ Thus, total estimated cost for supporting 1 FPO as mentioned above is INR54 lakhs, where INR27 lakhs by the government and remaining INR27 lakhs by FPO (with assumptions of 12% interest for a term loan)
- ▶ The total cost for supporting 500 FPOs is INR27,000 lakhs (INR270 crores), out of which INR13,500 lakhs (INR135 crores) is assistance by the government to FPOs and remaining amount of INR13,500 lakhs (INR135 crores) to be borne by FPOs.

vi. Establishment of nurseries

- ▶ In total 18 new nurseries are proposed to be established new and 2 nurseries are proposed for upgradation.
- ▶ 10 nurseries including one with tissue culture lab and 2 with virus indexing facility facilities are proposed for INR1,681 lakhs (INR16.81 crores) with the government share of INR747 lakhs (INR7.47 crores) and private contribution of INR934 lakhs (INR9.34 crores) under HPSHIVA.
- ▶ Upgradation of two nurseries is suggested: Shahpur Nursery in Kangra may be upgraded for Sweet Orange and Guava from next year. Similarly, Bhumpal PCDO in Hamirpur may be upgraded for Sweet Orange.
- ▶ For non-project areas, 8 more nurseries are proposed with total cost of INR1,141 lakhs (INR11.41 crores), government share being envisaged at INR500 lakhs (INR5 crores) and private equity contribution of INR641 lakhs (INR6.41 crores).
- ▶ For floriculture, nurseries that are already existing can be utilized for the purchase of planting material.

vii. Establishment of orchard

The cost for establishment of new orchards has been proposed based on existing norms for non-high/ultra-high-density plantation and 50% of cost for high/ultra-high-density plantation and other crop categories (crop intensive, non- crop intensive, normal spacing, HDP etc.). The maximum project cost norm for high/ultra-high-density plantation is INR5 lakhs per hectare while MIDH cost norms prevail for others.

- ▶ For a new orchard establishment under proposed area expansion and rejuvenation, approximate cultivation cost is estimated at INR89,973 lakhs (INR899.73 crores), in which the government subsidy amounts to INR44,987 lakhs (INR449.87 crores) and FPO/private contribution of INR44,987 lakhs (INR449.87 crores).

viii. Flower cultivation

- ▶ For floriculture, the area expansion requires an amount of INR9,110 lakhs (INR91.10 crores) with equivalent contribution each of INR4,555 lakhs (INR45.55 crores) is proposed from both.

ix. Composite fencing

- ▶ The composite fencing cost is about INR1,84,525 lakhs (INR1,845.25 crores) @ INR5 lakh per ha to be established with 70% support from the government amounting to INR1,29,168 lakhs (INR1,291.68 crores) and private contribution to INR55,358 lakhs (INR553.58 crores).

x. Anti-hail nets

- ▶ The cost for anti- hail nets is INR1,29,168 lakhs (INR1,291.68 crores) @ INR3.5 lakh per hectare. The government support is INR1,03,334 lakhs (INR1033.34 crores) and farmers contribution is INR25,834 lakhs (INR258.34 crores).
- ▶ The cost of support system for anti-hail nets under KUSHY schemes comes to INR664.3 crores if 50% area is under steel and 50% is area under bamboo support structure.

xi. Crop insurance

To protect the farmers against sudden weather damage to the crop, the farmers should be encouraged to take crop insurance and for effective coverage under the same, government may pay 50% of the premium, which is INR4,875 per ha. Thus, the aggregate amount is INR1,800 lakhs (INR18 crores) for 36,905 ha.

xii. Reward for improved productivity

To encourage better productivity an award of about INR50,000 per farmer and INR1 lakh per FPO for five best farmers and five best FPOs. Thus, the total amount is INR52.5 lakhs rounding off to INR53 lakhs (INR0.53 crores), in which the total cost for farmers comes to INR17.50 lakhs and for FPOs will be INR35.00 lakhs (INR0.35 crores).

xiii. Product development for indigenous commodities and value addition

Three patents filling cost may be supported every year at the unit cost of INR5 lakhs/patent to encourage new product development. In seven years, it is estimated about 21 patents thus the total cost of INR105 lakhs (INR1.05 crores).

xiv. Good agriculture practices

Four GAP certifications every year at the unit cost of INR75,000/per year. It is proposed to provide assistance of 60% of cost subject to maximum of INR 40,000/ha with maximum of 4 ha/beneficiary. The total certifications in seven years are estimated to be 28 and the total cost for the same is INR21 lakhs (INR0.21 crores).

xv. Integrated pest and nutrient management

IPNM are important components of value chain development and to support the same, the government may support 50% of the cost subject to a maximum of INR20,000 per ha limited to 2 ha per beneficiary with unit cost of INR40,000/ha including pheromone traps, labor cost, cost of nutrient and fertilizers, and cost of pesticides. Thus, total cost is INR14.762 lakhs (INR147.62 crores) in which government share is about INR7,381 lakhs (INR73.81 crores) and same contribution from the private.

xvi. Organic farming and natural farming

An area of 5,000 ha is proposed to be brought under for organic farming at a cost of INR10,000 per hectare for branding and promotion of organic produce in addition to existing Paramparagat Krishi Vikas Yojana (PKVY) with a total cost of INR500 lakhs (INR5 crores) by government support.

An additional 5,000 ha area at a cost of INR2,500 per hectare assistance is proposed under natural farming with the total amount of INR125 lakhs (INR1.25 crores). The additional support for cowsheds, drums, gratuity on cows and natural farming reserves is also proposed. The estimated cost of these components is about INR817.5 lakhs (INR8.17 crores), thus, the total amount is INR942.5 lakhs (INR9.425 crores). The government contribution is INR684 lakhs (INR6.84 crores) and private contribution is about INR258.5 lakhs (INR2.585 crores).

xvii. Packaging material

Packaging material is a huge cost for proper transport of horticulture produce and thus, it is proposed to provide a one-time reimbursement @ 25% of the packaging material cost as per actual amount subject to maximum invoice amount of INR25,000 per beneficiary. The total amount comes to INR1,25,000 lakhs (INR1250 crores) in which government contribution is INR31,250 lakhs (INR312.5 crores).

xviii. Green technology

To promote green technology, an incentive of INR20,000 per Individual/FPO working in Horticulture produce/products is proposed with assumption of 100 individuals/FPOs adopting green technology. The cost adds up to INR20 lakhs (INR0.2 crores) for this activity.

xix. Horticulture mechanization

For Horticulture mechanization, an additional subsidy of about 10% (thus total 60% subsidy) may be given to all components related to horticulture under existing Sub Mission on Agricultural Mechanization (SMAM). The total amount of INR5,000 lakhs (INR50 crores) has been demarcated for the same.

xx. Drone technology and IoT

Drones can be used for targeted input application, timely diagnosis of nutrient deficiency, crop health monitoring, rapid assessment of crop yield, and crop losses. Crop nutrient spraying through drones facilitates rapid application and can treat sizeable areas quickly. It is proposed to purchase 20 drones at a cost of INR10 lakhs each with 60% or maximum of INR5 lakhs per drone

as government support. IoT (Internet of Things) driven value chain is proposed to be implemented at the total cost of INR10,000 lakhs (INR100 crores) with 100% government contribution.

C. Capacity building and institutional strengthening

Institutional strengthening is vital to the successful development of the horticulture sector in Himachal Pradesh. The flagship capacity building program named “Kshamta se Samruddhi” by the Department of Horticulture may be implemented which would be responsible for the overall capacity building related to horticulture in the state.

The Project Consultancy and Management Unit (PCMU) may be set up at the Department of Horticulture, Himachal Pradesh level to handhold the department, monitor effective implementation of the policy. The PCMU may coordinate with relevant stakeholders and update the government from time to time regarding its implementation. The estimated cost is about INR500 lakhs (INR5 crores) per annum, thus about INR3,500 lakhs (INR35 crores) for 7 years. The activities will be focused on training and capacity building, marketing, and branding, quality standards and export marketing. The estimated cost for these professional agencies is INR100 lakhs (INR1 crore) per annum each, thus the total cost of INR2,100 lakhs (INR21 crores) for seven years.

xxi. The training and capacity building programs are:

- ▶ Training for nursery development program to be provided for all the districts. The training has been planned for DoH officials (24 nos.) along with exposure visits, as well as for entrepreneurs (50 nos.), gardeners including lab technicians (74 nos) per program. A total of INR198 lakhs (INR1.98 crores) has been proposed for the same.
- ▶ For value chain development of horticulture crops, INR28,451 lakhs (INR284.51 crores) are envisaged for increasing capacity building of the stakeholders. The value chain training has been proposed for 56 facility managers, 112 technicians, 560 skilled workers, 55 officials, 1,00,000 farmers and 4,000 entrepreneurs. To integrate the private value chain actors, one-day exposure visit has been envisaged for private stakeholder to these facilities.
- ▶ For apiculture capacity building program, an amount of INR417 lakhs (INR4.17 crores) has been proposed. The capacity building activities include two- day awareness generation programs, five-day training programs and exposure visits.
- ▶ For mushroom training program, INR381 lakhs (INR3.81 crores) have been proposed. Five-days training programs may be organized with strength of 50 farmers. These trainings may be conducted once in a year per district level cluster for three years benefitting approximately 1,500 farmers.
- ▶ For capacity building in floriculture, crops a total of 3,000 farmers need to be trained for five-days with 10 trainings/year @ 1 training for the main district every year for six years. The total cost for training is estimated to be INR750 lakhs (INR7.5 crores).

xxii. Marketing, branding, outreach activities, export facilitation and quality standards

Marketing of fruit is a complex process and includes all the functions and processes involved in the movement of the produce from the growers to final consumers. The project aims to develop collection centers, pack houses, transport infrastructure and processing infrastructure. Farmers will bring the produce to the collection center. The facility for transportation can be provided by the collection center or can be arranged by the farmers themselves. For this facility, the collection center will charge a nominal fee of INR1,000/trip for 5 MT. The collection center will provide the services for sorting, grading, and packaging @0.5/kg and additional INR0.5/kg for packaging material, if required. The primary processed produce will then flow to different channels: 50% to

the pack house, 10% to the processing unit, 30% to the wholesaler and 10% directly to the consumer.

- ▶ Himachal Pradesh State Agricultural Marketing Board (HPSAMB) may encourage stakeholders in APMCs to participate in online trading on e-NAM by devising trade related incentives. Exemption of 0.25% of market fee for traders who undertake transactions through end-to-end online trading process in e-NAM.
- ▶ Promotion of the produce under “Himachal Farm Fresh” brand and pre-established marketing linkages.
- ▶ The outreach strategy shall have two distinct dimensions and will focus on propagating knowledge/information about schemes, various programs and strengths of horticulture in HP and to attract private investment in the sector.
- ▶ An estimated cost of about INR5,000 lakhs (INR50 crores) have been allocated for the proposed marketing, branding and outreach activities.
- ▶ The estimated cost is about INR5,000 lakhs (INR50 crores) for carrying out the activities under quality and export facilitation.
- ▶ Other interventions include focus on vocational courses, establishment/strengthening of Horticulture universities, augmentation of human resources, establishment of incubation center and Centre of Excellences (COEs). The total cost proposed for this component is INR67,050 lakhs (INR670.50 crores).
- ▶ Similarly, for establishment of Project Consultancy and Management Unit and Professional Agencies is about INR5,600 lakhs (INR56 crores).

D. Research and development

An investment of INR27,610 lakhs (INR276.10 crores) is proposed for research and development activities. A research and innovation hub is proposed to be established which will conduct research and development on various aspects also focusing on inputs. The components include:

- ▶ Eco-friendly research which includes bio-enhancers for improving soil micro-organisms, bio-fertilizers and bio-pesticides, organic farming, and natural farming.
- ▶ Hi-tech research includes genetic engineering for the development of new crop varieties, hydroponics and aeroponics for mass multiplication, post-harvest management and standardization of nutrients and pesticides for application through drone.
- ▶ Research on production and post-harvest management technologies, including standardization of PHM protocols, shipment protocols.
- ▶ Design of energy efficient produce evacuation solutions including well ventilated trucks for short duration haulage etc.
- ▶ Development of active packaging solutions and usage of natural products like grass, bamboo in packaging.
- ▶ Formulation of specific export shipment and logistics protocols for fruit crops.
- ▶ Development of pre-harvest and post-harvest protocols for horticulture crops including suggested intercrops for various fruits.
- ▶ New technology adoption in the state like Agro- Photovoltaic Anti hail systems /solar energy anti-hail nets, etc.

The R&D component is mostly proposed under government share to the tune of INR27,540 lakhs (INR275.40 crores) whereas amount of INR70 lakhs (INR0.7 crores) from entrepreneurs is expected in case of Biofertilizer and Biopesticides units @ 50%.

E. Alternative interventions

The alternative interventions include establishment of single window clearance system, horticulture led rural resurgence, quality testing laboratory for honey, development of honey by products, Integrated Beekeeping Development Centre, automatic spawn production unit, canning unit, export-oriented floriculture units, horticulture nutrition gardens etc.

Alternative interventions also include integration with other line departments, introduction of new and improved germplasm, standards for domestic and export markets, integration of infrastructures, carbon markets and integration of financial institutions, weather related advisory services, gender inclusion, electricity, support, registration and stamp duty incentives, tax holiday and self-regulations. The total estimated cost for these components is INR41,042 lakhs (INR410.42 crores).

Total investment and government share

Table 1: Investment summary

S. No.	Component	Total cost (INR Lakhs)	Government (INR Lakhs)	Private/others (INR Lakhs)
A	Infrastructure Development	2,04,191	1,51,733	52,459
B	Value chain Augmentation	6,67,631	3,84,209	2,83,422
C	Capacity Building and Institutional Strengthening	1,12,847	1,12,847	0
D	Research and Development	27,610	27,540	70
E	Alternative Interventions	41,042	39,764	1,278
	Grand Total	10,53,321	7,16,093	3,37,229

A total investment of INR10,53,321 lakhs (INR10,533.21 crores) is proposed with government share of INR7,16,093 lakhs (INR7,160.93 crores) and private contribution of INR3,37,229 lakhs (INR3,372.29 crores). Operational and maintenance cost of the infrastructure may be borne by the private sector.

A component wise breakup of the cost is presented below:

Table 2: Component wise- Investment summary

S. No	Particular	Area or number	Unit rate (INR Lakhs)	Total (INR Lakhs)	Total (INR Crores)
A. Infrastructure					
i)	Irrigation			55,006.00	550.06
1	Drip irrigation component	36,905	1.2	44,286.00	442.86
2	Sprinkler irrigation for flowers	1,200	0.6	720.00	7.2
3	Lifting and storage, an additional provision	1	10,000	10,000.00	100
ii)	Integrated laboratory	12	200	2,400.00	24
iii)	Input Shops	24	10	240.00	2.4
1	13 Shops under HPSHIVA	13	10	130.00	1.3
2	11 Shops by entrepreneurs	11	10	110.00	1.1
iv)	Post-harvest infrastructure			1,46,545.0	1,465.45
a	Collection centers	247		7,396.00	73.96
1	HPSHIVA	65	30	1,950.00	19.5

S. No	Particular	Area or number	Unit rate (INR Lakhs)	Total (INR Lakhs)	Total (INR Crores)
2	HPHDP and other fruits	175	30	5,250.00	52.5
3	Floriculture	7	28	196.00	1.96
b (i)	Pack house	38		15,914.00	159.14
1	HPSHIVA	13	426	5,538.00	55.38
2	HPHDP	11	426	4,686.00	46.86
3	Other fruits	13	426	5,538.00	55.38
4	Flowers	1	152	152.00	1.52
b (ii)	In Pack house, automated packaging lines, specialized High Reach Material Handling Equipment	26		637.00	6.37
1	Automated packaging lines	13	15	195.00	1.95
2	Specialized High Reach Material Handling Equipment (max 2 units)	13	34	442.00	4.42
c	Processing Units	10		2,378.00	23.78
1	HPSHIVA	3	224	672.00	6.72
2	Pecan nut processing unit	1	10	10.00	0.1
3	HPHDP	3	224	672.00	6.72
4	Other processing unit	1	224	224.00	2.24
5	1 Freeze dehydration plant	1	50	50.00	0.5
6	1 Oleoresin extraction plant	1	750	750.00	7.5
d	Ripening chambers	4	300	1,200.00	12
e	Controlled Atmosphere	2	750	1,500.00	15
f	Hitech markets			1,00,000.0	1000
1	One market in each district	12	5,000	60,000.00	600
2	Hi Tech market for horticulture crops	2	20,000	40,000.00	400
g	Export Hubs	3	5,000	15,000.00	150
h	Gravity Ropeways of 10 Km	14	INR18 lakhs per Km	2,520.00	25.2
	Total Infrastructure- A			2,04,191.00	2,041.91
B. Augmentation of Value Chain					
v)	Formation of FPOs	500		27,000.00	270
1	Fruits in new proposed area	189	54	10,206.00	102.06
2	Flowers in new proposed area	7	54	378.00	3.78
3	Honey	14	54	756.00	7.56
4	Mushroom	7	54	378.00	3.78
5	In the existing area	283	54	15,282.00	152.82
vi)	Establishment of nurseries			3,022.00	30.22
1	Nurseries including 1 tissue culture lab and 2 with virus indexing)	10		1,681.00	16.81
2	Upgradation of nursery	2	100	200.00	2
3	Non- project area nurseries	8		1,141.00	11.41
vii)	New Orchards Establishment and rejuvenation (excluding HPHDP)	20,105		89,973	899.73
viii)	Flower Cultivation	1,200		9,110.00	91.1
ix)	Composite fencing	36,905	5	1,84,525.0	1,845.25

S. No	Particular	Area or number	Unit rate (INR Lakhs)	Total (INR Lakhs)	Total (INR Crores)
x)	Anti-hail nets and support			1,95,596.5	1,955.97
1	Anti-Hail nets	36,905	3.5	1,29,167.50	1,291.675
2	Anti-hail nets support system (50% steel, 50% bamboo)	36,905		66,429.00	664.29
xi)	Crop insurance	36,905	0.04875	1,800.00	18
xii)	Reward for improved productivity	70		53.00	0.525
1	Rewards (5 farmers for 7 years)	35	0.5	17.50	0.175
2	FPO rewards (5 FPOs for 7 years)	35	1	35.00	0.35
xiii)	Product development (3 every year for 7 years)	21	5	105.00	1.05
xiv)	Good Agricultural Practices (4 every year for 7 years)	28	0.75	21.00	0.21
xv)	Integrated Pest & Nutrient Management	36,905	0.4	14,762.00	147.62
xvi)	Organic farming and Natural farming			1,443.00	14.43
1	Organic farming for 5000 ha	5,000	0.1	500.00	5
2(i)	Natural farming for 5000 ha	5,000	0.025	125.00	1.25
2(ii)	Natural farming additional subsidy			818.00	8.18
xvii)	Packaging material	5,00,000	0.25	1,25,000.00	1,250
xviii)	Green technology	100	0.2	20.00	0.2
xix)	Horticulture mechanization	1	5,000	5,000.00	50
xx)	Drone technology and IoT			10,200.00	102
1	Drone application	20	10	200.00	2
2	IoT Driven value chain	1	10,000	10,000.00	100
	Total Augmentation value chain - B			6,67,630.5	6,676.31
C. Capacity building and institutional strengthening					
xxi)	Training and capacity building programs			30,197.00	301.97
1	Training on nursery development			198.00	1.98
2	Value chain development			28,451.00	284.51
3	Apiculture training			417.00	4.17
4	Mushroom training			381.00	3.81
5	Floriculture			750.00	7.5
xxii)	Marketing, branding, outreach activities, export facilitation and quality standards etc.			77,050.00	770.5
1	Marketing, branding and outreach			5,000.00	50
2	Quality standards and export facilitation			5,000.00	50
3	vocational courses, establishment of horticulture universities, augmentation of human resources, establishment of incubation center and Centre of Excellences (COEs)			67,050.00	670.5
4	Project consultancy and management unit and professional agencies			5,600.00	56
	Total Capacity Building and Institutional Strengthening- C			1,12,847.0	1,128.47
D. Research and development					
1	Bioenhancers	1	20	20.00	0.2
2	Biofertilizer unit	1	50	50.00	0.5
3	Biopesticide unit	1	90	90.00	0.9

S. No	Particular	Area or number	Unit rate (INR Lakhs)	Total (INR Lakhs)	Total (INR Crores)
4	Organic farming	1	1,000	1,000.00	10
5	Natural farming	1	1,000	1,000.00	10
6	Genetic engineering lab	1	5,000	5,000.00	50
7	Hydroponic lab	1	240	240.00	2.4
8	Aeroponic lab	1	210	210.00	2.1
9	PHM lab	1	20,000	20,000.00	200
	Total Research and Development- D			27,610.00	276.10
E. Alternative interventions					
1	Single window clearance			2,000.00	20
2	Horticulture led rural resurgence			20,000.00	200
3	Apiculture			7,666.00	76.66
4	Mushroom			306.00	3.06
5	Floriculture			1,010.00	10.10
6	Health and nutrition			60.00	0.6
7	Others			10,000.00	100
	Total Alternative Interventions- E			41,042.00	410.42



A close-up photograph of a pair of hands holding a small, young plant seedling. The seedling has several bright green, oval-shaped leaves and a thin brown stem. Its roots are visible, and it is still attached to a clump of dark brown soil. The hands are positioned at the bottom of the frame, with fingers gently gripping the soil. The background is a soft-focus green, suggesting an outdoor garden setting. The entire image is framed by a yellow border that follows the top and right edges, while the bottom and left edges are black.

1

The scenario of the
horticulture sector

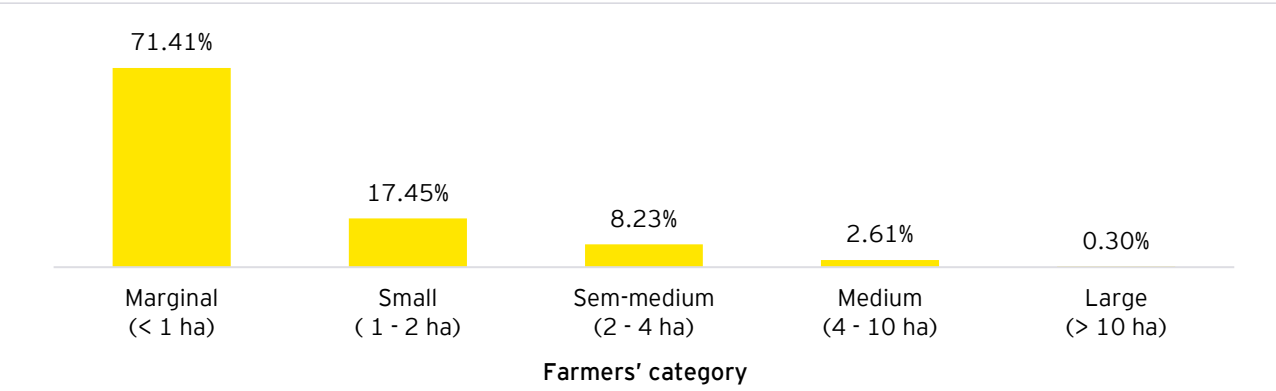
1. The scenario of the horticulture sector

The Indian horticulture sector contributes about 33% to the agriculture gross value added (GVA), making very significant contribution to the Indian economy. India is producing about 334.60 million tons (2020-21) of horticulture produce which has surpassed the food grain production, that too from much less area (i.e., 27.05 million ha for horticulture against 127.6 million ha for food grains). The productivity of horticulture crops is much higher compared to the productivity of food grains (12.49 tones/ha against 2.23 tones/ha)⁵. Over the years, horticulture has emerged as one of the potential agricultural enterprises in accelerating the growth of the economy. Its role in the country's nutritional security, poverty alleviation and employment generation programs are becoming increasingly important. It offers not only a wide range of options to the farmers for crop diversification, but also provides ample scope for sustaining large number of horticulture industries which generate tremendous employment opportunities.

Himachal Pradesh lies between 31° 22'40" and 33° 12'40" N latitude and 75° 45'55" and 78° 12'20" E longitudes, bounded by Jammu and Kashmir (J & K) in North, Punjab and Haryana in the South and Uttar Pradesh (UP) in Southeast. It has an area of 55,673 sq. km with a population density of 123 person/sq km, Kangra is the most populous and Lahaul- Spiti is the least populous district⁶. Himachal Pradesh is a hilly and mountainous tract with an altitude varying from about 350 meters to 6,975 meters above mean sea level. The region presents an intricate mosaic of mountain ranges, hills, and valleys.

The estimated population of Himachal Pradesh is 7.43 million by March 2022⁷. About 90 percent of the state's population lives in rural areas, most of which are dependent on agriculture in some way or the other, for their livelihoods⁸. Agriculture and allied sectors, as a key sector, has been supporting about 60 percent of the population. It registered a growth of 18.3 percent in 2019-20 (First Revised Estimate or FRE) with a Gross Value Added (GVA) of INR10,583 crore as compared to INR8,949 crore during 2018-19 (Second Revised Estimate or SRE)⁹. In Himachal Pradesh, horticulture is no longer a sub sector of agriculture sector but is recognized as a sector. It has crossed agriculture in terms of value addition.

Figure 2: Distribution of land holdings in HP



Source: Economic Survey, 2020-2021, pp.74

The distribution of land holdings in Himachal Pradesh has been given in the figure below. Out of the total geographical area of the state (55.67 lakh hectare), the area of operational holdings is about 9.44 lakh

⁵ "Statistics 2nd Advance estimates 2019-20", Department of Agriculture and Farmers Welfare, <https://agricoop.nic.in/en/>

⁶ "States", Census India, <https://www.censusindia.co.in/states/himachal-pradesh>

⁷ Aadhaar Saturation Report", Unique Identification Authority of India website, https://uidai.gov.in/images/Aadhaar_saturation_report-as_on_31-03-2022.pdf

⁸ "States", Census India, <https://www.censusindia.co.in/states/himachal-pradesh>

⁹ "State Economy, Public Finance and Taxation", Government of Himachal Pradesh Economic Survey, 2020-21, pp.10 (accessed via <https://himachalservices.nic.in/>)

hectares and is operated by 9.97 lakh farmers with an average holding size of about 0.95 hectare¹⁰. The distribution of land holdings, according to 2015-16 agricultural census highlights that **88.86 percent of the total holdings belongs to small and marginal farmers**. About 10.84 per cent of holdings are owned by semi medium and medium farmers and only 0.30 per cent by large farmers.

Himachal Pradesh is well endowed with natural resources and has made significant progress in horticulture development. Presently, there are 12 districts, 52 Sub-divisions, 75 tehsils and 34 sub-tehsils in Himachal Pradesh. The Himalayan ecosystem offers an enabling environment characterized with favorable microclimatic conditions for cultivation of a wide range of temperate to sub-tropical fruits. It also has diversity in agro-climatic conditions with possibilities to produce 'off-season' fruits and vegetables. The state's agriculture is dominated by high value horticultural commodities. This characteristic has resulted in shifting of land use pattern from agriculture to fruit crops in the past few decades. The area under horticultural crops increased from 2.08 lakh hectares in 2009-2010 to 2.33 lakh hectares in 2019-20 (CAGR of about 1%), similarly, fruit production volume increased from 3.82 lakh MT to 8.45 lakh MT during the same period (CAGR of about 8%)¹¹.

1.1. Area and production of horticulture crops

Horticulture in HP has been responsible for many of the positive outcomes in employment, wages, and poverty reduction. The area under temperate fruits, other than apple, increased from 26,875 hectares in 2009-10 to 27,956 hectares in 2019-20. Citrus and other sub-tropical fruits increased from 22,050 hectares and 48,628 hectares in 2009-10 respectively to 25,051 hectares and 56,079 hectares in 2019-20 respectively, however, nuts, and dry fruits exhibit area decreased from 11,037 hectares in 2009-10 to 10,070 hectares in 2019-20¹². The table below represents the percentage of HP area and production across various categories with respect to India and respective yield comparison.

Table 3: Area and production in Himachal Pradesh and India

Particular	Himachal Pradesh		India		Percentage of HP		Yield (MT/Ha)	
Category	Area '000 ha	Production '000 MT	Area '000 ha	Production '000 MT	Area	Production	HP	India
Fruits	232.14	828.23	6,664.17	99,069.3	3.48	0.84	3.6	14.9
Vegetable	88.61	1,776.02	10,352.9	1,91,769	0.86	0.93	20.0	18.5
Aromatic and Medicinal	1.12	0.91	627.69	797.63	0.18	0.11	0.8	1.3
Flower	0.71	17.99	304.61	3,063.06	0.23	0.59	25.3	10.1
Spices	6.79	10.6	3,824.31	9,419.52	0.18	0.11	1.6	2.5
Honey	-	6	-	120	-	5.00	-	-
Total	329.37	2,639.75	25,660.7	3,20,479	1.28	0.82	8.0	12.5

Source: National Horticulture Board, Second Advance Estimate 2019-20

The total area under fruit production and volume of production are presented below. It is observed that the area has been increasing over the years. However, the volume of fruit production declined from 2015-16 till 2018-19 and increased in 2019-20.

¹⁰ "Agriculture, Horticulture and Allied Services", *Government of Himachal Pradesh Economic Survey, 2020-21*, pp. 74 (accessed via <https://himachalservices.nic.in/>)

¹¹ "General Overview", *Government of Himachal Pradesh Economic Survey, 2020-21*, pp.10 (accessed via <https://himachalservices.nic.in/>)

¹² "Agriculture, Horticulture and Allied Services", *Government of Himachal Pradesh Economic Survey, 2020-21*, pp.84 (accessed via <https://himachalservices.nic.in/>)

Figure 3: Total area under fruit production in HP ('000 ha)

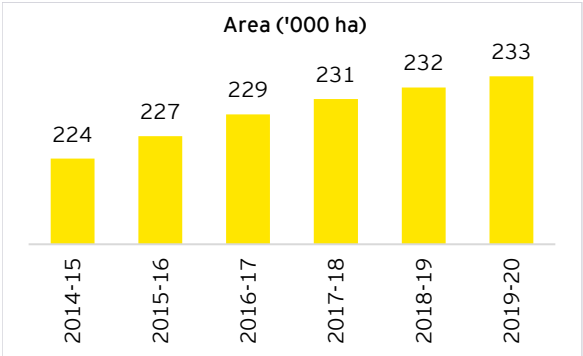
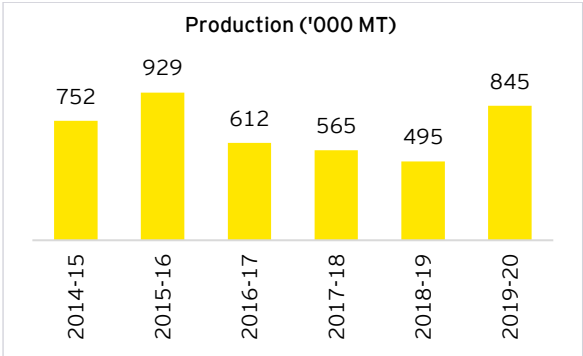


Figure 4: Total volume of fruit production



Source: Department of Horticulture, Government of Himachal Pradesh

Himachal Pradesh has two distinct production zones namely: (i) temperate and sub-temperate horticulture; and (ii) sub-tropical horticulture. Temperate horticulture occurs in the high hills and valleys and cold/dry zones is dominated by apple cultivation, while sub temperate horticulture is predominantly in the mid-hills zone. Sub-tropical horticulture primarily occurs in the Low Hill and Valley zone, areas near the plains.

The total area under fruit crops was 2.34 lakh ha, with a production of 7.53 lakh metric tonnes in 2021-22. The average productivity of fruit crops was very less (3.70 MT/ha) compared to a national average of (14 MT/ha).

Some of the observations for field visits included: The orchards were planned in a traditional way with a huge spacing, no training and pruning of orchard, and mulching was observed in few places along with a heavy use of fertilizers and pesticides. No proper harvesting and post-harvest treatment were observed. Farmers were working on individual basis and marketing efforts were not organized. Generally, fruits were sold by the farmers in HP without any value addition or primary processing, grading, or packing activities. The grading and packing were conducted by commission agents and/or traders in market yards, although parts of farmers were aware of its importance and advantages. Majority of fresh fruits were being sold in Azadpur Mandi in New Delhi, or in Pathankot and Chandigarh in Punjab/Haryana, Yamuna Nagar in Haryana, Paonta Sahib and Jessore in Himachal Pradesh. The central government provided internal standard for grading and provisions concerning size for selected fruits, such as apple, grape, mango, strawberry, pears, etc.

In recent years, processing and canning of fruits have started taking place, and the Himachal fruits are being sold not only as fresh but as processed fruits also. The processed products from fruits and vegetables are beverages, jams, jellies, candies, preserves, canned fruits and vegetables, dehydrated fruits and vegetables, pickles, soup mixes, sauces, and ketchups. Fruit products that have growing demand, especially in the Middle East countries include pickles, chutneys, fruit pulps, canned fruits, concentrated pulps and juices, and frozen fruits.

The food processing industry in HP is at a nascent stage¹³. A study conducted by the Industries Department, GoHP indicates that the total investment in assets, across food processing, for Small and Medium Enterprise (SME) is INR83.75 million, with an abysmally low processing capacity of about 1,113 tonnes¹⁴. The major challenges include procurement of raw materials for processors especially if it must be done in large volumes; and lack of i) on farm primary processing facilities, such as grading and sorting, ii) cold chain infrastructure iii) forward linkages through refrigerated transportation and (iv) lack of marketing avenues

¹³ "Project Context", *Himachal Pradesh Horticulture Development Society*, <https://hds.hp.gov.in/>

¹⁴ "Small scale enterprises", *MSME Development Institute, Solan*, <https://msmedihimachal.nic.in/>

1.2. Agro climatic zones of Himachal Pradesh

Table 4: District agro climatic zones of Himachal Pradesh

District	Zone	Rainfall (mm)	Climate	Altitude (m)	Percentage of geographic al area	Percentage of cultivated area	Major Crops
Shimla	High hills Zone	1,161.3	Humid temperate	1,801 to 2,200 above sea level	35	33	Apple, pear, plum, cherry, apricot, almond
	Mid hill zone		Mild temperate	651 to 1,800 above sea level	32	53	
Kullu	High hill zone	1,439.3	Humid temperate	1,801 to 2,200 above sea level	35	33	Apple, Pear, Plum, Pomegranate
	cold dry zone		Dry temperate	>2,200 above sea level	8	3	
Mandi	mid hill zone	1,438.0	Mild temperate	651 to 1,800 above sea level	32	53	Apple, mango, pear, kagzi lime
Chamba	Shivalik hill zone	1,298.1	Sub-tropical	350 to 650 above sea level.	35	33	Apple, walnut, galgal, mango
	Mid hill zone		Mild temperate	651 to 1,800 above sea level	32	53	
	High Hill Zone		Humid temperate	1,801 to 2,200 above sea level	35	33	
	Cold Dry Zone		Dry temperate	>2,200 above sea levels	8	3	
Kinnaur	Cold dry zone	689.7	Dry temperate	>2,200 above sea levels	8	3	Apple, apricot, almond.
Lahaul spiti	Cold dry zone	650.7	Dry temperate	>2,200 above sea levels	8	3	Apple, apricot, almond, plum
Kangra	Shivalik Hill Zone	1,920.9	Sub-tropical	350 to 650 above sea level.	35	33	Mango, kagzi lime, orange/kinnow, litchi
	Mid Hill Zone		Mild temperate	651 to 1,800 above sea level	32	53	
	High hill zone		Humid temperate	1,801 to 2,200 above sea level	35	33	
Solan	Shiwalik hill zone	1,230.2	Sub-tropical	350 to 650 above sea level.	35	33	Plum, apricot, mango, pear
	Mid hill zone		Mild temperate	651 to 1,800 above sea level	32	53	
Sirmour	Shivalik hill zone	1,563.5	Sub-tropical	350 to 650 above sea level.	35	33	Apple, peach, mango, plum, apricot
	Mid hill zone		Mild temperate	651 to 1,800 above sea level	32	53	

District	Zone	Rainfall (mm)	Climate	Altitude (m)	Percentage of geographic area	Percentage of cultivated area	Major Crops
	High hill zone		Humid temperate	1,801 to 2,200 above sea level	35	33	
Bilaspur	Shivalik hill zone	1,563.5	Sub-tropical	350 to 650 above sea level.	35	33	Mango, litchi, guava, kagzi lime,
Una	Sub mountain low hills	1,329.4	Sub-tropical	350 to 650 above sea water levels	35	33	Orange/kinnow, malta/musambi, mango
Hamirpur	Shivalik hill zone	1,563.5	Sub - tropical	350 to 650 above sea level.	35	33	Mango, guava, aonla, litchi, kagzilime, pear, papaya, galgal

Source: AGRISNET, Government of Himachal Pradesh; Economics and State Department, Himachal Pradesh.

A photograph of a person wearing a blue jacket, standing in a greenhouse and examining a tomato plant. The person is holding a tablet in their left hand and touching the plant with their right hand. The greenhouse is filled with rows of tomato plants, some with green and some with red tomatoes. The background shows the curved structure of the greenhouse roof.

2 | Approach and methodology

2. Approach and methodology

The quantitative and qualitative data-based analysis had been used to develop the horticulture Sector strategy. Predominantly, the market perspective was considered focusing on end markets where the selected fruits were being sold in fresh or in value-added form either locally, regionally, or internationally, thus providing the opportunities for creating economic growth. The value chain mapping and development approach were used wherein data is collected and analyzed for value chain development and investment plan.

The team conducted field visits to understand the ground level information. The visits in each district covered focused group discussions and interviews with stakeholders from PRF clusters, FLD clusters, district department officials, agricultural produce market committees, Krishi Vigyan Kendra, public and private processing units, public and private nurseries, universities, research institutions. The following tools were used to conduct the stakeholder consultations:

2.1. Surveys and interviews

2.1.1. Questionnaire survey

A questionnaire was designed to collect information of selected fruits growing in households in such a way that it minimized ambiguity and provided the valid data and information.

2.1.2. Key Informant Interview (KII)

Semi structured questions were designed for KII with lead farmers already cultivating the selected crops to collect data on production constraints, input supply issues, integrated nutrient management (INM), integrated pest management (IPM), sufficiency of PoP, GAP, initial investment costs, operational cost, quality management issues, sorting and grading, post-harvest management, and marketing. Likewise, KIIs were conducted with line departments, Horticulture Produce Marketing and Processing Corporation (HPMC), Himachal Pradesh State Agriculture Marketing Board (HPSAMB), input suppliers, commission agents, wholesalers, and retailers to understand their costs, margins, and constraints as well as to get their inputs/insights.

2.1.3. Focus Group Discussion (FGD)

Open-ended topic specific questions were designed for FGD with homogenous groups of stakeholders, such as input suppliers, cluster farmers, wholesalers, commission agents, retailers, and financiers. FGD with cluster farmer groups to begin with related to: production constraints, marketing constraints, harvesting and assembling constraints and post-harvest management and post-harvest loss, infrastructure up grading, policy, capacity building and regulatory issues, institutional issues such as federation of clusters to enhance for example bulk procurement of inputs and seedlings from suppliers and collective post-harvest management and marketing, etc.

2.1.4. Stakeholder workshops

EY team conducted technical stakeholder workshop as follows:

Inputs were collected from technical workshop conducted by AFC under CSO8 package at Bilaspur on 27 November 2021 with DoH officials from the districts and blocks, lead farmers, input suppliers, representatives from the university and EY team. The purpose of the technical workshop was to assess production systems of selected crops, market linkages, organization for marketing, preparation of value chain maps and analysis of selected crops.

One workshop with different stakeholders, including farmers, wholesalers, retailers, processors, commission agent, department officials, HPMC officials, marketing board officials, university officials, Asian development bank members, was organized at Shimla on 27 April 2022. The plan has been enclosed in Annexure 1.

2.2. Stakeholder mapping and analysis

A stakeholder can be defined as an agency, institution, group, or individual with direct or indirect interest in the fruit value chain. The identification of relevant stakeholders for collaborative initiative is challenging. Stakeholders are often selected by their roles and functions. Generally, stakeholder analysis refers to a range of approaches for the identification and description of stakeholders based on their attributes, interrelationships, and interests. There are two important tools identified to undertake stakeholder analysis namely, the Participation Analysis Matrix (PAM) and Process Net-Map (PNM). Both approaches measure different aspects of stakeholders’ interaction in the value chain.

Stakeholder analysis was used to understand the value chain by defining the aspects of the value chain, identifying the key actors in the chain, and assessing their respective interest and influence in that value chain. For this study, PNM approach by identifying different stakeholders in each process of the value chain was considered, and then discussed with them in detail to understand their roles, level of influence and interest, issues faced by them.

The list of stakeholders across the three phases of value chain is as follows:

- ▶ **Upstream:** Cultivators (Farmers); nurseries (private and government); Input providers (seed, agro chemicals); Credit providers (Banks, NBFCs); Irrigation technology /services providers
- ▶ **Midstream:** Processors; Warehouse; Cold storage owners; Grading, sorting and packaging unit owners
- ▶ **Downstream:** Traders; Wholesalers; Commission agents; Retailers; Exporters; APMCs /Mandi

Besides individual stakeholders, institutions that have a direct role in the value chains were shortlisted for further analysis. Based on the skills and FGDs with key stakeholders, their roles, level of importance and influence; and the issues are highlighted in the below table.

Table 5: Stakeholder analysis in existing value chain of Himachal Pradesh

Actors	Level of Importance	Level of Influence	Roles	Issues/Challenges
Farmers	High	Low	▶ Land Preparation ▶ Purchase of Inputs ▶ Plantation ▶ Post-natal care ▶ Harvesting ▶ Post-harvesting ▶ Marketing/Sale	▶ Lack of elite planting material ▶ Lack of Finance ▶ Price and quality and timely availability of agriculture inputs ▶ Low access to knowledge and technologies ▶ Uncertainties of labor ▶ Lack of facilities for processing and value addition ▶ Lack of facilities to transportation ▶ Market information and intelligence ▶ Climate vagaries, leading to low productivity and sometimes, crop failure
Input Providers	High	Low	▶ Provision of quality inputs	▶ Lack of finance ▶ High transportation cost ▶ Storage ▶ Quality

Actors	Level of Importance	Level of Influence	Roles	Issues/Challenges
Nurseries (Government)	High	Low	▶ Provision of quality planting materials	▶ Inadequate infrastructure ▶ Lack of skilled human resources ▶ Difficulty in getting mother progeny for multiplication
Nurseries (Private)	High	Low	▶ Provision of quality planting materials	▶ Inadequate infrastructure ▶ Lack of finance ▶ Lack of skilled human resources ▶ Difficulty in getting mother progeny for multiplication
NABARD	High	Medium	▶ Provision of necessary finance	▶ Difficulty in getting necessary documentation/proposals for re-financing
Other financial institutions	High	Medium	▶ Provision of credit	▶ Defaulters ▶ Remoteness of clients ▶ Small loan amount and high cost of operation
Processors	Medium	Low	▶ Processing ▶ Packaging and labelling ▶ Distribution and Marketing	▶ Low volume of produce ▶ High rate of transportation ▶ Lack of finance ▶ Poor market accessibility ▶ Low demand of processed fruit products
Traders	Medium	High	▶ Purchase from Farmers ▶ Aggregating ▶ Transporting ▶ Grading & sorting	▶ Size of farms and produce leading to low quantity of produce from individual farmer ▶ Product quality ▶ Lack of finance ▶ Poor road connectivity and accessibility
Commission Agents	Medium	High	▶ Channelizing the produce between farmers/traders & wholesalers/retailers	▶ High fluctuations in volume and price ▶ Poor market facilities ▶ Market spoilage ▶
Wholesalers	Medium	High	▶ Grading and sorting ▶ Distributing	▶ Product quality and shelf life ▶ Price fluctuations ▶ Lack of grading and sorting facilities ▶ Lack of cold chain facilities
Retailers	Medium	High	▶ Aggregating ▶ Sorting and Grading ▶ Packaging and labelling ▶ Distributing and marketing	▶ Lack of finance ▶ Lack of sorting and grading facilities ▶ High cost of transport ▶ Market spoilage
Consumers	High	Low	▶ Consumption ▶ Processing	▶ Price fluctuations ▶ Product quality
HPMC	High	Low	▶ Pack house and CA stores ▶ Fruit processing	▶ Lack of finance

Actors	Level of Importance	Level of Influence	Roles	Issues/Challenges
				▶ Infrastructure upgradation and renovation
HSAMB	High	Low	▶ Marketing of fruit produce	▶ Lack of finance ▶ Infrastructure upgradation and renovation
Department of Horticulture (DoH)	High	High	▶ Policy support ▶ Project Implementation support ▶ Quality control ▶ Farmers' training and capacity building ▶ Infrastructure development	▶ Shortage of finance ▶ Staff turn-over and transfers ▶
Asian Development Bank (ADB)	High	High	▶ Provision of necessary finance ▶ Policy support ▶ Guidance and support	▶ Quality control ▶ Fund utilization
University	High	Low	▶ Research and development ▶ Training to farmers ▶ Preparation of Package of Practices (PoPs) for different fruit crops	▶ Lack of finance for necessary R & D ▶ Infrastructure maintenance and improvement
National Horticulture Board (NHB)	Medium	Medium	▶ Accreditation of nurseries ▶ Development of infrastructure ▶ R & D in technology upgradation	▶ Maintaining quality control of the accredited nurseries ▶ Lack of finance ▶ Infrastructure upgradation and renovation
APEDA	High	Low	▶ Export promotion ▶ Research and studies	▶ Maintaining quality standards
Himachal Pradesh Irrigation and Public Health Department (IPH)	High	High	▶ Development of irrigation infrastructure ▶ Training and capacity building	▶ Lack of finance ▶ Infrastructure upgradation and renovation
Other Line Departments	Low	Low	▶ Providing necessary support in horticulture promotion ▶ Collaboration and convergence	▶ Lack of finance ▶ Infrastructure upgradation and renovation

2.3. Benchmarking studies

Horticulture in each of the states in India is significant. This chapter studies the various strategies implemented in major states focused on horticulture, especially selected commodities. The states that are selected for benchmarking studies are as follows:

Table 6: Selected states for benchmarking

State	Features
Maharashtra	Top producer of pomegranate (Rank 1, 63%), Sweet Orange (Rank 2, 21%), Mango (Rank 10, 4%)
Uttar Pradesh	Top producer of guava (Rank 1, 23%), Mango (Rank 1, 21%), litchi (Rank 6, 6%)
Bihar	Top producer of litchi (Rank 1, 35%), guava (Rank 3, 11%), mango (Rank 3, 11%)
Punjab	Top producer of plum (Rank 5, 5%), litchi (Rank 7, 6%), guava (7, 5%). The state envisages for addition of about 1 lakh hectares area under horticulture crops.
Uttarakhand	Similar terrain as Himachal Pradesh. Moreover, top producer of plum (Rank 1, 44%), Litchi (Rank 8, 4%).

Note: Rank of the state and percentage of states' share in production of the respective commodities in India.

Source: National Horticulture Board 2015-16 (litchi, plum), 2017-18 (other crops).

The above states have significantly augmented their horticulture value chains, which is described in the subsequent section. The key learnings from the benchmarking studies presented below are as follows:

- ▶ Promotion of collective organization like MAHAANAR, MAHAMANGO etc.
- ▶ Brand building initiatives like “Five Rivers” and implement Geographical Indications(GI) certification for fruits
- ▶ Policy support to incentivize the PHM and food processing sector
- ▶ Incentives for establishment of hi- tech nurseries, Centre of Excellence etc.
- ▶ Priority towards floriculture through establishment of floriculture parks
- ▶ Development of infrastructure– packhouses, integrated export facilities– required to boost fruit exports
- ▶ Promote research and development of the latest technology like technology to increase shelf life of fruits
- ▶ Government facilitation to initiate online sale of litchi fruits by associating with postal department in Bihar
- ▶ Involvement of FPOs in marketing, knowledge sharing, Inputs supply etc.
- ▶ Establishment of fruit estates to provide state-of-the-art world class equipment, machinery, technical know-how and other services in a package from nursery production to processing under one umbrella.
- ▶ Establishment of fruit nutrition gardens in collaboration with academic institutions
- ▶ Set up of State Climate Change Centre of Uttarakhand for knowledge management related to climate change and Strengthening State Strategies for Climate Actions (3SCA) project implementation

2.3.1. Maharashtra: Infrastructure and export boost (pomegranate and citrus)

Maharashtra ranks 2nd in fruit production in the country, accounting for almost 12%¹⁵ of the fruit production. It is the leading producer of pomegranate in India accounting for almost 60% of the total production. It is also the leading grower of orange, accounting for almost 21% of the total orange production in the country. In addition, it also accounts for approximately 3% of the Mango production in the country and boasts of premium varieties like Alphonso/Hapus. The Government of Maharashtra has recognized the competitive advantage of the state in fruit production and has taken a slew of measures to improve the value chains.

- ▶ **Institutional mechanism:** Maharashtra State Agricultural Marketing Board (MSAMB) is the apex body which is looking into the value chain development of multiple crops, including fruits. The MSAMB has promoted crop specific organizations to facilitate appropriate market led interventions. Some of the crop specific bodies include:
 - i. **MAHAMANGO** is the apex organization of Mango growers. The organization specifically investigates the export of Alphonso mangoes (as well as their marketing in domestic markets). It is a co-operative partnership society. The facility center of MAHAMANGO have facilities like facilities like pre-cooling, cold-storage, pack house, grading packing line etc. for export of mangoes. The entity is in existence since 1991
 - ii. **MAHAANAR** is the apex body of Pomegranate growers and is in existence since 2005. The body works towards improving the market offtake both in national as well as international markets. It also makes available the technical know-how of quality production of pomegranate to the growers through training and demonstration programs
 - iii. **MAHAGRAPES** is a partnership firm of sixteen grape growers' cooperatives in areas of Sangli, Solapur, Pune, and Nasik regions of Maharashtra with a membership of almost 2,500 farmers. In keeping with the international trend of fruit growers becoming exporters, the vineyard owners of Maharashtra entered the international market with their own brand, Mahagrapes. It acts as a facilitator, quality controller, input supplier and service provider to its member societies.
- ▶ **Infrastructure to facilitate primary processing and exports:** There are 154¹⁶ operational pack houses (including that of MSAMB) in Maharashtra duly approved by APEDA. These pack houses are recognized/approved by several countries including, EU Member Countries, USA, China, etc. The pack houses deal with multiple crops including pomegranate, mango, grape, etc.

In addition, MSAMB also operates 20¹⁷ fruit and vegetable modern facility centers. Each center is equipped with:

- | | |
|---|---------------------------|
| ▶ Cold storage - 25 MT | ▶ Anteroom- 42 Sq. m |
| ▶ Precooling - 5 MT | ▶ Plantroom - 39 Sq. m |
| ▶ Packhouse area - 107.30 Sq. m 1155 Sq. feet | ▶ Office - 32 Sq. m |
| ▶ D.G. Set - 62.5 KVA | ▶ Storeroom - 17.30 Sq. m |
| ▶ Transformer - 100 KVA | ▶ Shop - 3 - 54 Sq. m |
- ▶ **Improved brand value through GI tagging:** A few fruits of the state have received GI tagging. These include Alphonso (of Ratnagiri), Kesar (of Marathwada region) and pomegranate (of Solapur). GI Tag coupled with adequate export infrastructure has helped the producers of Maharashtra to reach export destinations regularly

¹⁵ Horticulture Statistics at a Glance 2018, National Horticulture Board (accessed via <http://nhb.gov.in/>)

¹⁶ "Statistics", *Agricultural and Processed Food Products Export Development Authority (APEDA)*, <https://apeda.gov.in/>

¹⁷ "Facilities", *Maharashtra State Agricultural Marketing Board*, www.msamb.com

- ▶ Maharashtra is a major hub for international trade. The major exit options for export produce are Mumbai sea and airport, JNPT/Nhava Sheva port and Marmagao seaport.
- ▶ There are eight specialized food parks with facilities like cold storage, warehousing, advanced packaging, tetra packaging and food testing laboratory¹⁸.
- ▶ Three Floriculture parks are developed as world class facility for production of flowers with nursery, post- harvest infrastructure, logistics facilities
- ▶ The premier institute namely, Central Food Technology Research Institute (CFTRI) caters to the technology transfer, business development related to food processing

2.3.2. Bihar: Policy push along with infrastructure and market interventions (litchi and mango)

Bihar is the leading grower of litchi in India and accounts for almost 70% of the total production. It is also a leading grower of mango accounting for almost 10% of the total mango production in the country. The Government of Bihar has recognized the competitive advantage in these two crops and have taken a slew of measures to improve the value chains.

- ▶ **Infrastructure to facilitate primary processing:** Government of Bihar, under its Industrial Incentive Policy and Krishi Road Map, have facilitated creation of required post-harvest infrastructures as detailed out below
 - i. There are two state-of-the-art pack houses, one each in Muzaffarpur and Vaishali district, which primarily cater to litchi. These pack houses facilitate marketing of the produce in national as well as international markets (primarily EU countries)
 - ii. Department of Industry, Government of Bihar has set up an integrated export facility with pack house and irradiation unit at industrial area Fatuha, Bihar. The major objectives of the project are:
 - ▶ Creating advance irradiation facility targeting fruit and vegetable processing units in the state
 - ▶ Reduce the overall wastage of fruits and vegetables and ensuring the remunerative price to the farmers
 - ▶ Increasing the export of fruits and vegetables from the state
 - iii. Bihar Agriculture University, Sabaur has established a product development center to facilitate budding entrepreneurs to develop food products using crops like litchi and mango
- ▶ **Improved brand value through GI Tagging:** Jardalu mangoes which are predominantly grown in the Bhagalpur district of Bihar are known for its exclusive aroma, sweetness, and other nutritional properties. It received the Geographical Indications(GI) certification in 2018. Thus, it is now a well-recognized brand and is commanding a price premium both in domestic and export markets

Similarly, Shahi litchi which is predominantly grown in the Muzaffarpur district of Bihar, is known for its exclusive aroma and sweetness. It received the Geographical Indications(GI) certification along with Jardalu Mango in 2018. Thus, it is now a well-recognized brand and is commanding a price premium both in domestic and export markets. Moreover, the Government of Bihar initiated the online supply of litchi fruits by associating with Postal department during Covid lockdown, to benefit litchi growers¹⁹.

¹⁸ "Food Processing Sector", *Maharashtra Industry, Trade and Investment Facilitation Cell*, <https://maitri.mahaonline.gov.in/>

¹⁹ "Bihar govt, postal dept join hands for online delivery of Shahi Litchi", *Mint*, 24 May 2020, via <https://www.livemint.com/news/india/>

- ▶ The research at Bhabha Atomic Research Centre and National Research Centre on Litchi resulted in treating litchi and preserving it for 60 days at low temperature, benefiting farmers in reducing the losses²⁰.

2.3.3. Uttar Pradesh: Incentivizing entire food processing value chain

Uttar Pradesh is the leading producer of guava and mango in the country and accounts for more than 20% of the national production for each crop. The state produces varieties which are amenable for both table purpose as well as processing.

- ▶ Mangoes produced in Malihabad, Maal, and Kakori of Lucknow district have a geographic indicator tag. Some of the prominent varieties include²¹:
 - ▶ GI tagged Malihabadi Dushheri mango
 - ▶ GI tagged Allahabad Surkha guava
- ▶ The state has developed an appropriate policy framework to incentivize enterprises in various value nodes including processing. The Food Processing Industry Policy 2017 provides for identification of food processing zones on the basis of availability and suitability of the local raw material for setting up food processing industries in various districts of the state. The policy also provides for following major incentives:
 - a) A subsidy amounting to 25 percent of incurred expenditure on plant machinery and technical civil work in respect of setting up, expansion and modernization/up gradation of the food processing units in the state will be provided, subject to a maximum of INR50 lakhs in all the districts of the state.
 - b) Cent-percent of the rate of interest accrued on the loan taken from banks/financial institutions for meeting the expenditure on plant machinery, technical civil work, and spare parts for establishing the micro and small food processing industries will be reimbursed for a maximum period of five years. Other food processing unit's setup in the state will be reimbursed the amount of interest accrued on the loan taken for the banks/financial institutions for meeting the expenditure on plant machinery, technical civil works, and spare parts, at the rate of 07 percent for a period of five years. Its maximum limit will be INR50 lakh per year per unit.

Apart from the above, the policy provides for additional incentive of 10% of the eligible project cost for projects sanctioned under the Mega Food Parks Scheme, Scheme for Integrated Cold Chain and Preservation Infrastructure, etc. Such incentives and policy framework are expected to significantly improve agricultural/horticultural value chains in the state leading to remunerative prices to farmers, quality food for consumers and overall improved employment opportunities in the sector.

- ▶ The state has strong research support for varietal development and scientific cultivation of mangoes extended by ICAR and by the Central Institute for Subtropical Horticulture (CISH), which is based in Lucknow. As per vision 2030 prepared by Central Institute for subtropical Horticulture (CISH), the production of fruits was projected as 220.57 million MT, out of which the projected production for mango is 36.92 million MT. Some constraints faced in export of mangoes are as follows which may be applicable in case of Himachal Pradesh also²².
 - ▶ Each importing developed nation requires different pre-treatment of mango, e.g., the US needs irradiated fruits, while Japan's requirement is VHT These process infrastructures, besides not

²⁰ "Bihar is the top litchi producing State", *Press Information Bureau*, <https://pib.gov.in/>

²¹ "Improving Agricultural Value Chains in Uttar Pradesh", *Asian Development Bank*, <https://www.adb.org/>

²² "CISH Vision 2030", *ICAR- Central Institute for Subtropical Horticulture*, <https://cish.icar.gov.in/>

being available at all the places, are expensive, thereby increasing the cost of exports and placing the country in a disadvantageous position.

- ▶ Concerted efforts are not being made to implement the CODEX Alimentarius and GLOBALGAP standards in India. These standards are essential for export of mangoes to the European Union and USA, besides accommodating their own standards on quarantine, etc.
- ▶ **Processing of Mango-** There are four packing houses for primary processing approved by the Agricultural and Processed Food Products Exports Development Authority (APEDA), which are mostly used for export purposes. Two of these are owned by Uttar Pradesh Mandi Parishad (council or assembly)–one located in Rehmankheda (Lucknow) and the other in Saharanpur. The two other packing houses are privately owned. Secondary and Tertiary processing is limited to one unit registered under state license and five units under central license from FSSAI.
- ▶ **Marketing through FPOs:** About four FPCs are actively involved in trading and marketing of mango produce directly with traders in metro cities and established marketing links with players like Metro cash and carry, NeML etc.²³ Three FPOs were promoted under a novel wadi (orchard) development program by NABARD in Lalitpur District to support members of the vulnerable Saharia tribe to develop guava orchards and related activities.

2.3.4. Punjab: Transiting from grain bowl to leading fruit producer

Punjab, which is known as the grain bowl of India, is gradually shifting towards horticulture. Various reports, news articles suggest that the area diverted to horticulture in the last decade was 1.26 lakh hectares (3.11 lakh acres). The area under horticulture has increased from 2.55 lakh hectares (6.30 lakh acres) in 2008-09 to 3.81 lakh hectares (9.41 lakh acres) in 2018-19, which is an increase of 55.51 per cent in a decade. It is the best state in country for area under irrigation, with 98% of net irrigated area.

Presently, the area under horticulture in Punjab is 86,670 ha under fruits, 2,73,250 ha under vegetables, 2,100 ha under flowers and 18,730 ha under spices and aromatic crops. In the next five years, Department of Horticulture, Punjab has targeted to bring an additional area of about 1,00,950 ha under horticultural crops which will lead total area to 4.81 lakh ha., which will be 6.11% of the total cropped area, with special focus on citrus, guava, pear, litchi and mango. The state now produces approximately 54 Lakh MTs of vegetables and 18 lakh MTs of fruits. Such an enhancement is being especially helpful for small and marginal farmers. The Department of Horticulture, Government of Punjab, is taking required measures in the form of the following interventions²⁴:

- ▶ Establishment of Centre of Excellence (CoE)- under Indo- Israel (Vegetables, Citrus), Indo- Dutch (Potato, Floriculture), especially to facilitate appropriate training of farmers on package of practices.

The Key features of CoE for fruits (Citrus), Hoshiarpur are as follows:

- ▶ Facility is established in area of 17 acres and total project cost of INR1,039.56 lakh
- ▶ Hi-Tech Nursery-area of 1,000 sq. m
- ▶ Screen houses for Mother Blocks
- ▶ Standardization and demonstrations of citrus varieties and root stocks: Various exotic and indigenous citrus varieties and rootstocks are being evaluated at Centre of Excellence. 31 different cultivars of citrus (12 sweet orange) budded on different rootstock have been planted at the center.
- ▶ Packhouse with two cold rooms of capacity five MT and pre-cooling room of 2.5 MT
- ▶ Till date 17 trainings have been organized and 540 farmers and 225 technical personnel have been trained. Four National and International Seminars have been organized on citrus cultivation.

²³ "Improving Agricultural Value Chains in Uttar Pradesh", Asian Development Bank, <https://www.adb.org/>

²⁴ "Documents- Horticulture Status Report", *Horticulture, Government of Punjab*, <https://horticulture.punjab.gov.in/>

The Key features of CoE for Floriculture, Ludhiana

- ▶ Facility is established in area of 7.5 acres and total project cost of INR808.79 lakh
- ▶ Hi-Tech Nursery- Area of 1,000 sq. m
- ▶ High-tech Dutch Poly House: It has Dutch technologies with automated climate control, irrigation and fertigation system in an area of 2,300 sq. m. Production technologies of four crops namely, Rose, Gerbera, Chrysanthemum and Lilium will be standardized in this structure.
- ▶ Naturally ventilated polyhouse, shade net house, net house, and walk-in-tunnels for demonstration purposes.
- ▶ A pack house, cold room, and a pre- cooling room of capacity 5 MT each
- ▶ Establishment of fruit estates to provide state of art world class equipment, machinery, technical know-how and other services in a package from nursery production to processing under one umbrella.
 - ▶ Citrus estate is established with following facilities
 - ▶ world class leaf and soil analysis laboratory
 - ▶ Provision of latest machinery like electrostatic sprayer and hydraulic pruner etc. on rent hire basis
 - ▶ Quality agrochemicals shops
 - ▶ Grading, waxing and packing facilities,
 - ▶ Processing facilities
 - ▶ Provide experts advice
 - ▶ On similar lines, Pear estate at Amritsar, litchi estate at Pathankot, guava estate at Patiala, horticulture estate at Faridkot, etc. are envisaged in Punjab.
 - ▶ In addition, the state government proposes to establish 25 horticulture estates in the state in the next five years (five estates per year), with every district having one such estate²⁵.
 - ▶ Fruit Nutrition Garden has been initiated in collaboration with PAU, Ludhiana, to provide about 21 types of quality nutritious fruit around the year.
 - ▶ In floriculture, department targets to establish propagation units in each block, improve collection and import of planting material, conduct farmer trainings, promote Bulb production of gladiolus, tuberose and planting stock for chrysanthemum and rose.
 - ▶ Punjab Agri Export Corporation Limited has been responsible for establishment of various post-harvest management facilities including the following:
 - ▶ Setting up of Integrated facility for fruits and vegetables at Aohar, Punjab, which shall consist of pneumatic seed driller, Harvester with conveyor on trailer, vegetable transplanter, washing- grading- packing lines, dehydration unit, Individually Quick Freezing (IQF) etc.
 - ▶ Individual Quick Freezing (IQF) unit at a primary processing center, village Veka, Amritsar
 - ▶ The government has facilitated establishment of quality food processing related infrastructure, including three mega food parks in Ludhiana, Fazilka and Kapurthala, more than 600 cold storage facilities, 162 warehouses with storage capacity of 12 MMT and a cargo terminal in Amritsar (fully operational) and Mohali (work in progress).
 - ▶ The state is also promoting organic farming and is currently marketing certified organic products (wheat, Paddy) under the brand name “five rivers.”
 - ▶ Cluster facilitation cum monitoring cell to be set up under the Chairmanship of Managing Director, Punjab Agri Export Corporation (PAGREXCO)
 - ▶ Punjab Bureau of Investment Promotion is acting as one stop office for all investment related facilitation.

²⁵ “Documents- State Plan”, *Horticulture, Government of Punjab*, <https://horticulture.punjab.gov.in/>

2.3.5. Uttarakhand- Aspirational state with similar geographical terrain

More than three-fourth of the total population of Uttarakhand (UK) depends on agriculture for their livelihood and the economy is predominantly dependent on mountain agriculture. The average farm size is 0.80 hectares in Uttarakhand. About 53% of the cultivated area is rain fed and irrigated area is about 47 per cent of the net area sown, of which about 86% is in plains and 14% is in hills. Cropping intensity is about 158 percent. Maize, rice, and pulses are dominant Kharif crops while wheat and barley are important Rabi crops. Important cash crops are potato, ginger, and off-season vegetables.

Horticulture is a very important component of Uttarakhand's economy. Tropical fruits which are grown in the state are litchi, mango, guava aonla and citrus, temperate fruits are apple, pear, peach, plum, apricot and walnut. Animal husbandry is an important and vital sector and about 90 percent of households keep livestock in the state. The area under horticultural crops has increased from 1.17 lakh ha in 2002-03 to 2.96 lakh ha in 2019-20 and production increased from 8.90 lakh MT (2002-03) to 17.91 lakh MT during 2019-20²⁶.

The Department of Horticulture and Food processing is focusing on the adoption of improved and appropriate technologies for ensuring quality, including genetic upgradation of all horticulture crops, with the adoption of following activities:

- ▶ **Planting material:** Nurseries in Uttarakhand are regulated by the recently formulated Uttarakhand Fruit Nursery Act, 2019 and Uttarakhand Fruit nurseries (Regulation) Rules 2021. The state nurseries shall be responsible for conducting educational training and tour for farmers.
- ▶ **Branding of produce:** The government plans to sell the fruits under cluster name like "Mukteshwar Plums"²⁷
- ▶ **Climate change:** The state prepared Uttarakhand Action Plan on Climate Change (UAPCC) in the year 2015 which focuses on integration of the climate actions in the on-going and proposed developmental programs to cope with the impact of climate change in the state. The State also prepared a Climate Change Vulnerability and Risks Assessment (VRA) for the entire state to the level of Blocks.

To support the adaptation planning, the State founded the State Climate Change Centre (SCCC), Uttarakhand as a State Nodal Agency for managing knowledge related to climate change in the state, established within Department of Forest, Uttarakhand. It is supported through a bilateral cooperation agreement between MoEF&CC and Swiss Agency for Development and Cooperation under the project "Strengthening State Strategies for Climate Actions (3SCA)". UNDP is providing technical support to the center in this project.

²⁶ "Uploads", *Department of Horticulture and Food processing*, <https://dohfp.uk.gov.in/wp-content/uploads/2021/06/Classifications-opportunities.pdf>

²⁷ "Uttarakhand government plans to brand, market produce", *The times of India*, 18 October 2019, <https://timesofindia.indiatimes.com/business/india-business/>

2.4. Existing schemes of the central and state government

The section below presents the major state and central government schemes which are relevant for implementation of the project. The summary of schemes of state and central governments which can be leveraged for financing the required investments are tabulated below:

Table 7: Central and state government schemes related to horticulture, agriculture, and irrigation

Ministry/ Agency	Scheme	Component	Incentive
Ministry of Food Processing Industries	Pradhan Mantri Kisan SAMPADA Yojana	Comprehensive package of schemes to support for creation/expansion of modern agri infrastructure ▶ Mega Food Parks ▶ Integrated cold chain and value addition Infrastructure ▶ Creation/expansion of food processing/preservation capacities (Unit Scheme) ▶ Infrastructure for Agro-processing Clusters ▶ Creation of backward and forward linkages ▶ Food safety and quality assurance infrastructure ▶ Human Resources and institutions	35%-50% of eligible project cost as grant (depending on the scheme maximum grant assistance is limited to INR10 crore)
	Production Linked Incentive Scheme for Food Processing Industry (PLISFPI)	This scheme provides incentives based on sales and investment criteria mainly to promote branding and marketing activities and manufacturing innovative/organic products, in which fruits and vegetable products are also covered under one of the segments.	▶ Financial incentives @ 50% of expenditure on Branding and Marketing abroad subject to a maximum grant of 3% of Sales of food products or INR50 crore per year, whichever is less. ▶ Minimum expenditure on Branding and marketing abroad for Incentive shall be INR5 crores over five years.
National Horticulture Board	MIDH	It includes activities such as: Plantation Infrastructure Development (Open pollinated crops, Hybrid seeds); Horticulture Mechanization (tractor, power tiller, land development, tillage and seed bed preparation equipment's; Sowing, planting reaping and digging equipment); Integrated post-harvest management (Integrated pack house with facilities for conveyer belt, sorting, grading units, washing, drying and weighing; Pre-cooling unit; Cold room (staging,); Mobile pre- cooling unit.; Cold Storage (Construction, Expansion and Modernization); Establishment of marketing infrastructure for horticulture produce in government/private and cooperative (Wholesale markets Rural markets/mandies/direct markets)	It is being implemented in the state under which assistance is provided as back ended subsidy @ 50% to farmers for carrying out various horticultural activities.

Ministry/ Agency	Scheme	Component	Incentive
		Gravity Operated ropeway in hilly areas).	
Ministry of Agriculture & Farmers' Welfare	Agri Infrastructure Fund	Access to financing and credit guarantee from government. Eligible projects: ▶ Post-Harvest management projects ▶ Viable projects for building community farming assets ▶ Projects on hub and spoke model Eligible lending institutions after signing MoU with NABARD/DA&FW caters loans to beneficiaries including Farmers, FPOs, SHGs, Marketing/Multipurpose Cooperative Societies, Federations, PACS, JLG, APMCs, Central/State/local body sponsored PPP Projects, Agripreneurs, start-ups for infrastructure development at farm gate and aggregation points	▶ All loans to have interest subvention of 3% per annum up to a limit of INR2 Cr for a maximum period of 7 year. ▶ Credit guarantee coverage for a loan up to INR2 Crore. The fee for this coverage will be paid by the government.
	Support to State Extension Programs For Extension Reforms (ATMA) Scheme	The scheme shall provide a 'Support to State Extension Programs for Extension Reforms' aims at making extension system farmer driven and farmer accountable by disseminating technology to farmers through new institutional arrangements viz. Agricultural Technology Management Agency (ATMA) at district level to operationalize the extension reforms on a participatory mode	The scheme is supported by the central government. The funding pattern is 90% by the central government and 10% by the state government. The 10% state's share shall consist of cash contribution of the state, beneficiary contribution or the contribution of other non-governmental organizations
	Formation and Promotion of 10,000 Farmer Producer Organizations (FPOs)	The Scheme shall provide holistic and broad-based supportive ecosystem to form new 10,000 FPOs to facilitate development of vibrant and sustainable income-oriented farming and for overall socio-economic development and wellbeing of agrarian communities.	FPOs will be provided financial assistance upto INR18.00 lakh per FPO for a period of three years. In addition to this, provision has been made for matching equity grant up to INR2,000 per farmer member of FPO with a limit of INR15.00 lakh per FPO and a credit guarantee facility up to INR2 crore of project loan per FPO from eligible lending institution to facilitate institutional credit accessibility to FPOs.
	E-Nam	E-NAM is a pan-India electronic trading portal, managed centrally by Small Farmers' Agribusiness Consortium (SFAC), with a network of 1000 selected markets to create a unified national market for agricultural commodities.	▶ Assistance to APMCs /RMCs is subject to approval of Project Appraisal Committee (PAC). ▶ Assistance to the tune of INR75 Lakh per APMC ▶ State /UT /their agencies may apply for approval of Detailed Project Reports (DPRs) and grant under the scheme.

Ministry/ Agency	Scheme	Component	Incentive
	Per drop more crop (PMKSY)	Promotion of micro-irrigation (drip, sprinkler, etc.)	▶ Subsidy of 55% for small & marginal farmers and 45% for other farmers of the cost of facility. ▶ Each beneficiary entitled to a max. subsidy of five acres.
	Watershed (PMKSY)	Water harvesting structures such as check dams, nala bund, farm ponds, tanks etc.	▶ Outlay decided yearly basis
	Soil Health Card	Soil Health Card (SHC) is a Government of India's scheme promoted by the Department of Agriculture and Co-operation under the Ministry of Agriculture and Farmers' Welfare. The scheme aims at promoting soil test based and balanced use of fertilizers to enable farmers to realize higher yields at lower cost also the main objective is to aware growers about the appropriate amount of nutrients for the concerned crop depending on the quality of soil.	▶ To procure, compile and analyze the state-wise data relating to the proposed interventions of the Mission activities. ▶ To maintain relevant records/file and data of the various Mission activities. ▶ To assist in developing uniform formats for submission of action plans; monitoring and evaluation formats. ▶ Funding assistance for demonstration of Soil Health Card technology shall not exceed INR2,500 per hectare
	Pradhan Mantri Fasal Bima Yojana	Pradhan Mantri Fasal Bima Yojana (PMFBY) aims at supporting sustainable production in agriculture sector. Providing financial support to farmers suffering crop loss/damage arising out of unforeseen events Ensuring flow of credit to the agriculture sector which will contribute to food security, crop diversification and enhancing growth	Coverage of Crops ▶ Food crops (Cereals, Millets & Pulses), Oilseeds ▶ Annual Commercial /Annual Horticulture Crops Kharif - 2.0% of SI or Actuarial rate, whichever is less Rabi - 1.5% of SI or Actuarial rate, whichever is less Kharif and Rabi - 5% of SI or Actuarial rate, whichever is less
	Agriculture Marketing Infrastructure (AMI) sub-scheme	Post-harvest infrastructure with a focus on Gramin Haats	▶ 25% to 33% of Capital cost up to INR25 lakhs to 1.33 crore
	PM Kisan Samman Nidhi Yojna	The scheme aims to supplement the financial needs of all landholding farmers' families in procuring various inputs to facilitate proper crop health and appropriate yields, commensurate with the anticipated farm income as well as for domestic needs. Under the Scheme an amount of INR6,000/- per year is released by the central government online directly into the bank	The scheme excludes all institutional Land holders; and Farmer families in which one or more of its members belong to various categories

Ministry/ Agency	Scheme	Component	Incentive
		accounts of the eligible farmers under the direct benefit transfer mode.	
	KCC Scheme	Scheme aims at providing adequate and timely credit support from the banking system under a single window with flexible and simplified procedure to the farmers for their cultivation and other needs.	▶ Farmers can take out a loan of up to INR3 lakh and also avail produce marketing loans. ▶ Insurance coverage for KCC scheme holders up to INR50,000 in the case of permanent disability or death. A cover of INR25,000 is given in the case of other risks. Credit is available for a period of up to three years
	Weather Based Crop Insurance Scheme (WBCIS)	From the year 2016-17 name of the scheme has changed to Restructured Weather Based Crop Insurance Scheme (R-WBCIS) and sum insured has been revised and bidding system has been introduced. During Rabi season 2019-20, 84,623 farmers have been covered under R-WBCIS for apple, peach, plum, mango and citrus fruit crops, who have insured their 63,61,540 trees for which the state government has borne 25 per cent premium subsidy of INR20.31 crore.	The sum insured is equivalent to the 'cost of cultivation' and shall be the product of the cultivator's declared 'area/tree under cultivation.
APEP Scheme is a financial assistance scheme introduced by APEDA, Ministry of Commerce & Industries, GoI	Agriculture & Processed Food Export Promotion Scheme (APFEPS)	Development of Export Infrastructure, Quality Development, Market Development from 2021-22 to 2025-26	▶ 40% of eligible project cost up to INR1 crore (infra) ▶ 40% up to INR4 lakhs (quality improvement and testing) ▶ 40% of the project cost up to INR75 lakhs (lab up-gradation) ▶ 40% of the project cost up to INR20 lakhs (Studies, NPD, Shipment trial, branding)
NABARD	Micro Irrigation Fund scheme	The main objective of the fund shall be to facilitate the States in mobilizing the resources for expanding coverage of Micro Irrigation by taking up special and innovative projects and also for incentivizing micro irrigation beyond the provisions available under PMKSY-PDMC.	Corpus of INR5,000 Crore operationalized by NABARD for mobilizing additional resources for expanding outreach and coverage beyond provisions of PMKSY - PDMC. Under this fund, state governments. are provided loans at 3% below the cost of funds, and this is dovetailed by central government as interest subvention.
Ministry of New and Renewable Energy (MNRE)	PM-Kusum	Under PM KUSUM Yojana, farmers, groups of farmers, panchayat, co-operative societies can apply to plant a solar pump. The total cost involved in this scheme is divided into three categories in which the Government will help farmers. The government will	Component-A: Procurement Based Incentive (PBI) @ 40 paise/kWh or INR6.60 lakhs/MW/year, whichever is less, will be provided for the first five years by MNRE to DISCOMs, for buying the power from farmers

Ministry/ Agency	Scheme	Component	Incentive
		provide a subsidy of 60% to farmers and 30% of the cost will be given by the government in form of loans. Farmers will only have to give 10% of the total cost of the project.	Component-B & C: CFA of 30% of the benchmark cost or the tender cost, whichever is lower. State government subsidy 30%; remaining 40% by the farmer
Ministry of MSME	SFURTI	Development of common cluster infrastructure	Grant assistance of 90% of the eligible project cost up to INR20 crores
Department of Horticulture	Establishment of Anti-hail nets	Anti-hail nets	Subsidy of 80% of the cost for small and marginal farmers. In case of big farmers 50% subsidy
	Horticulture Development Scheme	Provision of plants, equipment for orchard development	For garden colony up to 33% subsidy not exceeding INR36,000 for orchard development For individual orchards limit is INR3,000
Department of Agriculture	Mukhya Mantri Greenhouse Renovation Scheme (MMGRS)	Keeping in view the damage caused to the polyhouse structure due to natural calamities and losses incurred by the farmers, the Government of Himachal Pradesh has launched MMGRS in 2017-18 in order to provide support to such farmers.	Under this scheme, assistance was being provided to the polyhouse farmers @ 50% maximum subject to INR45/- per sq. meter for replacement of poly sheet after at least three years of polyhouse construction or damaged due to natural calamities. The state government has recently announced to raise the rate of assistance to 70% and has also allocated funds to the Department of Horticulture for the year 2018-19.
Department of Agriculture	Saur Sinchai Yojana 2021	To provide the facility of irrigation using solar power	Government will provide 90% financial assistance to small and marginal farmers for purchase of pump-sets. Government provides 80% subsidy to all individual medium and big farmers.
Department of Horticulture	The Mukhyamantri Madhu Vikas Yojana	To encourage farmers to take up beekeeping and production of bee products in the state.	Assistance to beekeeper will be provided to 50 bee colonies. The beekeeper will be given 80 per cent cost amount or INR1,600 per bee colony to raise 50 bee colonies. In each district, a bee-breeder of 300 bee colonies will be given an amount of INR3 lakh. They will be given 50 per cent subsidies on the transportation per year. A five-day training camp will be organized every year for 25 novice beekeepers, under which a sum of INR400 will be provided per beekeeper per day. In addition, for 20 beekeepers, a 15-day tour will be organized at renowned institutions of the country and abroad, under which a sum of INR7,000 per beekeeper will be provided. To establish a honey processing unit, 100 per cent of the cost of the project will be provided for the plantation of bee flora in two bighas. Under the Horticulture Mission, there is a

Ministry/ Agency	Scheme	Component	Incentive
			provision of providing 50 per cent subsidy on the production of bee colonies to the beekeepers. The farmers will also get 50 per cent subsidies on honey extractor, food grade container in which INR7,000 per set will be provided.
Department of Horticulture	Himachal Pushp Kranti yojana	To support protected cultivation, Open field cultivation and Human Resource development in Floriculture	Maximum limit for availing assistance under this scheme will be 4,000 sq. meter as per beneficiary family. 50-100% assistance based on category components.

Central government budget outlay (2021-22) under different schemes for Himachal Pradesh are as follows:

- ▶ Mission for Horticulture Development- INR2.75 crores
- ▶ National Food Security Mission- INR0.95 crores
- ▶ National Rainfed Area Authority- INR1.0080 crores
- ▶ Pradhan Mantri Krishi Samman Nidhi- INR144.12 crores
- ▶ Pradhan Mantri Krishi Sinchaie Yojana- INR4.17 crores
- ▶ Rashtriya Krishi Vikas Yojana- INR2.13 crores
- ▶ Sub mission on Agriculture Extension- INR3.78 crores



3

Focused crop groups

3. Focused crop groups

The following process is adopted to propose the area expansion of crops under various categories in horticulture that need immediate intervention by Government in Himachal Pradesh.

3.1. Fruit crops

The year wise data of horticulture crops is provided in Annexure 3. The average area under cultivation and CAGR during the period 2014-15 till 2020-21 of all the crops is provided below.

Table 8: Average area (ha) under cultivation and CAGR (%)

Name of Fruits	Average (ha.)	CAGR (%)	Name of Fruits	Average (ha.)	CAGR (%)
Apple	1,12,387	0.8%	Cherry	449	-0.1%
Mango	41,920	0.5%	Jamun	255	0.4%
Citrus	24,593	1.3%	Papaya	218	-0.1%
Plum	8,721	0.4%	Kiwi	152	7.5%
Pear	6,868	-1.1%	Banana	80	-3.7%
Litchi	5,821	3.3%	Grapes	80	-5.1%
Peach	5,045	-0.6%	Loquat	57	-2.0%
Almond	4,926	-1.8%	Strawberry	50	-4.4%
Walnut	4,450	-0.3%	Sapota	49	1.0%
Apricot	3,576	-1.5%	Olive	31	-4.7%
Pomegranate	2,678	3.3%	Ber	31	-0.5%
Aonla	2,526	1.7%	Karonda	14	9.5%
Guava	2,360	3.3%	Bael	13	-2.4%
Jackfruit	1,322	12.7%	Hazelnut	12	-1.3%
Pecan nut	908	0.6%	Fig	11	0.0%
Persimmon	483	5.6%			
			Top 50%		Bottom 15%

Source: Department of Horticulture, Government of Himachal Pradesh.

Note: For simplicity, orange/Kinnow, Malta/Mosambi, Kagzi lime, Galgal and Grapefruit are together considered as Citrus category.

As per above information, for formulating the strategy and interventions proposed the fruit crops have been categorized into four groups based on CAGR and 50 percentile crop list in terms of average area under cultivation (2014-15 till 2020-21). The Top 50% crop in terms of average area under cultivation with positive CAGR are placed under category A and with negative CAGR are placed under Category B. Similarly, among bottom 50% crops in terms of average area under cultivation, fruit crops with positive CAGR are placed under Category C and the other crops under Category D. The categories are presented below:

Table 9: Identified categories of fruits

Categories	Positive CAGR	Negative CAGR
Top 50% crops in terms of average area	A Apple Mango Citrus Plum Litchi Pomegranate Aonla Guava Jackfruit Pecan nut Persimmon	B Pear Peach Almond Walnut Apricot
Bottom 50% crops in terms of average area	C Jamun Kiwi Sapota Karonda	D Cherry Papaya Banana Grapes Loquat Strawberry Olive Ber Bael HazelNut Fig



The proposed interventions are as follows:

Category A:

- ▶ Himachal Pradesh Subtropical Horticulture, Irrigation, and Value Addition (HPSHIVA) project funded by Asian Development Bank, is envisaged to improve the area under cultivation of sub- tropical crops namely Sweet orange, Plum, Litchi, Mango, Pomegranate, Guava, Pecan nut, Persimmon and also improving their value chain.
- ▶ Similarly, the increase in area under cultivation of Apple, other fruits, and the corresponding interventions to improve their value chain are being proposed under **Himachal Pradesh Horticulture Development Project** funded by the World Bank project in the period 2016- 2023.

The area coverage under these projects is presented below:

Table 10: Area coverage under HPSHIVA and HPHDP project

Name of project	Name of Fruits	Area proposed (ha)
Himachal Pradesh Subtropical Horticulture, Irrigation, and Value Addition (HPSHIVA)- 4,000 ha in progress and 6,000 ha in next phase.	Sweet Orange	3,500
	Guava	3,000
	Litchi	1,500
	Pomegranate	1,000
	Persimmon	250
	Plum	250
	Mango	250
	Pecan nut	250
Sub Total		10,000
Himachal Pradesh Horticulture Development Project	Apple	14,800
	Pear	500
	Cherry	300
	Peach	350
	Plum	400
	Apricot	350
	Walnut	100
Sub Total		16,800
Total		26,800

- ▶ The remaining crops in Category A are Aonla, Jackfruit and other citrus fruits including Orange/Kinnow, Kagzi lime, Grapefruit and Galgal. It is proposed that at least 30% of its area under plantation of Aonla and Jack fruit should be done and similarly 8% each of other citrus fruits.

Table 11: Proposed increase in Category A fruits (ha)

Name of Fruits	Area (2020-21) in ha.	Percentage increase	Proposed area
Aonla	2,565	30%	770
Jackfruit	1,752	30%	530
Kagzi Lime	12,281	8%	980
Orange/Kinnow	8,796	8%	700
Galgal	2,526	8%	200
Grapefruit	35	8%	5
Total			3,185

Category B:

In crops under this category B, it is observed that though these are major crops in terms of area, they are following a decreasing trend. The major reason for the decrease in area under cultivation is due to an increase in temperature.

Therefore, it is proposed to replace at least 25% of the area with low chilling varieties of these crops and it is also suggested to increase at least 8% in its area as follows:

Table 12: Proposed replacement area under Category B

Name of Fruits	Area (2020-21) in ha.	Percentage of Replacement	Proposed area- Replacement (I) in ha	Percentage increase	Proposed new area (II) in ha
Pear	6,668	25%	1,670	8%	530
Peach	4,934	25%	1,230	8%	390
Almond	4,675	25%	1,170	8%	370
Walnut	4,434	25%	1,110	8%	350
Apricot	3,343	25%	840	8%	270

Table 13: Proposed new area under category B

Name of Fruits	Total Proposed area- Replacement + New (I + II)	Area covered under HPHDP in ha	Net Proposed area in ha
Pear	2,200	500	1,700
Peach	1,620	350	1,270
Almond	1,540	-	1,540
Walnut	1,460	100	1,360
Apricot	1,110	350	760
Total			6,630

Category C

The crops under this category have high growth potential though their coverage is less. It is proposed to increase at least 30% in area.

Table 14: Proposed area under Category C

Name of Fruits	Area (2020-21) in ha.	Percentage increase	Proposed area in ha
Jamun	265	30%	80
Kiwi	187	30%	60
Sapota	52	30%	20
Karonda	19	30%	10
Total			170

Category D

The CAGR of crops listed under this category range from -8% to 0% and their contribution in state horticulture is very less. However, efforts should be made to promote and improve the crops under category D.

Table 15: Proposed area under Category D

Name of Fruits	Area (2020-21) in ha	Percentage increase	Proposed area in ha	Area covered under HPHDP in ha	Net Area Proposed in ha
Cherry	453	20%	90	300	0
Papaya	211	20%	40	-	40
Banana	70	20%	10	-	10
Grapes	68	20%	10	-	10
Loquat	53	20%	10	-	10
Strawberry	42	20%	10	-	10
Olive	27	20%	10	-	10
Ber	30	20%	10	-	10
Bael	13	20%	5	-	5
Hazelnut	12	20%	5	-	5
Total					110

However, Cherry can be removed as 300 ha area coverage is already proposed in HPHDP project.

New Crops:

Few potential crops can be taken for trial plantation in the state and also to check their potential. The two crops proposed for the same are Dragon fruit and Avocado and initially they are proposed to be planted in 10 ha area. The details about these crops are provided in Annexure 4.

The summary of area covered under all the above categories is as follows:

Table 16: Summary of proposed area under cultivation (ha)

Particular	Area (ha.)
Area under HPSHIVA	10,000
Area under HPHDP	16,800
A. Sub Total	26,800
Additional Area Coverage other than HPSHIVA and HPHDP	
Category A	3,185
Category B	6,630
Category C	170
Category D	110
Area under New Crops	10
B. Sub Total	10,105
Total (A+B)	36,905

The phasing of high- density plantation under HPSHIVA project is 1,000 ha each in first 3 years, 2,000 ha in year 4 and 2,500 ha each in year five and six, whereas, for area expansion of other crops, in category A is proposed at 3,185 ha, category B as 6,630 ha, category C as 170 ha and category D as 110 ha. It is

assumed that 10,105 ha shall be expanded uniformly from 2023-2030 over next seven years. On trial basis, 10 ha area expansion is proposed under new crops i.e., avocado and dragon fruit.

3.2. Floriculture

The major flower crops in the state are chrysanthemum, marigold, gladiolus, rose, carnation, liliun, alstroemeria, gerbera also including other seasonal, seeds and potted plants. Maximum production of flowers is in Kangra district followed by Sirmour and Solan.

The area under floriculture crops in 2015-16 is 719.05 ha but has been reducing at approximately CAGR of -10%. This was drastically declined of about 50% from 630 ha in 2019-20 to 374 in 2020-21 primarily due to Corona pandemic. Considering, the high potential of floriculture in Himachal Pradesh, it is proposed that additional increase of about 1,200 ha in the following proportion.

Table 17: Proposed area expansion of floriculture crops

Flowers	Proportion	Area (ha.)
Chrysanthemum (loose+ cut)	40%	480
Marigold	25%	300
Gladiolus	10%	120
Carnation	5%	60
Rose	5%	60
Lilium	3%	36
Alstroemeria	1%	12
Gerbera	1%	12
Others	10%	120
Total	100%	1,200

The area of expansion under floriculture will be about 171 ha every year from 2022-23 till 2029-30, i.e., total expansion of about 1,200 ha.

3.3. Apiculture

Apiculture is being promoted by the department of horticulture and distributed bee colonies of about 2,924 in 2021-22. Currently, there are 1,771 Number of bee colonies that are maintained by the government with a production of about 10.45 MT. It is observed that the production of honey is growing at CAGR of about 9.7% with about 2101.7 MT in 2021-22. With this rate, it is estimated that production of honey will be increased to 4,500 MT by 2030 i.e., additional production of 2,400 MT by 2030.

3.4. Mushrooms

As per statistics, the mushroom production in Himachal Pradesh has increased from 14,207 MT in 2018-19 to 17,686 MT in 2021-22 at a CAGR of 7.6%. Several large and small growers are engaged in the production of mushrooms. There are not many large- scale units in Himachal Pradesh and most of the small- scale mushroom production unit's capacity varies from 50-500 TPA, with most of the units have a capacity below 200 TPA.

To sustain the current CAGR of 7.6% and to ensure that the production of mushroom reaches to 32,000 MT (more than double the current value) by 2030 ensuring an additional production of 14,000 MT several steps need to be undertaken which are covered in the report.





4

Proposed strategy and
investment plan

4. Proposed strategy and investment plan

Modern production practices, value addition activities, value chain governance, viable market channels and a conducive enabling environment are some of the key factors for successful horticultural development. If properly implemented, strategies and investment in technology and infrastructure will bring about opportunities for business development, profit and income generation, employment creation, food and nutrition security and GDP growth. The strategy report covers the development of overall horticulture sector including Apiculture, mushroom, floriculture. Keeping in synergy with the HPSHIVA, HPHDP, the facilities created under this project can be utilized for multiple crops, which will also help in generating more revenue and proper utilization of the created facilities.

The proposed strategy for the horticulture sector development in the state focuses on modern technological innovations in pre-harvest (canopy management, training and pruning, plant protection and post-harvest practices, organization at the base level with formation of cooperatives and FPOs, development of infrastructure, capacity building, marketing linkages and strategies for marketing, development of subsidiary sectors, introduction of new crops, branding and promotional activities, capacity building of the DOH, institutions, entrepreneurs, farmers, FPO members and cooperatives.

Snapshot of development under World Bank Project

The Himachal Pradesh Horticulture Development Project is implemented across the state for temperate fruit crops by the Department of horticulture and is funded by the World Bank. The special focus of the project is for interventions in economically backward and far-flung areas, such as Chamba and Sirmour on a cluster-based approach. Till 2020-21, 12,93,649 nos. planting material and 16,61,149 root stocks were imported. In this project, the major focus is on Apple crop, out of the total area 16,800 ha proposed for expansion, 14,800 is proposed for Apple whereas only 2,000 ha is proposed for other crops like Plum, Peach, Pear, Apricot, Walnut etc. 30 common service centers and FPCs are established. Pack house capacity of 18,800 MT is proposed to be installed at 5 temperate locations of Shimla, Kinnaur, Mandi, Kullu and Chamba. Three CA stores with total capacity of 1,250 MT are proposed. Two HPMC processing facilities are proposed to be upgraded located at Solan, Mandi districts. New processing facilities have been proposed to be established in Shimla district. Nine market yards have been proposed for upgradation.

To achieve the mission, vision and objectives of the state as presented in Section 1, the following strategies need to be adopted as discussed below.

A. Infrastructure development

4.1. Establishment of infrastructure

The infrastructure proposed for the project are input shops, irrigation infrastructure, collection centers, pack house units, processing units, ripening chamber, reefer vans, pick up vans, material ropeways and infrastructure for apiculture and mushroom development. It is suggested that the infrastructure should be utilized for other horticulture crops also to bring about the financial viability of the infrastructure.

4.1.1. Irrigation infrastructure

The irrigation infrastructure is to be developed for the total area proposed and will have main delivery tank near cluster, pipeline from main delivery tank to cluster, valves on the rising main/gravity main feeding water to MDT, valves on the pipeline supplying water to cluster and drip irrigation component such as dripper, laterals, etc.

The estimated cost of drip irrigation is INR1.2 lakhs per hectare. Therefore, for total area of 36,905 ha, the total cost of drip irrigation is INR44,286 lakhs.

The estimated average cost of sprinkler irrigation for flowers is INR60,000 per hectare. Therefore, for total area of 1,200 ha, the cost of irrigation is INR720 lakhs.

For lifting and storage, an additional provision of INR10,000 lakhs is proposed. Therefore, the total cost of irrigation infrastructure is INR55,006 lakhs out of which government contribution is INR49,505 lakhs and private contribution is INR5,501 lakhs.

It is proposed that assistance of about 80% for small and marginal farmers and other farmers for establishment of irrigation infrastructure in horticulture crop orchards. In addition, 100% assistance for establishment of community-based irrigation system in convergence with PMKSY. The subsidy should be front ended, that is, the farmer should not be required to pay the total cost upfront to the drip irrigation equipment provider (Dealer) and then apply for re-imbursement. The subsidy should be front- ended and farmers should approach the District Horticulture Officer for his requirement. Once sanctioned, farmer should pay his portion to the dealer and subsidy should be paid directly to the dealer by the government upon completion of installation and certification by government authorities.

4.1.2. Integrated laboratory with plant tissue analysis labs

Integrated laboratory with plant tissue analysis labs may also include soil water, Maximum Residual Limit analysis (MRL), and Heavy Metal Analysis labs. One such facility may be developed in every district at 100% assistance to public sector. The estimated investment is about INR2,400 lakhs for 12 facilities. In addition, it is also proposed to provide 60% support cost to the private sector, subject to maximum project cost norm INR2 crore/unit.

The major equipment in such facility is Soil Pycnometer, Atomic Absorption Spectroscopy (AAS), Bio Oxygen Demand (BOD) Incubator with humidity control- Fully Automatic, Humidity Oven, Horizontal laminar flow, Compound microscope trinocular, Digital weighing balance, Stereo binocular microscope, Autoclave (vertical), Spectrophotometer.

4.1.3. Input shops

An input shop is a small enterprise whose aim is to facilitate access to inputs for farmers and supply a local service. Space for input shops may be provided in the packhouse facilities at district level. There are two options for setting up an input shop. It can be set up by an entrepreneur based on a 50% project subsidy and 50% equity from entrepreneur or for FPOs a maximum support from the government is 80%.

It is suggested to establish at least two input shops per district. The total cost estimated for one input shop is INR10 lakhs bringing the total to INR240 lakhs (for 24 input shops). There are 13 input shops are proposed under HPSHIVA project which may be managed by FPOs in the packhouse premises and the remaining 11 input shops by entrepreneurs.

Table 18: Input shops

Input shops	Number of input shops	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Government share	Government Cost (INR Lakhs)	Private cost (INR Lakhs)
By FPOs	13	10	130	80%	104	26
By Entrepreneurs	11	10	110	50%	55	55
Total	24		240		159	81

These input shops will provide fertilizers, pesticides, common facility centers for packaging material, biofertilizers, equipment for harvesting, crates, harvesting bags, etc. They can also rent out the equipment based on service fee.

4.1.4. Collection centers

Through establishment of collection centers, the producers will take advantage to aggregate, minimal process, package their produce. It will also act as service centers and cater to other produce in the area. Development of collection centers close to the production clusters will give opportunities both to the whole sellers/traders and producers for negotiation and marketing while reducing the wastage.

HPSHIVA project proposes a fund establishment of 65 collection centers and in addition, 175 collection centers for other crops. Thus, in total, it is proposed to establish 240 collection centers for fruits at cluster level preferably by FPOs @ INR30 lakhs for each collection center.

These centers may be developed with 80% assistance from the government and 20% contribution by farmer members/entrepreneurs where land may be provided by farmer members/entrepreneurs, whereas operation and maintenance will be the responsibility of the management committee of the CHPMA/FPOs.

In addition, seven collection centers are to be established preferably in Kullu, Mandi, Solan and Sirmour for flowers, based on current flower production. The collection centers will comprise the receiving area, pre-cooling unit, SS table for sorting, cold storage staging room, and reefer vans for transportation. The cost of each collection center for flowers is INR28 lakhs. The details of the cost are presented in Annexure 8.

The total cost of collection centers is coming to INR7,396 lakhs out of which INR5,917 lakh is government support and INR1,479 lakh is the private contribution.

Table 19: Collection centers

Collection centers	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Government share	Government cost (INR Lakhs)	Private cost (INR Lakhs)
Collection centers (under HPSHIVA)	65	30	1,950	80%	1,560	390
Other collection centers	175	30	5,250	80%	4,200	1,050
Collection centers for flowers at Kullu, Mandi, Solan and Sirmour	7	28	196	80%	157	39
Total	247		7,396		5,917	1,479

4.1.5. Pack houses

Pack houses should have facilities like weighing, sorting, weigh grader, packing, storage, waxing, labelling, quality testing laboratory, and reefer vans. A joint venture shall be formed between FPO and strategic partner. The strategic partner will be responsible for the O&M of the pack house. These centers will also serve as a facility provider and the revenue stream will be through service charges for different services as also the sale of the inputs. The total cost for the establishment of one center is INR426 lakhs.

As part of the HPSHIVA project it is proposed to establish 13 pack houses. The pack houses are proposed to be established at a 55:45 basis like schemes in other states, in which DoH can subsidize 55% of the project cost as back ended subsidy and 45% should be the equity contribution with maximum project cost norm of INR400 lakhs. The subsidy can be linked to the progress of the project and can be released in installments.

HPHDP project proposed upgradation of six pack house existing facilities of HPMC at Gumma, Jarol Tikker, Oddi, Rohru, Patlikuhl and Tutupani. In addition, green field investment of five grading and packing houses at Chamba, Kunaur, Mandi, Kullu and Shimla districts.

Thus, for the remaining fruits, 13 pack houses will be required, in proportion with area coverage with respect to HPSHIVA project area coverage. The cost of each pack house shall be INR426 lakhs. One pack house for flowers is proposed to be established in the Kangra district. This can also be linked to an export-oriented unit to be established in the district. The pack house will comprise the receiving area, pre-cooling unit, SS table for sorting, cold storage staging room, multi chambered cold storage room and reefer vans for transportation. At least, one export-oriented packaging houses for flower crops may be established in Himachal Pradesh.

The details of the cost are presented in Annexure 7.

Table 20: Pack house

Packhouses	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Maximum Cost Norm (INR Lakhs)	Government share	Government Cost (INR Lakhs)	Private cost (INR Lakhs)
Pack houses (under HPSHIVA)	13	426	5,538	400	55%	2860	2678
Pack houses under HPHDP	11	426	4,686	400	55%	2420	2266
Other pack houses for fruits	13	426	5,538	400	55%	2860	2678
Pack house for flowers	1	152	152	400	55%	84	68
Total	38		15,914			8,224	7,690

In addition to above, assistance may be provided for establishing automated packaging lines for fruits with farm code labelling, with packaging material and 100% assistance as per invoice, maximum of INR15 lakh per project. Similarly, specialized high reach material handling equipment with admissible cost of INR17 lakhs per unit, maximum of 2 units can be established in a pack house. Assuming 50% of proposed pack houses (13) will have automated packaging, lines and remaining 13 will have high reach material handling equipment i.e., each of 2 units (maximum), then the total cost involved works out to INR637 lakhs.

Table 21: Packaging lines and specialized High Reach Material Handling Equipment

Particular	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Maximum Cost Norm (INR Lakhs)	Government share	Government Cost (INR Lakhs)	Private cost (INR Lakhs)
Pack house- automated packaging lines, specialized high reach material handling equipment	26	As mentioned above	637	automated packaging lines- 15 lakh/unit specialized High Reach Material Handling Equipment- 17 lakh/unit - max 2 units	100%	637	0

4.1.6. Processing units

The processing units are proposed for the production of fruit pulp and concentrates with aseptic packaging, juice, jam, jelly sauces and canned fruits and a separate processing unit for Pecan nut. A total of 10 processing units are proposed to be established.

It is proposed to establish/upgrade the following processing units under HPSHIVA:

- ▶ Three processing units for fruits under HPSHIVA each at a cost of INR224 lakhs/unit to be established/upgraded
- ▶ One ginning and shelling unit for Pecan nut at a cost of INR10 lakhs.

The units that can be considered for upgradation are public processing units in Kangra (Nagrota) and Sirmour districts with similar cost. The details of the cost are presented in Annexure 8.

The three processing units under HPHDP are as follows:

- ▶ Upgradation of two HPMC processing facilities in Solan and Mandi districts.
- ▶ Establishment of one new processing facility in the Shimla district.

In addition to above, one processing unit is proposed in temperate region, preferably the Kullu district.

The other processing units proposed are as follows:

- ▶ One Freeze dehydration plant
- ▶ One Marigold Oleoresin extraction plant

Freeze dehydration plant

Freeze dehydration/drying is one of the safest methods to dehydrate the horticulture crops and preserve their nutritional standards for a long time. The entire fruit freeze-drying process is automatically run after the freeze-drying machine's technical process program is set. The dry material processed by the fruit freeze-drying machine needs to meet the standard of crispy and not hard, smooth, and not collapsed, not discolored, not destroying nutrients, and good rehydration standards. The large-scale freeze-drying machine production line is a standardized, automated, clean, and energy-saving line as per the requirements of the industry. As the drying is done at low temperatures, the quality and nutrients of the product is maintained. The cost for setting up a plant is INR50 lakhs. This facility can be utilized for freeze dehydration of all the fruits.

Marigold Oleoresin extraction plant

A plant can be set up for extraction of natural pigment, Oleoresin, and lutein from marigold flowers with a capacity of 30 MT/day. Lutein has many advantages being non-toxic, non-degradable due to oxidative resistance also providing many health benefits to human being preventing free radical damage. The extraction plant requires investment of INR750 lakhs.

It is proposed that 55% of the project cost may be given as back ended subsidy and 45% may be the promoter's contribution with maximum limit of project cost of INR10 crores for FPOs/entrepreneurs/farmers working in the horticulture sector.

Table 22: Processing units

Processing units	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Government share	Government cost (INR Lakhs)	Private cost (INR Lakhs)
Processing units (under HPSHIVA)	3	224	672	55%	370	302
Pecan nut processing unit	1	10	10	55%	6	4.5
Processing units under HPHDP	3	224	672	55%	370	302
Other processing unit	1	224	224	55%	123	101
Freeze dehydration plant	1	50	50	55%	28	22.5
Oleoresin extraction plant	1	750	750	55%	413	337.5
Total	10		2,378		1,308	1,070

4.1.7. Ripening chamber

In total, four ripening chambers are proposed to be established. The ripening chambers can be used for mango, banana, papaya. It is proposed to provide 55% back-ended subsidy for private entrepreneurs and 80% for FPOs with maximum project cost limit of INR3 crores for maximum of 300 MT per beneficiary. The proposed chamber size for ripening is 10 MT/chamber with maximum of 300 MT capacity. It is considered that two ripening chambers may be established by FPOs and remaining by the entrepreneurs. The maximum cost of ripening chambers is INR1,200 lakhs.

Table 23: Ripening chambers

Ripening chamber	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Government share	Government cost (INR Lakhs)	Private cost (INR Lakhs)
By FPOs	2	300	600	80%	480	120
By entrepreneurs	2	300	600	55%	330	270
Total	4		1,200		810	390

4.1.8. Controlled atmosphere storages

The number of controlled atmosphere storage facilities proposed are two. It is proposed to provide 55% back ended subsidy for private entrepreneurs and 80% for FPOs with maximum project cost limit of INR7.5 crores for 1,000 MT per beneficiary. It is considered that one controlled atmosphere storage may be established by FPO and one by the entrepreneur. The cost of controlled atmosphere storage is INR1,500 lakhs.

Table 24: Controlled Atmosphere storage

Controlled Atmosphere Storage	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Government share	Government cost (INR Lakhs)	Private cost (INR Lakhs)
By FPOs	1	750	750	80%	600	150
By entrepreneurs	1	750	750	55%	412.5	337.5
Total	2		1,500		1,012.5	487.5

Note: As per NHB norms, it is about INR32,000 per MT, however with all the facilities including dock leveler, palatized racks, CA generators, CA doors, etc. cost about INR750 lakhs for 1,000 MT.

4.1.9. Hi-tech markets

A high-tech or smart mandi covers the entire marketing area of mandi and provides for intra and inter-state trading facilities, including farmgate purchases augmented with state-of-the-art marketing infrastructures like online trade facilitation, primary processing, quality assaying, storage, online payment, transportation, and market intelligence for optimum price realization of the horticulture produce.

DOH, in association with HPSAMB, may facilitate development of hi-tech markets and strengthening of existing markets on PPP mode. At least one existing market in every district may be strengthened with an amount of INR5,000 lakhs per market total amounting to INR600 crores for 12 districts. In addition, two hi-tech markets dedicated to the horticulture produce shall be developed, each of worth INR200 crores. Thus, the total amount of investment is INR1,000 crores.

4.1.10. Export hubs

Establishment of three export hubs shall be done for having easy accessibility to maximum places. The facilities in export hubs include short term cold storage units, loading and unloading areas, weighing facility, refer vans etc. The cost of one export hub is estimated about INR50 crores, thus for three export hubs, total of INR150 crores.

4.1.11. Material ropeways

Due to the difficult terrain, life is difficult for people living in the remote hills/mountainous areas. Transportation of crops/goods to market and crossing of river without bridge can be exhausting and dangerous. It is generally women and children who carry these heavy loads on their backs, down treacherous, winding mud tracks. When it rains, or there is a landslide, it is completely impossible to take goods to market. An alternative means of transportation like material ropeway can provide a sustainable solution to the excluded and isolated people of rural and mountainous regions of Himachal Pradesh.

Material ropeway works solely on gravitational force without using electricity and other external power. These ropeways are simple and inexpensive to operate as well as environmentally friendly and help increase the rural productivity. It works two ways — sending produce down from the top by material and at the same time a smaller load (one third) is taken up from below to top by the force of goods coming down. It is suitable only for transportation of goods. The total cost for material ropeways in 14 ropeways of 10 km each at a cost of @18 lakhs/km is INR2,520 lakhs, with 50 % government assistance and 50% private contribution. Two ropeways may be established in the third year and thereafter three ropeways every year. It is suggested that two ropeways each may be developed in Mandi, Kangra, Hamirpur, Kinnaur and one each in Bilaspur, Solan, Sirmour, Shimla, Kullu and Chamba districts.

4.1.12. Transportation

Assistance in transportation of fruits shall be applicable as per *Operations Green* under *Pradhan Mantri Kisan Sampada Yojana*, providing incentives for transportation and preservation. In addition, thrust should be given to improve connectivity to rural/remote areas and reduce congestion in urban areas.

B. Augmentation of value chain including technology

4.2. Formation of FPOs

The Government of India approved and launched the central sector scheme of “Formation and Promotion of 10,000 Farmer Producer Organizations (FPOs)” to form and promote 10,000 new FPOs till 2027-28, with a total budgetary outlay of INR6,865 crores.

Under the scheme, the formation and promotion of FPO is based on a produce cluster area approach and specialized commodity-based approach. While adopting cluster-based approach, formation of FPOs will be focused on “One District One Product” for development of specialized product. The support provided to FPOs is in the form of FPO management cost (up to maximum of INR18 lakh /FPO or actual, whichever is lesser during three years from the year of formation), equity grant in the form of matching grant up to INR2,000 per farmer member of FPO subject to maximum limit of INR15.00 lakh fixed per FPO is being provided.

In Himachal Pradesh till now 174 FPOs have been registered, 8 under SFAC, 99 under NABARD and 67 under other implementing agencies.

The number of FPOs proposed to be formed for additional area coverage of fruits, flowers, mushroom and honey are as follows:

Table 25: Proposed FPOs for additional area expansion

Commodity	Total FPOs	Remarks
Area covered under 10,000 ha	70	Total number of FPOs are calculated in proportion with HPSHIVA plantation schedule every year. The approximate production from area has been estimated by assuming the productivity of 10 MT/ha and about 70% of the produce shall be handled by the FPOs @ 1,000 MT/FPO. The 70 FPOs shall be formed as shown in the table below, every year for seven years.
Area under HPHDP	49	The approximate production from area has been estimated by assuming the productivity of 10 MT/ha and about 70% of the produce shall be handled by the FPOs @ 1,000 MT/FPO. The 49 FPOs shall be formed as shown in the table below, every year for seven years.
Other fruit crops	70	The approximate production from the area has been estimated by assuming the productivity of 10 MT/ha and about 70% of the produce shall be handled by the FPOs @ 1,000 MT/FPO. The 70 FPOs shall be formed as shown in the table below, every year for seven years.
Flowers	7	The approximate production from the area has been estimated by assuming the productivity of 25 MT/ha and about 25% of the produce shall be handled by the FPOs @ 1,000 MT/FPO. The seven FPOs shall be formed as shown in the table below, every year for seven years.
Honey	14	Number of FPOs are calculated with the assumption that additional production of 2400 MT is uniformly distributed every year (343 MT). It is assumed that 70% of the produce shall be handled by the FPOs @ 100 MT/FPO. The 14 FPOs shall be formed as shown in the table below, every year for seven years.
Mushroom	7	Number of FPOs are calculated with the assumption that additional production of 14,000 MT is uniformly distributed every year (2,000 MT). It is assumed that 70% of the produce shall be handled by the FPOs @ 1,000 MT/FPO. The seven FPOs shall be formed as shown in the table below, every year for seven years.
Total	217	

The total number of FPOs for new area expansion are 217. It is suggested to form overall 500 FPOs i.e., additional 283 horticulture FPOs by mobilizing farmers from existing area under Horticulture (Only 30 FPOs have been formed till date). The year wise target for formation of FPOs in case of HPSHIVA project

shall be in proportion with plantation schedule i.e., 10% each in year 1, year 2 and year 3, 20% in year 4, 25% each in year 5 and year 6. For other all others, it is proposed that 5% of FPOs to form in each year 1 and year 2, 10% in year 3, 15% in year 4, 20% each in year 5 and year 6, and 25% in year 7 for ease of implementation.

Table 26: Year wise target for FPOs

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
FPOs for area covered under 10000 ha	7	7	7	14	17	18	0	70
Area under HPHDP	2	2	5	8	10	10	12	49
Area under other fruit crops	3	3	7	10	15	15	17	70
FPO for existing orchards	14	14	28	42	57	57	71	283
Floriculture	0	1	1	1	1	1	2	7
Honey	1	1	1	2	3	3	3	14
Mushroom	0	1	1	1	1	1	2	7
Total	27	29	50	78	104	105	107	500

It is proposed to provide additional 3% interest subvention to FPOs, in addition to existing 3% interest subvention as per Agriculture Infrastructure Fund (AIF) for any term loans taken up to INR2 crores. In addition, matching equity grant of about INR2,000 per farmer subject to INR15 lakh per FPO is proposed for FPOs.

With these into consideration, the maximum total amount that is proposed for each FPO is about INR27 Lakhs by the government for all two incentives mentioned above. The details of the calculations are provided in Annexure 13. Thus, total estimated amount is INR27,000 lakhs out of which government assistance is INR13,500 lakhs and the remaining amount of INR13,500 lakhs by to be borne by FPOs through equity contribution.

4.3. Establishment of nurseries

The nurseries in Himachal Pradesh need to be registered under “The Himachal Pradesh Fruit Nurseries Registration Act, 2015”. There are 54 PCDOs and 601 private nurseries in Himachal Pradesh.

Table 27: PCDOs and private nurseries

District	PCDOs	Private nurseries
Bilaspur	5	14
Chamba	3	32
Hamirpur	4	7
Kangra	2	31
Kinnaur	7	28
Kullu	1	167
Mandi	10	92
Shimla	3	162
Sirmour	10	53
Solan	8	9
Una	1	6
Grand Total	54	601

Existing nurseries should be utilized to the maximum extent. To meet the additional area expansion, it is suggested to procure quality planting material within state or other states in the initial years and subsequently, the requirement will be met through the established nurseries. Procurement of planting material should be done with the following steps:

- ▶ Releasing the tender notices for procurement of planting material
- ▶ It is suggested that the procurement of planting materials should be based on open tendering process. DOH may appropriately finalize the specifics of the minimum qualification criteria.

In addition, it is suggested to develop nurseries to fulfill the requirement of planting materials for developing the state of Himachal Pradesh's internal capacity and to rely less on other states. For establishment of nurseries, it is proposed to develop a separate block for mother plants. Production of sapling may start from second year or third year depending on the crop/variety, once the nursery is established. Increasing the production for each nursery may be achieved by extending the facilities rather than establishing new nurseries. Investment costs of different nurseries range between 1 crore to 3 crores depending on the variable facilities across the crops, with maximum area of 4 ha.

As part of HPSHIVA project it is proposed to develop 10 nurseries. It is suggested that the financing models for all nurseries will be on a 50:50 basis, in which DOH can subsidize 50 % of the project cost as back ended subsidy and 50 % should be the equity contribution. A tissue culture unit is proposed at YS Parmar University of Horticulture & Forestry, Solan.

The assistance is subject to maximum project cost norm of INR1 crore/unit for fruit nurseries, INR3 crore/unit in case of citrus and INR2 crores for tissue culture lab; and project cost norm of INR25 lakhs in case of upgradation.

The summary of nursery development cost for each of the fruit crops is proposed to be done in the first two initial years 2023-24, 2024-25 is presented below, along with percentage share by the government:

Table 28: Cost details for nursery development of fruit crops

Fruits Crops	Unit cost (INR Lakhs)	Number of Nursery	Total cost (INR Lakhs)	Maximum cost norm	Government share	Government cost (INR Lakhs)	Private cost (INR Lakhs)
Sweet Orange	315	2	630	600	50%	300	330
Guava	97	2	194	200	50%	97	97
Pomegranate (Nursery cum Tissue culture lab)	246	1	246	200	50%	100	146
Litchi	101	1	101	100	50%	50	51
Persimmon	120	1	120	100	50%	50	70
Plum	140	1	140	100	50%	50	90
Mango	128	1	128	100	50%	50	78
Pecan nut	122	1	122	100	50%	50	72
Total		10	1,681			747	934

Upgradation of existing government nurseries

It is suggested by respective DDHs that Shahpur Nursery in Kangra may be upgraded for Sweet Orange and Guava from next year. Similarly, Bhumpal PCDO in Hamirpur may be upgraded for Sweet Orange. The approximate cost estimated for upgradation of 1 nursery is INR1 crore, thus total of INR2 crores is proposed with 100% Government contribution. In case of private nurseries, 50% assistance for maximum project cost of INR25 lakhs for upgradation.

As part of HPHDP, it is suggested to either import the required planting materials or utilize existing nurseries in the state.

For the area expansion of other crops excluding those covered under HPSHIVA and HPHDP, it is estimated that at least eight nurseries will be required. The details of these calculations are provided in Annexure 6. Area under these crops will be 10,105 ha. The average spacing of this plantation is considered as 4*4 sq. m. It is assumed that procurement of 100% shall be done in the initial three years, followed by 70% in year 4, 50% in Year 5 and 10% in year 6 and 7 each and the remaining planting material requirement shall be met through production from the established nurseries.

Table 29: New nurseries proposed for other crops

Fruits Crops	Unit cost (INR Lakhs)	Number of Nurseries	Total cost (INR Lakhs)	Maximum cost norm (INR Lakhs)	Government share	Government cost (INR Lakhs)	Private cost (INR Lakhs)
Citrus	315	1	315	300	50%	150	165
Remaining crops	118	7	826	700	50%	350	476
Total		8	1,141			500	641

Quality planting material production and supply shall further be strengthened by training programs exposure visits for department staff, nursery owners and entrepreneurs along with diligent record keeping.

The selected site should be ready a day in advance of the planting material delivery to the site so that the mortality rate is minimized. The purchased planting material, both outsourced and in house, should be planted in the orchard with utmost care. For this, training of laborers/orchardists/gardeners should be arranged one month in advance of the planting season.

For floriculture, the Department of Horticulture has already established six floriculture nurseries in the state. Two are in Navbahar and Chharabra in Shimla district, Parwanoo in Solan district, Bajuara in Kullu district and Dharamshala and Bhatoon in Kangra district. Two model floriculture centers with tissue culture laboratories for quality floriculture planting material have been established in Chail, Solan district and Palampur, Kangra district. These centers are sufficient to cater to the additional demand of flower crops.

4.4. Establishment of orchards and flower plantation

The cost of establishment of orchards is calculated by considering existing norms for non- high/ultra-high density plantation and 50% of cost for high/ultra-high density plantation considering MIDH cost norms and maximum limits (for high/ultra-high-density plantation, maximum cost norm is INR5 lakhs per hectare) for various crop categories (crop intensive, non- crop intensive, normal spacing, HDP etc.) as detailed in Annexure 7.

The approximate total cultivation cost till 2029-30 works out to INR89,973 lakhs. INR44,987 lakhs is proposed as government support and INR44,987 lakhs through private contribution. High-density plantation cost is envisaged at about INR68,375 lakhs (@50% assistance) and other types of planting costs are envisaged at INR21,598 lakhs (@50% assistance). This cost of cultivation includes expenditure on planting material, etc. depending on the crop or type of plantation (normal or HDP) for new area expansion and rejuvenation i.e., 20,105 ha excluding the area under HPHDP project as it is already in progress. In the case of High/Ultra- Density Planation, 50% assistance is provided, thus government share is equivalent to INR34,188 lakhs and for other plantation type, it is INR10,799 lakhs.

In floriculture, the cost of cultivation is estimated by considering cultivation of Chrysanthemum (Cut - 50% and Loose - 50%), Marigold, Gladiolus, Alstroemeria and others in Open cultivation. The remaining flowers namely Carnation, Rose, Lilium, Gerbera, are considered in protected cultivation. As per Himachal Pushp kranthi yojana, the support for cost of cultivation support is provided at 1 lakh/ha for cut flowers and

40,000/ha for loose flowers, subject to a maximum of 2 ha per beneficiary is being provided @50% of cost. In case of protected cultivation, 50% of cost limited to 4 sq.m. per beneficiary in cost of planting material under cultivation of carnation and Gerbera under poly house/shade net house is being provided at INR610/sq.m. whereas for Rose and liliun it is INR426/sq. m. The detailed calculations are provided in Annexure 7.

The total cost of cultivation for area expansion of flowers works out to INR9,110 lakhs and Government share is envisaged at INR4,555 lakhs along with an equivalent contribution from private entrepreneurs.

The details for the establishment of fencing, anti- hail nets and its support system, etc. are provided below, in addition to above components for establishment of fruit orchards.

4.4.1. Fencing

The total cost of fencing for 36,905 ha area if the average of INR5 lakhs per hectare works out to INR1,845.25 crores. Under Mukhya Mantri Khet Sanrakshan Yojna, farmers are being provided 70% financial assistance for installation of solar electric fencing around the farm.

4.4.2. Anti- hail nets

At present, back ended subsidy is provided to the farmers for purchase of anti-hail nets @50% of cost whichever is less, limited to 5,000 sq. m per beneficiary under the MIDH scheme. In addition, state is providing 30% additional state share, thus a total of 80% subsidy is available to the farmers. The cost norm of MIDH scheme is INR35 per sq. m, i.e., INR3.5 lakh per hectare. Therefore, for the overall area of 36,905 ha, the estimated cost works out to INR1,291.68 crores.

In addition, under the state government Krishi Utpaad Sanrakshan (KUSHY) scheme, supports for installation of permanent support structure for anti-hail nets is provided as under for apples.

- a) For steel structure, cost norm is INR2.4 lakh per ha, 50% assistance to maximum of INR1.2 lakhs per ha is available
- b) For bamboo structure, cost norm is INR1.2 lakh per ha, 50% assistance to maximum of INR60,000 per ha is available

However, it is proposed to extend KUSHY scheme for all horticulture crops. Thus, for 36,905 ha area under fruit crops, the estimated cost is INR664.3 crores if 50% area is under steel and 50% area under bamboo support structure.

4.4.3. Crop insurance

Insurance may be decided based on crop, slope, zone sensitivity, expected damage, age/yield of plant. The premium for insurance may be charged at a rate of 5% per annum on approximate amount of 1.3 times the cost of cultivation. To support and encourage the farmers to avail the insurance scheme, government may pay a contribution in the premium amount (half of premium @5%) which is INR4,875 per ha. Thus, the aggregate amount is INR1,800 lakhs for 36,905 ha.

4.4.4. Improved productivity

It is proposed to provide rewards of about INR50,000 per farmer and INR1 lakh per FPO for five best farmers and five best FPOs in the state who have achieved the highest productivity every year. Thus, the total amount is INR52.5 lakhs rounding off to INR53 lakhs

4.4.5. Product development for indigenous commodities and value addition

It is proposed that the fees for filing the patent for innovative products related to horticulture by individual/startup/MSME/FPO may be reimbursed up to INR5 lakhs as financial incentive. The applicant will receive 50% of this reimbursement when they file and the remaining after the grant of patent related to horticulture. Assuming three patents every year, the total cost involved in INR105 lakhs.

4.4.6. Good agricultural practices

It is proposed to provide assistance of 60% of cost subject to maximum of INR 40,000/ha with maximum of 4 ha/beneficiary. It is assumed that four GAP certifications every year (for seven years) will be done and cost of 1 certificate is considered as INR75,000. The total cost for same comes to INR21 lakhs.

4.4.7. Integrated Pest and Nutrient Management

i. Integrated Pest Management

Integrated pest management, often known as integrated pest control, is a broad approach that combines methods for pest control that is both cost-effective and environmentally friendly. IPM tries to keep pest numbers below the point where they can cause economic harm.

Major components of IPM

- ▶ **Cultural practices:** Nursey management, healthy propagules (propagation materials), intercropping, tolerant varieties, etc.
- ▶ **Mechanical practices:** Removal and destruction of egg masses, larvae, pupae and adults of insect pests and diseases parts of plants wherever possible. Installation of bamboo cage cum bird perches, light traps, pheromone traps etc.
- ▶ **Biological practices:** Parasitoids, predators, bio-pesticides etc.
- ▶ **Chemical practices:** The use of chemical pesticides is the last resort when all other methods fail to keep the pest population below economic loss.

The package of practices for many horticulture crops have been standardized by the National Centre of Integrated Pest Management. For the new crops like persimmon, dragon fruit, avocado IPM practices can be standardized in collaboration with NCIPM.

ii. Integrated nutrient management

The use of chemical fertilizers and organic manures in tandem for crop production is known as integrated nutrient management. Its primary goal is to maintain soil fertility and facilitate appropriate plant nutrition availability. It is sustainable in terms of the environment, society, and economy.

- ▶ The nutrients that have been accumulated in the soil.
- ▶ The nutrients that are obtained from sources other than the farm.
- ▶ Crop residues, manures, and household wastes all contain plant nutrients.
- ▶ Crop nutrient uptake during harvest.
- ▶ Plant nutrients are lost in the field because of crop harvesting or volatilization.

It is proposed that for implementation of IPNM, 50% of cost subject to a maximum of INR20,000 per ha limited to 2.00 ha per beneficiary which include pheromone traps, labor cost, cost of nutrient and fertilizers, and cost of pesticides is provided with project cost norm of INR40,000 per hectare. Thus, total cost of INR14,762 lakhs in which the government share is about INR7,381 lakhs and equivalent contribution from private players.

4.4.8. Organic farming

It is proposed to give one time assistance of INR10,000 per ha for branding and promotion of organic produce in addition to existing Paramparagat Krishi Vikas Yojana (PKVY). Thus, total amount of INR500 lakhs is required for organic farming coverage in 5,000 ha.

4.4.9. Natural farming

It is proposed to provide one time assistance of INR2,500 per ha (additional INR500) to farmers as DBT as one-time assistance for the purchase of liquid manure drums and botanical extract preparation containers. Thus, total amount of INR125 lakhs is required for natural farming coverage in 5,000 ha. In addition, assistance is being provided for cowsheds, drums, gratuity on cows and natural farming reserves. The estimated cost of these components is about INR817.5 lakhs thus the total amount is INR942.5 lakhs. The detailed calculations are present in Annexure 13.

4.4.10. Packaging material

The proposed support may be provided as one- time packaging subsidy to the extent of 25% of the cost of the packing material with upper cap of INR25,000 per beneficiary. The total cost of packing material is estimated at INR1,25,000 lakhs for about 5 lakhs beneficiaries; hence government contribution would be INR31,250 lakhs on this head.

4.4.11. Green technology

There is an incentive of INR20,000 per Individual/FPO working in horticulture produce/products. With the assumption of 100 individuals/FPOs adopted green technology, the cost adds up to INR20 lakhs for this activity.

4.4.12. Horticulture mechanization

Additional subsidy of about 10% (thus total 60% subsidy) may be given to all components related to horticulture under existing Sub Mission on Agricultural Mechanization (SMAM), subject to its existing cost norms. The total amount of INR5,000 lakhs has been demarcated for the same.

4.4.13. Drone technology

Drones can be used for targeted input application, timely diagnosis of nutrient deficiency, crop health monitoring, rapid assessment of crop yield and crop losses. Spraying crop nutrient through drones facilitates rapid application and can be used to treat large areas quickly. The drones have capability to fly at low height (1m–3m) over the crop canopy, making them suitable for spraying crop nutrient. The soil and crop nutrient application using drone saves on input cost and environment.

The spray of fertilizers and pesticides through traditional means cause damage to the environment and human health, along with wastage of chemical and excessive usage of water. Drone- based sprays are environment friendly, require less amount of water, fertilizers, and pesticides due to better application and bio efficiency. These can also be used for organic liquid fertilizers. Drone planting systems have also been developed by many startups which allow drones to shoot pods, their seeds and spray vital nutrients into the soil. Thus, this technology increases consistency and efficiency of crop management, besides reducing the cost.

To promote the use of drones in agriculture, GoI is providing funding support to FPOs, KVKs, custom hiring centers (CHCs), and individuals for purchasing them. According to the latest guidelines issued by the Sub-Mission on Agriculture mechanization, for buying drones, the central government will provide

100% funding support of up to INR10 lakh to agriculture training institutes and KVKs. The proposals for purchasing drones will be applicable till 31 March 2023. A standard agriculture drone model costs INR10 lakh. Thus, for 20 drones, total cost of INR200 lakhs. Out of this, 60% subsidy or maximum of INR5 lakh subsidies may be provided for all horticulture related farmers, FPOs, etc.

4.4.14. IoT driven value chain

This value chain may include Internet of Things in horticulture production related to precision farming, Irrigation for precise nutrient management, spray schedule management and traceability of produce during marketing and latest technologies including drones, nano Technology. This nano- technology is applicable for precise foliar application of micro- nutrients like Zinc, Boron, Molybdenum and Manganese in horticulture crops and anti- bacterial coating, anti- fungal coating, ethylene absorbers, impregnation in packaging material to enhance shelf life in packaging etc. The estimated cost of implementing this is INR10,000 lakhs.

C. Capacity building and institutional strengthening

Institutional strengthening is vital to the successful development of the horticulture sector in Himachal Pradesh. The flagship capacity building program named “Kshamta se Samruddhi” by the Department of Horticulture may be implemented for the overall capacity building related to horticulture in the state. A professional agency would be hired to do gap analysis and further execution of the project. This will be monitored at state level. CoE will be linked with the project.

The Project Consultancy and Management Unit (PCMU) may be set up at Department of Horticulture, Himachal Pradesh level to handhold the department, monitor effective implementation of the policy. The PCMU may coordinate with relevant stakeholders and update the government from time to time regarding its implementation. PCMU may also suggest mid-course correction for effective implementation, transaction support for onboarding professional agencies, post transaction monitoring, development of monitoring dashboard, etc. PCMU shall do regular monitoring to facilitate farmers in decision-making regarding crop management, business, and management activities. The state department may have dedicated MIS portal for efficient tracking of status of project at the cluster level, farmer details, coverage of land under plantation etc. A professional agency may be hired through National Informatics Centre Services Inc. (NICS) rates or a transparent bidding process to set up PCMU with Department of Horticulture, Himachal Pradesh. The details of proposed experts required in PCMU and tentative cost in provided in Annexure 14. The estimated cost is about INR500 lakhs per annum thus about INR3,500 lakhs for seven years.

There will be dedicated professional agencies that may be on boarded with the help of PCMU in the following fields, such as training and capacity building, export facilitation, marketing and branding. PCMU may assist Department of Horticulture in monitoring of these agencies. The broad responsibilities of these professional agencies may be as follows (indicative):

- i. **Training and Capacity building:** Execute the overall capacity building programs related to “Kshamta se Samruddhi” program, including preparation of training plan and implementation of programs at ground level, with coordination from department and universities, deployment of Horticulture Extension Functionaries²⁸. This may also collaborate with universities/institutions for demonstration of new technologies to conduct regular trainings/workshops.

²⁸ One dedicated Horticulture Extension functionary may be appointed for every 25 hectares to handhold farmers and impart trainings at cluster level.

- ii. **Marketing and Branding:** This may promote the brand “Himachal Farm Fresh” and assist in maintenance of adherence to quality standards and follow the standard packaging practices by stakeholders, organizing marketing campaigns in both domestic and international locations.
- iii. **Quality standards and export facilitation:** To work closely with department and handhold stakeholders like FPOs, farmers, exporters and facilitate exports to identified export destinations, information dissemination on various schemes and benefits available for export promotion, quality standards and required support in availing, creating linkages.

The estimated cost of these professional agencies shall be INR1 crore per annum each, thus, total INR21 crores. The details of the interventions that may be done in these areas are provided below:

4.5. Training and capacity building

Training program for all stakeholders including farmers, FPOs, infrastructure facility supervisors, staff, supervisors, gardeners, entrepreneurs shall be organized in coordination with above mentioned professional agencies with the help of government universities, ICAR institutes, deemed/private universities/institutions recognized by UGC having faculty in horticulture.

4.5.1. Capacity building for nursery development and plantation

Production of quality planting material as well as building the institutional capacity is the key for success of a program for this scale. The project implementation requires training at various levels including empowering departmental personnel, entrepreneurs, and gardeners.

Capacity building for nursery is planned for the initial establishment stage. The training has been planned for DoH officials along with exposure visits, as well as for entrepreneurs, gardeners, and lab technicians.

i. District level Department Officials:

- ▶ A five-day training covering at least two officials per district should be conducted twice in every year to department officials by Department of Horticulture, Shimla in association with universities/research institutes in Year 1. In second year, a two- day refresher training for DoH officials should be conducted once in a year. The approximate average cost per person per day session is assumed as INR5,000, inclusive of all expenses (travel, food, boarding, trainer cost, etc.). The topics that can be covered during these trainings include:
 - ▶ Nursery establishment and Layout
 - ▶ IPM in nursery management
 - ▶ Symptoms of nutrient deficiency and their management
 - ▶ Monitoring and Evaluation Training
- ▶ Exposure visits (two days) for department officials once in a year for two years should be conducted. The approximate average cost per person per day session is assumed as INR10,000, inclusive of all expenses (travel, food, boarding, trainer cost, etc.). The tentative list of nurseries/institutions that may be considered are as follows:
 - ▶ Jain Irrigation Private Limited, Jalgaon
 - ▶ Central Institute of Sub tropical Horticulture, Lucknow
 - ▶ Indian Institute of Horticulture Research, Bangalore
 - ▶ Centres of Excellence
 - ▶ National Research Centers

ii. Entrepreneurs:

- ▶ The five-day trainings for entrepreneurs should be conducted by DoH in coordination with University of Horticulture and Forestry, Neri at least once in a quarter for at least 50 persons for two years. The approximate average cost per person per day session is assumed as INR5,000 inclusive of all expenses (travel, food, boarding, trainer cost etc.).
- ▶ The topics for training shall include the following:
 - ▶ Types of nurseries and industry profile
 - ▶ Determining cost of production, business types and establishment
 - ▶ Laws, regulations, and codes for nurseries
 - ▶ Introduction to personnel and business management
 - ▶ Site selection and layout
 - ▶ Water management and quality
 - ▶ Soil and substrate qualities
 - ▶ Winter protection
 - ▶ Nursery pest management
 - ▶ Containers and structures for propagation
 - ▶ Technical and business training

iii. Gardeners:

- ▶ It is suggested to conduct five day training of four gardeners per nursery (i.e., 68 gardeners for 17 nurseries) in the nurseries and six persons in Tissue culture unit by NSDC in coordination with DOH at least twice in a year for two years. The approximate average cost per person per day session is assumed as INR5000, inclusive of all expenses (travel, food, boarding, trainer cost, etc.).
- ▶ The topics for training shall include the following:
 - ▶ Soil sampling and soil sterilization/
 - ▶ Media preparation
 - ▶ Bud wood collection
 - ▶ Budding & grafting operations
 - ▶ Seed bed preparation
 - ▶ Seed sowing/planting
 - ▶ Techniques in transplanting of nursery plants
 - ▶ Propagation techniques: specialized parts, cutting, layering, budding, and grafting.
 - ▶ Use of bio fertilizers, growth regulators etc.
 - ▶ Various intercultural operations.
 - ▶ Inventory management

The total cost of capacity building related to nursery development is about INR198 lakhs. The breakup of each of the trainings is presented below:

Table 30: Capacity building plan for nursery development

Category	No of Officials	Number of days	Number/ year	Years	Cost/ person/ session	Total amount (INR Lakhs)
Capacity building for DoH officials (Year 1 - 5 days training)	24	5	2	1	5,000	12

Category	No of Officials	Number of days	Number/ year	Years	Cost/ person/ session	Total amount (INR Lakhs)
Capacity building for DoH officials (Year 2 - 2 day refresher training)	24	2	1	1	5,000	2.4
Exposure visits for DoH officials	24	2	1	2	10,000	9.6
Capacity building of entrepreneurs	50	5	4	2	5,000	100
Training for Gardeners	74	5	2	2	5,000	74
Total						198

4.5.2. Capacity building for value chain development

The high-density plantation must be appropriately managed to give maximum benefits to the small farmers/growers. Thus, building their capacities through training and exposure is critical. The training programs at state level, district level and cluster level should be conducted as follows:

The training and capacity building support will be provided on business development, export promotion, marketing, value addition, quality standards.

i. Training and capacity building for infrastructure management and operations

The training and capacity building support should be provided to 56 Managers (i.e., 38 Pack houses, nine processing units, four ripening chamber and five CA stores), along with two technicians for each facility (112 Nos) and support team (accountants, machine operators, driver, and security person etc.) for these facilities. Along with that, 560 nos. technical training for skilled workers are employed in the pack house and processing units. The training will be focused on facility management, operations, produce management and processing technology. In addition, the staff and managers will be trained to obtain and maintain ISO and HACCP certification for entering markets overseas. These certifications will help in achieving higher value for the processed value-added products. The trainings will be of five-day durations, a total of three trainings— once in every two years for managers and technicians should be conducted. For skilled workers, five-day training on Primary processing, operations, quality management, machinery functions, safety measuring should be conducted at least twice in a year for a period of three years. The training and capacity building activities of the district level unit personnel are proposed as follows:

Table 31: Training details for infrastructure management and operations

S. No.	Topic	Persons	No.	Duration (Number of days)	Number of trainings
1.	Packhouse operations, Supply chain management, Processing of produce, Storage, Certification, Sanitary and phyto sanitary	Managers	56	5	3
2	Food processing, certification, and safety measures	Technicians	112	5	3
3	Primary processing, operations, quality management, machinery functions, safety measures	Skilled workers (excluding managers and Technicians)	560	5	6 (once in a year)

The DoH staff will be oriented in value chain management practices, together with study tours and exposure visits within and outside the state. It is proposed that DDH, SMS, HDO and HEO from each district should be given trainings. The details are given below:

Table 32: Exposure visit details

S. No.	Topic	Persons	Number	Duration (Number of days)
1	Orientation on Value Chain Management, Promotion of linkage with financial and non-financial institutions	DoH, DDH, SMS, HDO & HEO	55	5
2	Exposure Visit within the State	DDH, SMS, HDO & HEO	48	1
3	Exposure Visit outside the state (e.g., Maharashtra, Karnataka)	DoH, DDH, SMS, HDO & HEO	55	3
4.	Exposure Visit outside India (e.g., Israel, New Zealand, Europe)	DDH (12) and DoH staff (7)	19	5

The private sector plays an important role in value chain promotion, and they should also be involved in the training and capacity building. The key private players in the value chain include processors, traders, commission agents, wholesalers, retailers, and input providers. It is proposed that these private players should be taken for exposure visit to value chain institutions namely collection centers, and district processing units. During the exposure visits, they should also be given an orientation on need and advantages of joint value chain promotion. It is estimated that each exposure visit will include up to 25 private players, which will be of 1 day duration. The details are given below:

Table 33: Exposure visits for private players

Item	2023	2024	2025	2026	2027	2028	Total
Number of exposure visits	12		12		12		36
Number of stakeholders	300		300		300		900

In addition to the above, five- day training for FPOs shall be conducted in terms of horticulture production techniques, post- harvest management of produce, business operations, etc. for the FPO staff and few farmer members covering up to 10 members per FPO. The training shall be conducted at least once per district in one year for the newly formed FPOs as detailed in Section 4.1.

ii. Training and capacity building for farmers

Orientation Training to Horticulture Extension Functionaries and Farmers on Production Technology and Value Addition (under HPSHIVA in pilot basis):

It is suggested to appoint one Horticulture Extension Functionary for every 25 hectares (i.e., 400 Horticulture Extension Functionaries for 10,000 hectares under HPSHIVA) in pilot basis. These functionaries should be trained on the overall operations in clusters including productivity enhancement techniques and technologies for high density plantation, canopy management, nutrition management, crop load management, IPM, INM, post-harvest treatment for extending shelf life of fruits etc. Five- day training in proportion with plantation schedule should be conducted. These functionaries will in turn train all the 25,000 farmers on the above topics which may coincide with the plantation schedule. As 25 farmers are estimated in each cluster, 1,000 training events are needed to be organized. Each training shall be of five-day duration. The training materials should be pictorial and in audio-visual mode in a language, easily understandable to the farmers in vernacular language. The venue of the training should be kept near to the cluster so as the women farmers can also attend the training.

In addition, at least 75,000 farmers shall be trained with the help of professional agency hired for training and capacity building.

Table 34: Details of plantation schedule and number of training events

Item	2023	2024	2025	2026	2027	2028	Total
Plantation %	10	10	10	20	25	25	100
Number of training events for HPSHIVA	100	100	100	200	250	250	1,000
Number of farmers to be trained for HPSHIVA	2,500	2,500	2,500	5,000	6,250	6,250	25,000
Number of farmers to be trained for other area	7,500	7,500	7,500	15,000	18,750	18,750	75,000

iii. Training to Entrepreneurs

It is proposed to identify and train at least two entrepreneurs from each FPO in backward and forward linkages, primary and secondary processing, packaging, and marketing. Hand-holding support to these entrepreneurs should also be provided in business plan preparation, technical follow-up, linkage with financial and non-financial institutions, and marketing of their produce. Each training will be conducted for five days. In each training event, 50 entrepreneurs will be trained. The detail of the training is provided below.

Table 35: Details of training to entrepreneurs

Item	2023	2024	2025	2026	2027	2028	Total
Plantation percentage	10	10	10	20	25	25	100
Number of entrepreneurs to be Trained under HPSHIVA	200	200	200	400	500	500	2,000
Number of entrepreneurs to be Trained for additional area	200	200	200	400	500	500	2,000
Number of training events	8	8	8	16	20	20	80

The summary of cost for the capacity building activities as discussed above, is as follows:

Table 36: Summary of capacity building- value chain development

Category	Number of persons	Number of days per training	Number of trainings in year	Number of years	Cost /person/t raining	Remarks	Total amount (INR Lakhs)
Training for Infrastructure management and operations (Facilities-Managers)	56	5	1	3	5,000	1 training for every 2 years.	42
Training for Infrastructure management and operations (Facilities-Technicians)	112	5	1	3	5,000	1 training for every 2 years.	84
Skilled workers in facilities	560	5	1	6	5,000	1 training every year	840

Category	Number of persons	Number of days per training	Number of trainings in year	Number of years	Cost /person/t raining	Remarks	Total amount (INR Lakhs)
DoH officials: Orientation	55	5	1	1	5,000	1 training in a year	13.75
DoH officials: Exposure Visit within the State	48	1	1	1	7,000	1 visit in a year	3.36
DoH officials: Exposure Visit outside the state	55	3	1	1	10,000	1 visit in a year	16.5
DoH officials: Exposure Visit outside India	19	5	1	1	40,000	1 visit in a year	38
Exposure visits for private players	300	1	1	3	7,000	1 visit in every district and all 7 districts should be covered in 2 years.	63
Training for FPOs (10 members per FPO)	500	5	1	1	50,000 per FPO (5,000 per farmer)	1 training per district every year as per FPO formation plan	1,250
Training for Horticulture Extension Functionaries for HPSHIVA (pilot)	400	5	in proportion with plantation schedule		5,000	NA	100
Training to Farmers	1,00,000	5			5,000	NA	25,000
Training to entrepreneurs	4,000	5			5,000	NA	1,000
Total							28,451

4.5.3. Capacity building for Apiculture

The Apiculture activity should be promoted in all districts of Himachal Pradesh. For calculations, it is considered that infrastructure and all training activities will be conducted at 10 district level clusters out of 12 districts (i.e., each district level cluster may consist of beekeepers from one or more districts).

The capacity building activities include Awareness generation programs, five days training programs and exposure visits. The awareness programs will be group meetings to attract farmers and young generation into Apiculture and Mushroom production as well. 4 awareness programs may be conducted per district level cluster in a year at INR10,000 per program thus adding to 40 programs per year for five years.

Five days training programs may be organized with strength of 50 beekeepers. These trainings may be conducted once in a year per district level cluster for three years benefitting approximately 1,500 beekeepers. The trained farmers may in turn build capacity in their community and encourage fellow farmers to pursue Apiculture.

Exposure visits to Integrated Beekeeping Development Centre may be organized for district officials (two per district level- DEO, SMS) and a one day exposure visit may be organized per year per district level cluster for 1 year. The detailed calculations are presented below.

Table 37: Budget estimate for Apiculture

S. No.	Item	Number of persons	Number of days per training	Number of trainings in year	Number of years	Cost/t raining/ person	Total cost (INR Lakhs)
1	Awareness generation program*	-	2	40	5	10,000	40
2	5 days training	50	5	10	3	5,000	375
3	Exposure visits for District officials	20	1	1	1	10,000	2
Total							417

*- Common Awareness programs for Apiculture and Mushroom production

4.5.4. Capacity building for Mushroom

For calculations, it is considered that infrastructure and all training activities may be conducted at 10 district level clusters out of 12 districts (i.e., each district level cluster may consist of beekeepers from one or more districts).

The capacity building activities include awareness generation programs (common with apiculture promotion activities), two days training programs and exposure visits. The awareness programs will be group meetings to attract farmers and young generation into Mushroom production. Four awareness programs may be conducted on a district level cluster in a year at INR10,000 per program thus adding to 40 programs per year for five years, in common with apiculture awareness program.

Five days training programs may be organized with strength of 50 farmers. These trainings may be conducted once in a year per district level cluster for three years benefitting approximately 1,500 farmers. The trained farmers may in turn build capacity in their community and encourage fellow farmers to pursue mushroom production.

Exposure visits to district officials (two per district level- DEO, SMS, etc. may be organized and one exposure visit may be organized per year per district level cluster for three years. The detailed calculations are presented below.

Table 38: Budget estimate for Mushroom

S. No.	Item	Number of persons	Number of days per training	Number of trainings in year	Number of years	Cost/ training/ person	Total cost (INR Lakhs)
1	Awareness generation program	Common Awareness programs for Apiculture and Mushroom production. The cost is already covered in Apiculture					
2	5 days training	50	5	10	3	5,000	375
3	Exposure visits for District officials	20	1	1	3	10,000	6
Grand Total							381

4.5.5. Capacity building for Floriculture

The number of farmers that should be targeted for training on cultivation of floriculture crops under open and protected cultivation is approximately 3,000. Five- day training programs shall be conducted covering topics, including Open and protected cultivation, harvesting, planting material, post- harvest management

practices, etc. with maximum strength of 50 farmers in each training program i.e., approximately one training per district every year for six years.

Table 39: Capacity building for Floriculture

S. No.	Item	Number of persons	Number of days per training	Number of trainings in year	Number of years	Cost/ training/ person	Total cost (INR Lakhs)
1	5 days training	50	5	10	6	2,000	750
Grand Total							750

4.6. Marketing, Branding, Outreach strategy, Export and Quality standards

4.6.1. Marketing

The marketing of fruit is a complex process and includes all the functions and processes involved in the movement of the produce from the growers to final consumers. The project aims to develop collection centers, pack houses, transport infrastructure and processing infrastructure.

Farmers will bring the produce to the collection center. The facility for transportation can be provided by the collection center or can be arranged by the farmers themselves. For this facility, the collection center will charge a nominal fee of INR1,000/trip for 5 MT. The collection center will provide the services for sorting, grading, and packaging @0.5/kg and additional INR0.5/kg for packaging material if required. The primary processed produce will then flow to different channels: 50% to the pack house, 10% to the processing unit, 30% to the wholesaler and 10% directly to consumer. The primary processed produce will fetch better price in the market because of its quality, uniformity, and cleanliness. The professional agency will form marketing linkages with multi chain retail stores like SAFAL Fruits and vegetables, Big basket, Grofers, Go for fresh, Ninja kart, country delight, etc. and institutional buyers like Army units, prison officials, mid-day meal scheme through asha workers, boarding schools to facilitate regular marketing channels. Premium A-grade and unique produce can also be marketed through exporters in different countries.

The National Agriculture Market (e-NAM) platform which integrated 1000 APMCs across 21 states/UTs is also operational in Himachal Pradesh. Currently, 19 APMCs are integrated in Himachal Pradesh. As of February 2022, about 52 FPOs, 1.24 lakh Farmers, 1,975 traders and 1,102 CAs are registered on e-NAM in Himachal Pradesh. e-NAM may be utilized to the full extent by Farmers and FPOs for selling the produce directly to traders at any APMC, integrated with e-NAM in Himachal Pradesh, as well as to traders in other states. The Department of Horticulture, with help of PCMU, should work with Himachal Pradesh State Agricultural Marketing Board (HPSAMB) and encourage stakeholders in APMCs to participate in online trading by devising incentives. In addition to above, two hi-tech markets shall be developed each of worth INR200 crores as mentioned in Section 4.1.9.

Himachal Pradesh State Agricultural Marketing Board (HPSAMB) may encourage stakeholders in APMCs to participate in online trading on e-NAM by devising trade related incentives. Exemption of 0.25% of market fee for traders who undertake transactions through end-to-end online trading process in e-NAM. To encourage participation of FPOs/farmers, top three farmers and one FPO performing trade through e-NAM may be awarded a cash prize of about INR50,000 (in the ratio of 5:3:2) and INR1 lakh respectively in each district every year. Thus, the total amount for this is INR126 lakhs.

Currently, as per Market Intervention Scheme (MIS) apples may be procured in 35 kilo bags with 2.5% more fruits, price was set at INR9.50 per kg, the handling charges will be INR2.75 per kg and assumed sale realization will be INR3.50 per kg. In addition, Market Intervention Scheme (MIS) for may be

implemented to other horticulture crops of low grades and Fair Average Quality (FAQ) may be adopted for all horticulture crops.

4.6.2. Branding

In the current times, and seeing the competition in the market, branding of the produce has become almost synonymous with marketing. Without branding, the produce can be sold only in local markets, whereas branding has the potential to take the produce to distant markets and gradually to overseas markets. To maximize the price realization for the farmer, it is essential to differentiate their produce from the competing states through a brand building approach. To achieve this, a concentrated strategy is planned that focuses on creating real value for those customers who are ready to pay for it and a brand strategy that differentiates their product from others.

Branding strategy involves developing a brand architecture by reviewing product-wise and market-wise profitability, revenue, volume, and market shares over the years. The exercise will focus on identifying which product will therefore be the flagship brand. While developing the brand architecture for the present focus of the state, Masterbrand strategy is suggested in which DOH can run the advertising campaign under a single brand (Umbrella Branding). The most suitable option for horticulture department is developing a Masterbrand strategy for the state which provides a framework for the produce of the state and an umbrella brand for marketing of the produce which can be termed as "Himachal Farm Fresh".

Brand promotion through social media:

Brand promotion can be done through regular updates in social media on Twitter handle, LinkedIn, and Facebook for overall promotion of horticulture sector in the state and the proposed brand.

- ▶ To identify the value proposition for the agricultural products based on market assessment and surveys, following options could be adopted for branding the products:
 - ▶ **Retail Branding**- This would include having special shelves/display for "Himachal Farm Fresh" branded produce, placement in front rows for more visibility in big retail chains.
 - ▶ **Geographical Branding** - Geographical branding positions a commodity from a specific geographical area e.g., sweet oranges have a specific characteristic color which can be promoted and even marketed in the brand name of the state.
 - ▶ **Packaging of products** - Packaging of products by farmers would attract more consumers. It not only increases shelf life of products but creates brand recognition in the eyes of buyers. Innovative packaging for "Himachal Farm Fresh" products will position the products in a better way in the market.

4.6.3. Outreach strategy

The outreach strategy shall have two distinct dimensions:

- ▶ To propagate knowledge/information about schemes, various programs, and strengths of horticulture in HP
- ▶ To attract private investment in the sector

We propose the following outreach strategy to address both the dimensions:

a. Propagating knowledge/information

Table 40: Description of various propagating methods

Methods	Description
Educational Presentations /Meeting	Presentations/Meetings to provide producers/farmers information about the program and schemes including about the department, what are the objectives; how youth can be involved to generate profit and create further employment, etc. and answer general questions. These meetings may be live streamed and recorded.
Public In-Person Meetings	Presentations that are face-to-face with an audience hosted by the department, community partner, or jointly. These meetings will be live streamed and public comments will be taken. Input tools will be made available or referenced.
Website	Website is the official site of the Department and provides general information about the programs, meeting agenda, calendar, documents, videos, links to tools and other relevant information.
Social Media	Includes Twitter, Facebook, YouTube, Instagram, LinkedIn, and other similar platforms, where information about the program will be posted regularly to inform stakeholders. This includes a social media advertising campaign.
E-Blasts	Regular e-blasts will be sent to keep the public informed about major announcements.
Newsletter	Monthly newsletter to summarize the key activities.

b. Attract investment/entrepreneurs

We propose the following activities towards attracting entrepreneurs/investment into the project region

- ▶ **Print:** Use of local edition of national newspapers, as well as regional newspapers, to highlight the broad contours of the schemes,
- ▶ **Outdoors/Dynamic hoarding and topical campaign:** Outdoor hoardings, at district level offices, relevant department offices should be placed for promotion of schemes,
- ▶ **Road shows at cluster/district:** The dedicated professional agency should carry out road shows in each of the clusters/regions for focused outreach about the schemes. These roadshows will cater to the local entrepreneurs of the district and nearby districts. Agribusiness enterprises, Industry associations, farmers, FPOs, district level government officials from Horticulture, Department of Industries should be invited, and presentations should be given on the objectives of the project, clusters and value chain covered, eligibility criteria, pattern of assistance under different schemes, selection process for the interested investors/entrepreneurs.
- ▶ **Creation of Investor Database:** One of the major outcomes of the road shows would be to identify and develop a database of interested investors/entrepreneurs and their area of interest. This database should be used to initiate targeted communication with the investors.
- ▶ **Creation of Sample brochures:** The intervention specific brochures shall be developed for creating awareness among interested investors/entrepreneurs. The brochure may have information related to the following:
 - ▶ Components and required financial investment
 - ▶ Key outputs/outcomes
 - ▶ Support available from different schemes/Government
 - ▶ Responsibility of the investor/entrepreneur
- ▶ **Collaboration with vernacular and mainstream media/press:** Media plays a vital role in highlighting the efforts of the government in bringing investment in horticulture sector through infrastructure creation. The department shall interact with press for dissemination of information.

- ▶ Outreach activity should also be focused to create awareness among the entrepreneurs (especially aspiring youths in the cluster). The department may organize workshops/seminars/webinars for dissemination of scheme/project related information through various platforms. This will primarily be done through four main channels as follows:
 - ▶ Social Media
 - ▶ Digital Media
 - ▶ Print Media
 - ▶ Existing networks, Conferences, and workshops

The investor data base is provided in Annexure 10. About INR5,000 lakhs have been allocated for the proposed for marketing, branding and outreach activities.

4.7. Quality standards and Export facilitation

One dedicated professional agency will undertake activities related to adherence to quality standards and export facilitation. They may be selected through transparent competitive bidding with the assistance from PCMU. The Key Performance Indicators (KPIs) and associated penalties, if any, shall be defined by PCMU in coordination with DoH and it will be regularly monitored. The estimated cost of this agency is INR100 lakhs per annum. The summary of quality standards and export facilitation is provided below:

4.7.1. Quality standards

Food quality standards give confidence to consumers in the safety, quality, and authenticity of what they eat. By setting down a common understanding on different aspects of food for consumers, producers and governments, standards enable trade to take place. The following section describes the food quality standards for the production and export of sub-tropical fruits. The quality standards are already covered under value chain. To support the development of horticulture sector in the state, opening of new marketing opportunities, and facilitation in domestic and export market the major certifications needed are good agricultural practices, which is based on technologies like integrated pest management, integrated crop management, conservation agriculture, and hazard analysis critical control point to control pesticides that seriously threaten human health and the environment.

The Codex Alimentarius includes standards for all the principal foods, whether processed, semi-processed or raw, for distribution to the consumer. Materials for further processing into foods should be included to the extent necessary to achieve the purposes of the Codex Alimentarius as defined. The Codex Alimentarius includes provisions in respect of food hygiene, food additives, residues of pesticides and veterinary drugs, contaminants, labeling and presentation, methods of analysis and sampling, and import and export inspection and certification.

FSSAI is a statutory body established under the Ministry of Health & Family Welfare, Government of India. The FSSAI has been established under the Food Safety and Standards Act, 2006, which is a consolidating statute related to food safety and regulation in India. FSSAI is responsible for protecting and promoting public health through the regulation and supervision of food safety. The FSSAI functions under the administrative control of the Ministry of Health and Family Welfare. The criteria like the location of the business, number of retail stores, etc. are needed while evaluating the nature of the license application.

Food Safety Compliance System (FoSCoS) is an enhanced version of Food Licensing and Registration System (FLRS) which was launched in 2012 for issuance of pan-India FSSAI licenses and registrations. It had evolved incrementally and organically with changing regulatory needs. FoSCoS is built using the latest technology with a vision to have modern on stop pan-India IT platform for food safety regulatory needs. FoSCoS is being integrated with other platforms of the Government of India such as GST, PAN, MCA, etc. to further ease out the processes for businesses and also facilitate a 360-degree profiling of businesses.

The ISO 9000 standards focus on the best management practices for quality assurance. It sets out the criteria for a quality management system and is the only standard in the family that can be certified. It can be used by any organization, large or small, regardless of its field of activity. This standard is based on several quality management principles, including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement.

Customers get consistent, good-quality products and services using ISO 9001 helps which in turn brings many business benefits. The ISO 9000 helps to create a more effective and efficient operation, increase the level of customer satisfaction and relation, enhance the motivation of employees as well as awareness and morale, and reduce wastage and increase productivity.

The professional agency with support from DoH will majorly support the farmers, CHPMAs/FPOs, etc. while connecting them to the respective agencies, certification bodies, supporting them in documentation, training in terms of accounting and managerial aspects, book-keeping and application and facilitation of the overall process.

4.7.2. Export facilitation

The dedicated professional agency, in coordination with APEDA, can develop a list of countries ready to take the specialty products and identified target export markets. A product wise targeted export markets and upcoming markets are also covered in value chain report which can form a starting point for targeted export market.

Interested CHPMAs/FPOs/District level units can be facilitated to generate import-export code. Initial trial shipment can be taken through already established exporters, after which depending on the success the CHPMAs/FPOs can directly take up exports in coordination with DoH and agency. The major activities that will be done by this agency are as follows:

- ▶ Assist in developing forward linkage to boost exports in coordination with PCMU
- ▶ Provide commercially useful information to the exporters and farmers
- ▶ Identification of key international markets and products
- ▶ Undertake activities for promotion of local varieties and their market access, and create awareness in overseas and domestic markets
- ▶ Promote new product Development for the upcoming markets
- ▶ Adoption of Global-GAP to minimize export risk

The estimated cost is about INR5000 lakhs for carrying out the activities under Quality and export facilitation.

4.8. Others

4.8.1. Vocational courses

To develop specialized manpower with focus of specific skills the state Universities /KVKs/Government Schools may encourage vocational courses (Tentative list).

- ▶ Plant health management
- ▶ Organic farming
- ▶ Natural Farming
- ▶ Mushroom production
- ▶ Bee keeping
- ▶ Floriculture cultivation and management
- ▶ Pack house, Cold storage, etc. and Supply chain management

- ▶ Post-harvest management and Processing technology
- ▶ Drone Technology and IoT
- ▶ FPO management

The government will encourage students to pursue approved courses on FPOs or any of the vocational courses and their fees to the extent of INR10,000 per year will be reimbursed by the government. The estimated cost is about INR350 lakhs, assuming at least 50 students for each of the above courses.

4.8.2. Horticulture University/College/Institute

Department of Horticulture may strengthen existing universities in addition to creation of new universities/colleges/institutes etc. The digitization of universities shall be promoted to reach out to students in other states/countries and have adequate manpower. The facility shall also have state of art technology to carry out advanced research and teaching methodology. The estimated cost is about INR500 crores.

4.8.3. Augmentation of human resources

Augmentation of technical human resources within the Department of Horticulture to implement the schemes/projects effectively. As part of institutional strengthening, PCMU shall conduct detailed studies and propose additional resources if required any. The estimated cost is about INR100 lakhs per annum.

4.8.4. Incubation center

Establishment of Incubation center may be undertaken by the State University of Horticulture and Forestry/Centre of Excellence- Horticulture. Incentives as per Himachal Pradesh start-up policy may be applicable.

This shall promote entrepreneurs and startups to provide innovative solutions across value chain including technological Solutions, financial services, etc. for increasing access to technology, savings, payments, insurance, and credit services to farmers. The estimated cost is about INR100 crores.

4.8.5. Centre of Excellences

Centre of Excellences for different crops/commodities are proposed to be established in with National/international collaboration for different horticultural and allied activities, which will serve as demonstration and training centers as well as source of planting material.

- ▶ Centre of Excellence for floriculture
- ▶ Centre of Excellence for mushroom
- ▶ Centre of Excellence for bee keeping
- ▶ Centre for plant genetic resources/germplasm conservation
- ▶ Centre of Excellence for potential fruit crops
- ▶ Centre of Excellence for high tech Nursery

The estimated cost of 1 Centre of Excellence is about INR1,000 lakhs thus total amount of INR6,000 lakhs.

D. Research and development

It is important to develop innovative and entrepreneurial ecosystem in the state. The aim of this center will be to help and support the incubates, entrepreneurs and students across the region from developing ideas to prototype startups, carry out research in both production and post-harvest technology and standardize the same for the benefit of farmers and local community.

4.9. Research and Innovation hub

4.9.1. Development of environment friendly protocols

i. Bio enhancers for soil micro- organisms

Soil microorganisms play a big part in supporting healthy plant life through microbial consortia i.e., N-fixation, P-solubilizer, and disease suppression activities. The soil bacteria secrete glue like sticky materials that bind sand with clay particles into micro aggregate (micro clusters). Fungi, the largest known organism on the face of earth, binds the micro aggregate from the larger soil aggregate structures, creating air and water passageways. Earthworm's "glaze" the passageways, they create nutrient rich and microbial active slime layer that enhances water holding capacity and soil structure. The best technique to enhance soil microbial in the soil is use of bioenhancers. These bio- enhancers can be used for seed treatment, fortification of compost, soil fertility improvement with these doses:

- ▶ Seed Treatment- 250 g of Bio-enhancer should be mixed in 10 L of water for seed treatment which will promote Seed treatment promote germination, growth, because the microbes produce hormones, fix atmospheric nitrogen, solubilize unavailable phosphorus, Zn and other nutrients in the soil and it protect seedling from fungus pathogens.
- ▶ Fortification of compost- One kg for fortification of 2 tons of FYM/Compost. Application of bioenhancer increases the availability of major and micronutrients in the soil to plant, to improve soil plant health. It promotes growth of plants because these microbes produce Indole acetic acid.
- ▶ Soil Fertility improvement-5 kg can be mixed at the time of field preparation, along with compost for one hectare.

General precautions in preparation of bio enhancer

- ▶ Since bio enhancers are rich source of microbial consortia, hence preferably earthen or plastic container should be used in their preparation.
- ▶ Any way metallic container should be avoided.
- ▶ Containers should be kept in shade and covered with wire mesh mosquito net to avoid egg lying.
- ▶ As for possible quality water say rainwater, water from well is preferred, chlorinated water from tap need to be avoided.
- ▶ Since bio enhancers are rich source of microbial consortia, their regular stirring twice or thrice a day is essential for proper aeration.
- ▶ As for possible, if fresh cow products of local breed are available, it is to be preferred.

The cost for this establishment is proposed as INR20 lakhs.

Table 41: Bio enhancer for crop activities

S. No.	Crop activity	Suitable bio-enhancer
1	Seed/Plant part treatment	Amritpani/Beejamrita/Cow Pat Pit/Cow Urine and dung powder + Agnihotra ash etc.
2	Enhancing decomposition of biomass	Jeevamrita/Cow Pat Pit/Panchgavaya/Agnihotra ash water etc.
3	Enhancing soil fertility	Amritpani/Jeevamrita/BD-500, CPP, CISH-Bio/ Biosol/Kunapjal/ Panchgavaya etc.
4	Crop vigour promotion	CPP, Jeevamrita, CISH-Bio, Biosol, Panchagavya etc.
5	Enhancing biotic & abiotic stress	CPP, CISH-Bio/Biosol/Kunapjal, Panchgavaya, Vermi wash etc.
6	Insect pest management	<i>Kunapjal</i> , CISH-Bio /Vermi wash/Biosol/Panchgavaya, Das Parni etc.
7	Seed/grain storage	Agnihotra ash/Panchgavaya

ii. Bio Fertilizers

Biofertilizers are substance that contain microbes, which help in promoting the growth of plants and trees by increasing the supply of essential nutrients to the plants. It comprises living organisms which include mycorrhizal fungi, blue-green algae, and bacteria. Mycorrhizal fungi preferentially withdraw minerals from organic matter for the plant whereas cyanobacteria are characterized by the property of nitrogen fixation. The components of biofertilizer are Bio compost, Triochoard, Azotobacter, Phosphorus, Vermicompost. The unit cost for the same is INR50 lakhs with 50% government support.

iii. Bio Pesticides

Bio pesticides are living organisms which can intervene the life cycle of insect pests in such a way that the crop damage is minimized. The agents employed as biopesticides include parasites, predators and disease-causing fungi, bacteria and viruses, which are the natural enemies of pests. Further, they complement and supplement other methods of pest control. Utilization of naturally occurring parasites, predators and pathogens for pest control is a classical biological control. On the other hand, these bio agents can be conserved, preserved, and multiplied under Laboratory condition for field release. Once these bio-agents are introduced in the field to build their population considerably, they are capable of bringing down the targeted pest' population below the economic threshold level (ETL). However, the crux lies in their mass production and application at the appropriate time. The major advantages of bio pesticides are no harmful residues; target specific and safe to beneficial organisms like pollinators, predators, parasites etc. growth of natural enemies of pests is not affected, thus reducing the pesticide application; environmentally friendly, cost effective, important component of IPM as 1st line and 2nd line of defense, chemicals being the last resort. And have efficacy ranging between 60-100%. The cost for establishment of biocontrol unit is INR90 lakhs with 50% government support.

iv. Organic farming

The organic farming system is based on a holistic approach for production of food with soil and biosphere management for improvement in soil health, healthy plant life, animal life and human life. The research can be taken up at UHF, Neri to standardize the package of practices for organic farming cultivation for all the crops in the state and efforts should be undertaken to develop the inputs at the farm level. A budget of INR1000 lakhs to be provided for the same with 100% support to the university for the same.

The sample package of practices for Mango Organic farming is provided in Annexure 11.

v. Natural farming

Natural Farming is a unique chemical-free farming method and is similar to organic farming with an agroecology-based diversified farming system that integrates crops, trees, and livestock, allowing functional biodiversity.

Table 42. Essential components

Component	Constituents/process	Expected benefits
Jeevamritha	Fermented microbial culture from indigenous cow dung and urine, jaggery, pulse flour, and farm soil	Stimulates soil-microbe activity to synthesize/increase the bioavailability of essential plant nutrients in situ; protect against pathogens, and promote earthworm activity
Beejamritha	Microbial coating for seeds, based on indigenous cow dung, urine, and lime	Protects young roots from fungus and Seed-borne or soil-borne infections
Mulching (Acchadana)	Covering the topsoil with cover crops and crop residues	Protects soil from direct exposure from sunlight produces humus, conserves topsoil increases water retention, encourages soil fauna prevents weeds
Whapasa	Soil aeration, a result of jeevamritha and acchadana- represents water management through improved soil structure and humus content	Increased water availability, water-use-efficiency, increased activity of earthworms, increase resilience to drought
Inter-cropping/Mixed cropping	Cultivation of a combination of different types of crops with different canopy and maturity times simultaneously	Reduces demand for particular types of plant nutrients and increases the availability of different types of crop production on regular basis to augment farmers' income

For standardization of techniques for other crops and for reduction of cost of cultivation, it is suggested to generate most of the inputs at farm level. A budget of INR1,000 lakhs to be provided for the same for 100% support to the university for the same.

4.9.2. Hitech technologies

i. Genetic engineering

With the changing climate conditions, India is witnessing many frequent climate changes, which include lack of chilling hours, frequent heat waves. Also, not receiving proper temperature at a particular stage of plant growth results in lower flowering or fruit set. This calls for a use of biotechnology and genetic engineering to research and develop the varieties and pH resistant rootstocks that are inherently resistant to extreme climatic conditions, pest and diseases and have higher yields.

For this, a R&D center is proposed in UHF, Neri with facilities or the already existing lab in the university can be upgraded with the newest facilities for which a fund of INR5,000 lakhs is proposed. The major facilities required will have Laminar flow, hardening area, protected green, house, chemical and glass ware, RT PCR.

ii. Hydroponic

For propagation of berries and mass multiplication of planting material for pomegranate, strawberry, banana hydroponic lab can be set up at UHF, Neri.

Hydroponics can increase the yield of commercial crops because plants are grown closer together than in the field. It also eliminates weeds and pests. Hydroponics allows automation of cultivation: temperature, lightning, pH and nutrients concentration control and ventilation.

A hydroponic lab can be established for the same at a cost of INR240 lakhs.

iii. Aeroponic

Aeroponics is the process of growing plants in an air or mist environment without the use of soil or misting the roots with hydroponic solutions suspended in the air. It does not use soil or aggregate medium. Aeroponics is a subgroup of hydroponics where plant roots are suspended in a dark enclosure, while a nutrient-dense solution is sprayed on the roots at certain intervals. Nutrient delivery in this system is very precise and faster growth is possible as roots get ample oxygen.

A precise dose of nutrient can be applied in the liquid form, both organic and inorganic. The major thing is maintenance of the nozzle as small pores in nozzles get clogged. The R&D center may be established at a cost of INR210 lakhs at the university.

4.9.3. Production and post- harvest technology

The production and post-harvest technology research lab in the university should strengthen its research on protection under weather, development of coatings for enhancement of shelf-life, standardization of MAP packaging of all the crops, standardization of packaging and storage technology, development of safe products for ethylene blockage to enhance the shelf-life, standardization of CA protocols for crops like pomegranate, and citrus, enhancement of shelf-life without use of cold chain to minimize costs.

The other research and development initiatives that may be carried out in the state are as follows:

- ▶ Design of energy efficient produce evacuation solutions including well ventilated trucks for short duration haulage
- ▶ Development of active packaging solutions and usage of natural products like grass, bamboo in packaging
- ▶ Formulation of specific export shipment and logistics protocols for fruit crops
- ▶ Development of harvest and post- harvest protocols for horticulture crops including suggested intercrops for various fruits
- ▶ New technology adoption in the state for Hail control systems like Anti- hail guns, Agro- Photovoltaic Anti hail systems /solar energy anti-hail nets

The expertise in Department of Horticulture and universities shall be utilized in various projects in India as well as collaboration with international bodies shall be strengthened.

The consolidated estimated amount of INR26,710 lakhs has been allocated for all R&D activities.

E. Alternative interventions

4.10. Miscellaneous

4.10.1. Single Window Clearance

A single window system for registration, submission of applications for incentives, online trade license, approvals from other line departments for farmers, FPOs, promoters, and other beneficiaries across the state may be established or existing eUdyan portal may be upgraded. This may reduce turnaround time, transparency and may enable effective monitoring. This portal shall be integrated with other line departments' portal and also with the single window clearance portal by Department of Industries, Himachal Pradesh. The estimated cost of establishment of single window clearance system is about INR2,000 lakhs.

4.10.2. Horticulture Led Rural Resurgence

Agri/horticulture tourism is a type of activity that brings tourists to a farm or ranch to experience agricultural or horticulture products, gain knowledge about the farming occupation and enjoy different kinds of farming activities. This concept has gained massive popularity in countries like United Kingdom, New Zealand, Italy and United States. As per various reports, the global agri-tourism market was valued at US\$69.24 billion in 2019 and is projected to reach US\$117.37 billion by 2027.

States like Maharashtra and Madhya Pradesh are promoting horticulture tourism by establishing farm stays/rural stays grouped with farming activities, selling of fresh farm produce, engaging tourists in traditional games, nature walks, and educational/technical tours, wherein horticulture activities act as the main attraction.

In Himachal Pradesh, there is an immense potential to develop Horticulture tourism, the state is famous for its fruit crops such as apple, mango, plum and litchi. Currently, many tourists engage in fruit picking activities in different parts of the state, largely conducted by small farm owners. The development of horticulture tourism in the state can very well diversify income generation options for farmers and can facilitate a stable source of revenue generation apart from existing production.

Role of state government

The Department of Horticulture in consultation with tourism, forest and rural development, shall facilitate the development of horticulture tourism clusters in the state by identifying suitable land parcels across 12 districts of the state. These land parcels should preferably be located near major tourist destinations of the state such as Shimla, Manali, Dharmshala and Dalhousie to attract tourists in large numbers.

Horticulture tourism clusters can be developed by involving local communities engaged in horticulture production activities. The clusters will promote locally produced agricultural and horticultural products and serve as a platform for visitors to learn about farming, rural lifestyle, local cuisine and food products. Further, to attract tourists' facilities such as log huts, mud houses, gaming activities, nature walks, trekking and hiking activities can also be developed. The revenue generated by these clusters will improve the livelihood conditions of local farmers and their surrounding communities.

Further, the state government in its budget 2022-23 has announced that Kotgarh- Thanadhar and adjoining areas in the Shimla district will be developed as the Satyanand Stokes Trail for which a comprehensive plan shall be developed through convergence with the coordination of the Horticulture, Tourism, and Language & Culture Departments. The Satyanand Stokes Trail can be developed by the Department of Horticulture under the concept of horticulture tourism cluster.

In order to facilitate the development of Horticulture tourism clusters in the state, approximately INR200 crores is proposed for 12 clusters. The breakup of estimated cost of development of horticulture tourism is provided in Annexure 5.

Some of the interventions that are proposed to promote Rural resurgence in terms of Horticulture Tourism is as follows:

- ▶ Viability gap funding to setup accommodation facility for horticulture tourism project ranging from INR50 lakhs to INR5 crores depending on the size of accommodation facility
- ▶ Assistance in financial support for development of approach road, construction of water pipe till the proposed horticulture tourism cluster/orchards
- ▶ Providing interest subsidy on the loan taken from banks, state financial corporations, or any state-level financial institutions subject to a maximum of INR25 lakhs for a period of five years
- ▶ Assistance in marketing and promotion of horticulture tourism clusters/orchards, the department in coordination with Tourism department may provide financial assistance of INR5 lakhs per cluster in a year to organize festival or events in the premises of tourism service providers, including home- stays

4.10.3. Apiculture

It is proposed that 50% of cost for all components including production of bee colonies by breeder, honey- bee colony, bee- hives and equipment shall be provided. This includes bee boxes and tool kits for beekeepers containing a smoker, bee veil, knife and hive tools and comb foundation units at INR26,000/box and honey processing unit at the cost of 1 crore. Honey processing unit of INR1 crore is proposed to support operational expenses for at least 3 years and purchase of pickup vans.

Quality testing laboratory for honey

The labs should have a testing facility with NMR (Nuclear Magnetic Resonance Technique which can do chemical fingerprinting of honey, unique to each batch and reliably detect purity issues, botanical source so that there is no mixing and adulterants. The cost of this type of laboratory is INR2,000 lakhs to be established by government.

In addition, promotion of fruit, flower-based honey and also value addition products/by- products including bee wax, propolis, pollen, royal jelly, bee venom. The capacity building program has been discussed in Section 4.6.3.

It is difficult for honey- bees to survive in winters as it is dearth period and also due to cold weather and lack of flowers. Thus, migration is mandatory for bees' survival in winter season especially in temperate regions. Thus, about 50% assistance for migration of honey- bees up to 2 lakhs per farmer/individual shall be provided.

It is also proposed to develop 3 Integrated Beekeeping Development Centre in each of the zones in Himachal Pradesh with about INR10.5 crores each with 100% contribution from government.

The total cost of interventions in apiculture comes about INR7,665 lakhs with government support of INR6,459 lakhs. The details are provided in Annexure 9.

4.10.4. Mushroom

Automatic spawn production unit

For modernization of mushroom production unit, we suggest establishing an automated spawn production unit at the rate of 1 ton/day with an investment cost of INR2.86 crore. Kangra and Hamirpur may be considered for automatic mushroom production unit based on discussions with DDH. The facility may be extended to other districts after initial success. The details are provided in Annexure 9. It is proposed maximum permissible cost of INR150 lakh/unit, INR40 lakh/unit and INR25 lakh/unit for automated

production unit, spawn making unit and compost unit respectively in which about 50% of the cost for private sector as credit linked subsidy. This is applicable for all varieties of mushrooms including specialty mushrooms. Thus, out of INR286 lakhs, INR215 lakhs by government and rest by private sector.

Mushroom canning

Mushroom canning is a method of preserving mushroom in which the food contents are processed and sealed in an airtight container (like mason jars, and steel and tin cans). Canning provides a shelf life typically ranging from one to five years, although under specific circumstances it can be much longer. The total cost for establishment of mushroom canning plant is INR20 lakhs. This plant can also be utilized for canning of other fruits like apple, pear, aonla, jackfruit, pineapple, kiwi, fig and guava.

In addition, production of specialty mushrooms like medicinal mushrooms may be promoted.

4.10.5. Floriculture

The packhouse for flowers that is proposed to be established in the Kangra district can also be linked to flowers export-oriented unit. At least, one export-oriented packaging house for flower crops should be established in Himachal Pradesh of cost about INR1,000 lakhs. A separate pavilion shall be provided in Ghazipur mandi of total cost of about INR10 lakhs with 50% assistance from government. Specialty flowers shall be promoted and incentivized. Specialty flowers shall be promoted and incentivized. Thus, total cost under floriculture is about INR1,010 lakhs with 100% contribution from government.

4.10.6. Health and Nutrition

The survey report of National Family Health Survey (NFHS) of HP states that more than 30% of the children under the age of 5 were found to be stunted stating poor nutrition as the major reason. Among the states of HP Chamba (42.6 percent), Bilaspur (40 percent) and Kullu (36 percent) showed the major percentage of stunted growth due to lack of proper calories, nutrient, and proteins in food.

To make Himachal Pradesh people nutritionally rich following interventions are required:

- ▶ Integration of horticulture produce in mid-day meal scheme. Flowchart with nutritional data can be circulated in aganwadi and nutrition and food security teaching should be made mandatory.
- ▶ Observing days like “Fruits day” to spread the theme of “Horticulture-as nutritional crops”
- ▶ Nutritional gardens with various fruit trees will be promoted along with homestay facilities

The estimated cost for facilitation and awareness campaigns is about INR60 lakhs shall be allocated.

4.10.7. Initiatives with other line departments

Department of Horticulture may be given priority to related activities in other state departments in Himachal Pradesh like Public Work Department (PWD), Himachal Pradesh Tourism Development Corporation (HPTDC), Department of AYUSH, Jal Shakti Vibhag, Department of MSME, Department of Information Technology etc. as well as Central Ministries.

4.10.8. Introduction of new and improved germplasm and quality planting material

Appropriate planting material and rootstock are the backbone to achieve higher productivity in horticulture crops. Immediate measures should be taken for adequate availability of planting material of latest varieties to the farmers. Similarly, looking into the climatic conditions, stress tolerant root stock (for specific conditions) should be made available to farmers.

4.10.9. Standards for domestic and export market

GLOBALGAP (EUREPGAP) standards are recommended for trading in export market for ease of doing business. Measures can be adopted by authority to do audits for checking such certification are done in appropriate manner to avoid any kind of risk and fraudulent practices.

4.10.10. Integration of infrastructure

Revamping of existing production infrastructure for instance poly houses, green houses to cultivate high value crops like strawberry.

4.10.11. Carbon markets

Implementation of carbon marketplace concept to encourage farmers follow environmentally beneficial agriculture practices.

4.10.12. Financial institutions

DoH may work with financial institutions, non- banking financial companies, banks, fin tech companies to introduce innovative financial solutions to provide credit services to farmers/FPOs and increase digital payments. A challenge fund may be created where NBFCs/FIs may be called with their innovative financial solutions to support farmers, similar to Assam Challenge Fund.

4.10.13. Weather related information dissemination

Automated weather forecasting systems should be used for forecasting accurate information at least 15 days in advance and disseminate this information to FPOs, so that they can take appropriate remedial measures against hailstorms, frost and temperature extremities.

4.10.14. Rural advisory services

Promoting inclusive Rural Advisory Services, while investments in R&D are needed in order to expand the potential for sustainable production, sharing knowledge about technologies, and innovative practices among family farmers is perhaps even more important for closing existing gaps in productivity and sustainability. Modern extension features many kinds of advisory services as well as service providers from the public, private and non-profit sectors.

In order to share the technical knowledge, a system of community radio is important to deliver advisory services and sharing of knowledge among community members.

4.10.15. Gender inclusion

FAO estimated that women's agricultural yields could increase by 20-30% if the gender gap in accessing agricultural inputs and extensions services were closed. This, in turn, could raise total agricultural output in developing countries by 2.5-4%, which has the potential to reduce the number of food-insecure people in the world by 12-17%. Having a gender-inclusive approach can be a part of reducing this disparity for women in agriculture globally. The approach should be to build a gender inclusive action plan and provide women with leadership roles.

For promoting more women participation **extra incentives** (1% extra) should be provided to the collectives who have a greater number of women members and women in the leadership roles. It is imperative that at least 30% women should be benefited from above schemes.

4.10.16. Electricity

Agriculture electricity connections may be given to horticulture including mushroom production units.

4.10.17. Registration and stamp duty incentives

50% Exemption from payment of stamp duty for lease of land/shed/buildings and mortgages and hypothecations related to horticulture.

4.10.18. Tax holiday

State GST exemption for 5 years for any services rendered in horticulture sector including sale and purchase of horticulture produce or products.

4.10.19. Self- regulation

As the government is gearing towards a regime of self-compliance it is suggested that state should encourage FPOs to voluntary adopt all requirements for setting up and the operation of GAP, organic production, processing units licenses and regulations, building regulations, products and standards, packaging and labelling, environment and pollution control and these should be regularly monitored by the members.

For all the above interventions from Section 4.10.7 to Section 4.10.19, total estimated cost is INR10,000 lakhs.

4.11. Total investment and financing arrangements for proposed interventions

The table below highlights the financing arrangement for each of the proposed interventions- infrastructure, augmentation of value chain, capacity building, institutional strengthening, research and development, and others:

Table 43: A. Interventions under infrastructure development

A. Interventions under infrastructure development	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Operation and Maintenance	Total cost by government (INR Lakhs)	Total cost by private/ FPO (INR Lakhs)
Irrigation Infrastructure	Refer Section 4.1.1.		55,006	80% for small and marginal farmers and other farmers and 100% for FPOs		49,505.4	5,501
Integrated laboratory with Plant tissue analysis labs	12	200	2,400	100% assistance to public sector or 60% to private sector subject to maximum project cost norm INR2 crore/unit.		2,400	0
Input Shops	24	10	240	80% of the project cost as back ended subsidy in case of FPOs, 50% in case of private player. Maximum limit of project cost of INR10 lakhs.	FPO/Cooperatives/Entrepreneur will be responsible of O&M of shops	159	81

A. Interventions under infrastructure development	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Operation and Maintenance	Total cost by government (INR Lakhs)	Total cost by private/ FPO (INR Lakhs)
Collection centres	247	INR28 lakhs for flower CC and INR30 lakhs for remaining	7,396	80% of the project cost as back ended subsidy and 20% Promoter's Contribution. Maximum limit of project cost of INR30 lakhs.	Management Committees of the Cluster Groups managing the orchards/promoter	5,917	1,479
Pack house	38	INR426 lakhs for fruits packhouse and 152 for flower packhouse	15,914	55 % of the project cost as back ended subsidy and 45% may be the promoter's contribution. Maximum limit of project cost of INR4 crores.	A Joint Venture will be formed between FPO and strategic partner. This strategic partner will be responsible for the O&M of the pack house or promoter	8,224	7,690
Packhouse-automated packaging lines, specialized High Reach Material Handling Equipment	26	Refer Section 4.1.5.	637	100% assistance as per invoice, maximum of INR15 lakh per project and INR17 lakhs per unit, maximum of 2 units respectively.		637	0
Processing units	10	Refer Section 4.1.7.	2,378	55 % of the project cost as back ended subsidy and 45% may be the promoter's contribution. Maximum limit of project cost of INR10 crores	A Joint Venture will be formed between FPO and strategic partner. This strategic partner will be responsible for the O&M of the pack house or promoter	1,308	1,070
Ripening chamber	4	300	1,200	Credit linked back-ended subsidy @55% for maximum of 300 MT per beneficiary for private entrepreneurs and it is 80% assistance for FPOs. Maximum limit of project cost of INR3 crores	A Joint Venture will be formed between FPO and strategic partner. This strategic partner will be responsible for the O&M of the pack house or promoter	810	390
Controlled Atmosphere storage	2	750	1,500	Credit linked back-ended subsidy @55% per beneficiary for private entrepreneurs and 45% assistance for	A Joint Venture will be formed between FPO and strategic partner. This strategic partner will be responsible for	1,012.5	487.5

A. Interventions under infrastructure development	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Operation and Maintenance	Total cost by government (INR Lakhs)	Total cost by private/ FPO (INR Lakhs)
				FPOs. Maximum limit of project cost of INR7.5 crores for 1000 MT	the O&M of the pack house or promoter		
Hitech Markets	Refer Section 4.1.9.		1,00,000	~70% government share and 30% from promoter	O&M will be done by the strategic private partner in the PPP.	70,000	30,000
Export hubs	3	5,000	15,000	~70% government share and 30% from promoter	O&M will be done by the strategic private partner in the PPP.	10,500	4,500
Material ropes	14	18 lakhs/km and 10 km each	2,520	50% government assistance and 50% private contribution, with cost norm of 18 lakh/km with credit linked back-ended subsidy @ 50% of capital costs		1,260	1,260
Sub Total (A)			2,04,191			1,51,733	52,458

Note: The subsidy can be linked to the progress of project and can be released in instalments

Table 44: B. Interventions under value chain augmentation

B. Interventions under value chain augmentation	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Total cost by government (INR Lakhs)	Total cost by private/ FPO (INR Lakhs)
FPOs	500	54	27,000	Refer Section 4.1.	13,500	13,500
Nursery infrastructure including Tissue culture lab under HPSHIVA	10	Refer Section 4.3.	1,681	Grant/Project assistance to promoter contribution is considered as 50 :50 in case of all fruit crop nurseries establishment subject to limits as mentioned in Section 4.2.	747	934
Nurseries for citrus and other fruits under additional area expansion	8	Refer Section 4.3.	1,141		500	641
Upgradation of nurseries	2	100	200	100% Government	200	0
Establishment of orchards- fruits	Refer Section 4.4.		89,973	50% assistance to Ultra/ high density planation upto limit of INR 5 lakh/ ha and others at 50% subject to MIDH limits based on type of fruit crop	44,986.5	44,986.5
Cultivation of flowers	Refer Section 4.4.		9,110	50% of the cost subject to limits based on type of crop	4,555	4,555
Fencing	36,905	5	1,84,525	70% assistance to farmers	1,29,168	55,358
Anti hail nets	36,905	3.5	1,29,168	INR35 per sq.m as per MIDH with 80% subsidy including state additional contribution	1,03,334	25,834

B. Interventions under value chain augmentation	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Total cost by government (INR Lakhs)	Total cost by private/ FPO (INR Lakhs)
Anti hail net support system	50% bamboo and 50% steel		66,430	As per KUSHY scheme- 50% subsidy, proposed to applicable for all fruit crops	33,215	33,215
Crop Insurance	Refer Section 4.4.3.		1,800	50% of premium each by government and farmers	900	900
Improved productivity	Refer Section 4.4.4.		53	100% by government	53	0
Product development for indigenous commodities and value addition	21	5	105	3 patents every year	105	0
Good agricultural practices	28	0.75	21	4 patents every year. 60% of cost subject to maximum of INR40,000/ha with maximum of 4 ha/beneficiary.	11.2	9.8
Integrated pest and nutrient management	36,905	0.4	14,762	50% of cost subject to a maximum of INR20,000 per ha limited to 2.00 ha per beneficiary with project cost norm of INR40,000/ha	7,381	7,381
Organic farming	5,000	0.1	500	one time assistance of INR10,000 per ha for branding and promotion of organic produce.	500	0
Natural farming	Refer Section 4.4.9.		942.5	One time assistance of Rs 2500 per ha (additional INR 500). Other subsidy as per Prakritik Kheti Khushal Kisan Yojana shall prevail	684	258.5
Packaging material	5,00,000	0.25	1,25,000	one time reimbursement @ 25% of packaging material cost	31,250	93,750
Green technology	100	0.2	20	assumption of 100 individuals/FPOs adopt green technology, INR20,000 per individual/FPO	20	0
Horticulture mechanization	1	5,000	5,000	Additional subsidy of about 10% (thus total 60% subsidy) may be given to all components	3,000	2,000

B. Interventions under value chain augmentation	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Total cost by government (INR Lakhs)	Total cost by private/ FPO (INR Lakhs)
Drone Technology	20	10	200	60% subsidy or maximum of INR5 lakh	100	100
IoT driven Value Chain	Refer Section 4.4.14.		10,000	100% government	10,000	0
Sub Total (B)			6,67,631		3,84,209	2,83,422

Table 45: C. Capacity building and institutional strengthening

C. Capacity building and institutional strengthening	Total cost (INR Lakhs)
Training and capacity building activities	
Nursery development and plantation	198
Value chain development	28,451
Apiculture	417
Mushroom	381
Floriculture	750
Marketing, branding and outreach strategy	5,000
Quality standards and export facilitation	5,000
Vocational courses	350
Horticulture university/college/institute	50,000
Augmentation of human resources	700
Incubation centre	10,000
Centre of excellences	6,000
Project consultancy and management unit	3,500
Professional agencies	2,100
Sub Total (C)	1,12,847

Table 46: D. Research and development

D. Research and Development	Number	Unit cost (INR Lakhs)	Total cost (INR Lakhs)	Mode of funding	Total cost by government (INR Lakhs)	Total cost by private/FPO (INR Lakhs)
Bioenhancers	1	20	20	100% by Government	20	0
Biofertilizer unit	1	50	50	50% by Government	25	25
Biopesticide unit	1	90	90	50% by Government	45	45
Organic farming	1	1,000	1,000	100% by Government	1,000	0
Natural farming	1	1,000	1,000	100% by Government	1,000	0
Genetic engineering lab	1	5,000	5,000	100% by Government	5,000	0
Hydroponic lab	1	240	240	100% by Government	240	0
Aeroponic lab	1	210	210	100% by Government	210	0
PHM lab	1	20,000	20,000	100% by Government	20,000	0
Sub Total (D)			27,610		27,540	70

Table 47: E. Alternative interventions

E. Alternative interventions	Total cost (INR Lakhs)	Total cost by government (INR Lakhs)	Total cost by private/FPO (INR Lakhs)
Single window clearance	2,000	2,000	0
Horticulture led rural resurgence	20,000	20,000	0
Apiculture	7,666	6,459	1,207
Mushroom	306	235	71
Floriculture	1,010	1,010	0
Health and nutrition	60	60	0
Others	10,000	10,000	0
Sub total (E)	41,042	39,764	1,278

Table 48: Summary of interventions

S. No.	Component	Total cost (INR Lakhs)	Government (INR Lakhs)	Private/others (INR Lakhs)
A	Infrastructure development	2,04,191	1,51,733	52,459
B	Value chain augmentation	6,67,631	3,84,209	2,83,422
C	Capacity building and institutional strengthening	1,12,847	1,12,847	0
D	Research and development	27,610	27,540	70
E	Alternative interventions	41,042	39,764	1,278
	Grand total	10,53,321	7,16,093	3,37,229

The year wise phasing of the investment is provided in Annexure 12.

4.11.1. Model for operation of infrastructure

The infrastructures can be developed on Public Private Partnership mode through a Special Purpose Vehicle formed by the Directorate of Horticulture, Government of Himachal Pradesh. The SPV can enter into a Joint Venture with a third party or the CHPMAs/FPOs for operation and management of the integrated facility centres. The infrastructure can be developed and operated on a build-own-operate model.

Role of the SPV

- ▶ Role of the SPV under this model shall be to identify the locations for development of the central hub and the retail outlets and to arrange the land required for the development from HUDA, Municipal Corporations, Panchayats etc.
- ▶ Thereafter the SPV shall select a concessionaire for development of the infrastructure on a build-own-operate model.
- ▶ The SPV may consider leasing out the land on subsidized rates and may also infuse equity into development of the infrastructure.
- ▶ It is preferable that the SPV holds less than 51% shareholding in the joint venture company for a more flexible organizational structure.
- ▶ In addition of revenue sharing from operational profits, the SPV may also charge the concessionaire an annual user fee for the infrastructure.
- ▶ SPV shall be responsible for monitoring the construction progress of the infrastructure and performance of the third party against stipulated performance criteria.
- ▶ The SPV shall assist the third party in obtaining statutory approvals required for establishment of the infrastructure.

Role of the concessionaire

- ▶ The concessionaire shall be responsible for development of the infrastructure within the stipulated timelines.
- ▶ The concessionaire shall seek and obtain all the statutory approvals required for construction and operation of the facilities to be created.
- ▶ Thereafter the concessionaire shall operate and manage the facilities including procurement of material, storage, primary processing, packaging and retail through the outlets.
- ▶ Revenue from operations shall be shared with the SPV as per the stipulated terms of agreement of the joint venture.
- ▶ The concessionaire shall make timely payments against the user fee for the infrastructure as applicable.



5

Conclusion and
way forward

5. Conclusion and way forward

Himachal Pradesh is currently known as “Apple state of India” and the horticulture sector has been very significant in the development of state, which is mostly dominated by temperate fruits. The state government is focused on the development of the horticulture sector in its entirety with emphasis on all the aspects and integrating within its ambit the subsidiary sectors too.

The strategy was formulated based on focused crop categorization for the state, stakeholder mapping and analysis of their influence on supply chain of the perishables. The sector development is proposed by adopting end-to-end holistic approach covering pre-production, production, post-harvest management, processing, and marketing. The focus is to provide appropriate returns to growers/producers, by promoting R&D technologies for cultivation and production. Shelf-life extension through post-harvest management and processing with special focus on cold chain infrastructure. Productivity improvement is suggested diversification from traditional crops to plantations, orchards, flowers and extension of appropriate technology to farmers for high-tech horticulture, precision farming and promoting subsidiary sector development. Benchmarking studies were done to identify the areas of improvement, effective post-harvest management, processing for value addition and marketing infrastructure. Benchmarking studies also suggested on adopting a coordinated approach, promoting partnership, convergence and synergy among R&D, processing, and marketing agencies, promote cooperatives/FPOs and their tie up with Market Aggregators (MAs) and Financial Institutions (FIs) to support adequate returns to farmers, support capacity-building, and the focus is also on human resource development, change in syllabus and curriculum of graduation courses at Colleges, Universities and vocational courses, and human resource and financing arrangement and Financial support through schemes at different levels of value chain.

Recommendations

Base on crop categorization and focused crops the area expansion is proposed as 36,905 ha: 10,000 ha for HPSHIVA, 16,800 under HPHDP and 10,105 ha for other crops. The total area expansion proposed is about 16% of current area under fruit cultivation (2.35 lakh ha in 2020- 21). For floriculture, area expansion has been proposed for 1,200 ha, for honey production an increase of 2,400 MT has been proposed and for mushroom, 14,000 MT additional production is presumed by 2030.

The strategy for development of horticulture has been covered under following aspects: augmentation of value chain through technological inputs, emphasis on infrastructure development, focus on research and development, capacity building and institutional strengthening, development of marketing, branding and outreach strategy, implementation of quality standards, export market facilitation and other interventions. A summary of all these interventions is provided below:

Infrastructure development

Pre harvest and testing infrastructure includes an integrated laboratory with plant tissue analysis labs may also include soil, water analysis, maximum residual limit analysis (MRL), heavy metal analysis labs (1 for every district), 24 input shops among production infrastructure. Post-harvest infrastructure comprises of 247 collection centres, 38 pack houses, 10 processing facilities, 4 ripening chambers, 2 CA storages, establishment of 2 hi-tech markets, strengthening of existing markets (at least 1 in every district), 3 export hubs and 14 material ropeways. The total proposed cost for this component is INR2,04,191 lakhs (INR2,041.91 crores) with government contribution of INR1,51,733 lakhs (INR1,517.33) and private contribution of INR52,459 lakhs (INR524.59 crores).

Augmentation of value chain

The augmentation of value chain includes formation of FPOs, establishment of nurseries and orchards, protective structures, insurance, and rewards, supported by IPNM and promotion of organic, natural farming and green technology.

Collectivization and formation of FPOs is one of the most important steps towards development of sustainable and robust supply chain. It is proposed to develop 500 FPOs in the state, out of which 217 FPOs are proposed in the new areas proposed for expansion with following breakup commodity group wise (189 for fruits, 7 for flowers, 14 for honey and 7 for mushroom). Additional 283 horticulture FPOs by mobilizing farmers from existing area under Horticulture (Only 30 FPOs have been formed till date). Member size for each FPO should be minimum of 100.

It is proposed to establish 18 nurseries including one with tissue culture lab and 2 with virus indexing facility along with upgradation of two nurseries. Shahpur Nursery in Kangra may be upgraded for Sweet Orange and Guava. Similarly, Bhumpal PCDO in Hamirpur may be upgraded for Sweet Orange.

Establishment of new orchards and rejuvenation is taken on scientific cultivation technology with high-density planting, ultra- high-density planting and normal spacing. Protection measures are proposed in terms of composite fencing for protection from wild animals, anti-hail nets for climate protection.

The value chain is further augmented by crop insurance, rewards for improved productivity, support for patents and GAP, IPNM, packaging material, drone technology and IoT. The total proposed cost for augmentation of value chain is INR6,67,631 lakhs (INR6,676.31 crores) with government contribution of INR3,84,209 lakhs (INR3,842.09 crores) and private contribution of INR2,83,422 lakhs (INR2,834.22 crores).

Capacity building and institutional strengthening

Institutional strengthening is vital in successful development of the horticulture sector in Himachal Pradesh. The flagship capacity building program named “Kshamta se Samruddhi” by Department of Horticulture may be implemented which would be responsible for the overall capacity building related to horticulture in the state.

A Project Consultancy and Management Unit (PCMU) may be set up at Department of Horticulture, Himachal Pradesh to handhold the department, monitor effective implementation of the policy. The PCMU may coordinate with relevant stakeholders and update government from time to time regarding its implementation. Under the PCMU three professional agencies will be engaged for training and capacity building, marketing and branding, quality standards and export marketing.

The training and capacity building programs are emphasized on nursery development, value chain development, apiculture, mushroom, and floriculture with durations of trainings between 2-5 days also strengthened by exposure visits within and outside the state.

The marketing of fruit is a complex process and includes all the functions and processes involved in the movement of the produce from the growers to final consumers. The marketing activities will be undertaken in collaboration with Himachal Pradesh State Agricultural Marketing Board (HPSAMB) and will be both through regular markets, newly established hi-tech markets and integration with online portals too. Under branding activities major work will be promotion of the produce under “Himachal Farm Fresh” brand and pre-established marketing linkages. The outreach strategy shall have two distinct dimensions and will focus on propagating knowledge/information about schemes, various program, and strengths of horticulture in HP and to attract private investment in the sector. The institutional strengthening pays emphasis on vocational courses, establishment of Horticulture universities, augmentation of human resources, establishment of incubation centre and Centre of Excellences (CoEs). The total proposed cost for this component is INR1,12,847 lakhs (INR1,128.47 crores).

Research and Development

Research and development is the most important component promoting sustainability and development of the sector in the long term. The focused components of R&D include eco- friendly research, hi-tech research, production and post-harvest management technologies, including standardization of PHM protocols, shipment protocols, active packaging solutions, export shipment and logistics protocols, harvest and post-harvest protocols, new technology adoption in the state like photovoltaic anti hail systems /solar energy anti-hail nets, etc. The total cost for the R&D component is INR27,610 lakhs (INR276.10 crores) mostly proposed under government share to the tune of INR27,540 lakhs (INR275.40 crores) and INR70 lakhs as private share.

Alternative interventions

Alternative interventions include establishment of single window clearance system, horticulture led rural resurgence, quality testing laboratory for honey, development of honey by-products, automatic spawn production unit, canning unit, export-oriented floriculture units, horticulture nutrition gardens.

Alternative interventions also include integration with other line department, introduction of new and improved germplasm, standards for domestic and export markets, integration of infrastructures, carbon markets and integration of financial institutions, weather related advisory services, gender inclusion, electricity, support, registration and stamp duty incentives, tax holiday and self-regulations. The total estimated cost for these components is INR41,042 lakhs (INR410.42 crores).

Outcomes of the Horticulture Sector Development Strategy

The outcomes from the strategy and focused development of the sector are presented herein below:

Expected quantitative outcomes:

- ▶ An overall average assistance of about 60% to beneficiary related to establishment of orchards, anti hail nets, fencing, integrated pest and nutrient management, irrigation etc.
- ▶ Collectivization of farmers through formation and promotion of about 500 Farmer Producer Organizations dedicatedly in the Horticulture sector
- ▶ The establishment and strengthening of about 18 hi- tech nurseries with production capacity of about 18 lakh planting material per annum
- ▶ Adoption of High and Ultra high density, an increase of 26% and 29% in yield per hectare respectively is expected compared normal spacing
- ▶ Target coverage of about 1 lakh hectares under Micro irrigation to save water by 70% results and help in promotion of ancillary industries and water conservation
- ▶ Protection from wild animals through adoption of composite fencing system to save about 20-25% damage to the crops without harming animals
- ▶ Additional area of about 37,000 ha to be brought under Integrated Pest and Nutrient Management
- ▶ Additional 10,000 ha is proposed to be covered under Organic farming and Natural farming with 5,000 ha allocation for each
- ▶ GAP certification including training, registration, and certifications at zero cost for farmers and targets to cover about 4 certifications every year. GAP certification cost may be paid by Department of Horticulture to empaneled consultants
- ▶ About 5 lakh farmers may be benefitted from one- time packaging cost reimbursement
- ▶ Impetus for use of green environment friendly technologies and estimated to be adopted by 100 individuals/FPOs in Horticulture produce/products which will have a larger impact on environment

- ▶ The horticulture crops currently which are not covered under any insurance may receive sum insured in case of adverse weather event which is estimated to be about 1.3 times cost of cultivation (Cost of cultivation ~1.95 lakhs) at approximately 2.5% premium by farmer and remaining premium percentage as charged by insurance company may be borne by government
- ▶ About 15- 20 collection centres, 2-4 packhouses per district and total of 10 processing units, 4 ripening chambers and 2 CA storages in the state to be established
- ▶ Skill development for all stakeholders in the value chain through sophisticated capacity building program- “Kshamta se Samruddhi” which may benefit more than 2 lakhs stakeholders
- ▶ Seamless coordination among line departments and enhanced approval process through single window clearance and process any requests within 30 days
- ▶ Target to have at least 30% women participation in various activities across the value chain

Expected qualitative outcomes:

Table 49: Qualitative outcomes

Component	Qualitative Outcome
Infrastructure benefits	▶ Providing protection against frost damage and excessive heat ▶ Better quality fruits due to uniform irrigation ▶ Support for development of ancillary industries e.g., drip pipes, jointers, mains, laterals, water storage systems, connectors, valves, drippers, etc.
Post-harvest infrastructure	▶ Post-harvest infrastructure will help in primary processing of the produce. Sorted produce will help in transfer of infection from one infected produce to another while graded produce will get better price in the market ▶ Controlled atmosphere storage will help in extending the shelf-life of produce for many months so that farmer collectives can plan the marketing as per demand in the market ▶ Processing facilities can be a major revenue earner as this will help in creating new and diversified products along with generation of employment ▶ Increase in market avenues and better price realization due to Export hubs, Hi- Tech Markets ▶ Transport and logistics infrastructure will support in reducing the time required to reach the market and the produce will reach the market in better condition
Hi Tech nurseries	▶ Inhouse production of disease free true-to-type quality planting material ▶ Saving on transportation cost leading of benefits to the farmers and environment ▶ Assurance of quality and lower mortality ▶ Development of ancillary industries for polyhouse, shade net, water storage structures, mist system, fan and pad system, grow bags, laboratory chemicals, glass wares etc.
Anti- hail nets and composite fencing	▶ Assistance in installation of support system for anti- hail nets for all crops as well as installation of anti- hail nets ▶ Composite fencing installation to protect from wild animal's attack
Crop Insurance	▶ Helps to mitigate the impact of adverse weather events ▶ Provides assurance to farmers to continue farming activities and not migrate to other occupations
Integrated Pest and Nutrient Management	▶ Reduces the pesticide problem, making the product more suitable for export ▶ Better for environment and human population ▶ Reduces ground water contamination ▶ Decreases workers' exposure to pesticides

Component	Qualitative Outcome
	▶ Reduced cost when compared to chemical pesticides ▶ Supplies balanced nutrition, timely application and foliar application ▶ Prevents hidden deficiencies and minimize the antagonistic effects resulting from nutrient imbalance ▶ Enhances the availability of applied as well as native soil nutrient
Organic farming	▶ Enhances the organic carbon content in soil ▶ Reduces pesticide and chemical residue in the soil ▶ Promotion of biodiversity ▶ Consumes less energy as it doesn't rely on the use of synthetic fertilizers ▶ Long-term sustainability ▶ Soil conservation and better waste management
Natural farming	▶ On-farm generation of inputs, resulting in lower cost ▶ Low application of pesticides ▶ Better for soil, water, and environment
Good Agriculture Practices	▶ For Indian farmers and exporters, compliance with GLOBALGAP is a must for the export of various fresh fruits and vegetables to European Countries
Packaging	▶ Standardization of crop-specific packaging technology ▶ Promotion of new, innovative and biodegradable packaging like banana leaves, starch coating, grass and bamboo, etc.
Capacity Building and Institutional Strengthening	▶ Effective and timely dissemination of scientific information to stakeholders ▶ Augmentation of related infrastructure including Centre of Excellences, etc. as well as human resources
Research and Development	▶ Focus on need-based research specific to the state ▶ Development of climate resilient varieties ▶ Development of post-harvest and shipment protocols
Other Outcomes	▶ Create competitive environment among farmers and FPOs to achieve the highest productivity, participation in online trading system ▶ Encouraging startup ecosystem through establishment of incubation centre and additional assistance in filing of patent ▶ Better reach of inputs, coordination, and information dissemination ▶ Additional income generation through horticulture tourism, foriculture, apiculture, mushroom etc. ▶ Improve nutrition among people in HP

Cumulative impact:

- ▶ This policy is expected to bring significant increase in productivity from 4 MT/ha to 20 MT/ha through the implementation of scientific modern technologies
- ▶ In terms of manpower enrichment, the policy will have employment generation to the tune of 6,00,000 and is expected to have a 2.5 times multiplier effect
- ▶ Doubling the contribution of horticulture in state GDP by 2032 and ultimately result in achieving the vision- Himachal Pradesh as the "Fruit bowl of India"

Way forward

The strategy described above put forwards a way for the horticulture sector development in the state and presents the way forward to achieve the suggested growth of 16% expansion in area and productivity matching with India average till 2030. The proposed strategy, once successful, will also have a spill-over effect on neighboring farmers and will pave a way to stop migration to the cities and create ample opportunities for the young population of the state at their respective native locations. The formation of FPOs in the state will result in collectivization of the produce and give them greater power for negotiating with marketing companies. Creation of the “Himachal Farm Fresh” brand in the state and implementation of the outreach activities will position the state produce in better competition and help in leveraging the marketing opportunities. The training programs will help in the implementation of scientific cultivation technology, better post-harvest management practices and retention of quality through better infrastructure for primary processing, secondary processing, storage, logistics and transportation.

The collectivization of farmers and produce, support form state government and donor agencies, leveraging schemes for central and state government and the development of ancillary industries will provide the project with capacity to bring a positive change in the state economy, increase share in the GDP, attract youth in horticulture and food processing, generate large scale employment, and create a cycle of development and growth in the state.





Annexures

Annexures

Annexure 1: Technical session plan

The workshop with different stakeholders including farmers, wholesalers, retailers, processors, commission agent, department officials, HPMC officials, marketing board officials, university officials, Asian Development Bank members was organized at Shimla on 27 April 2022. The technical session plan is attached below:

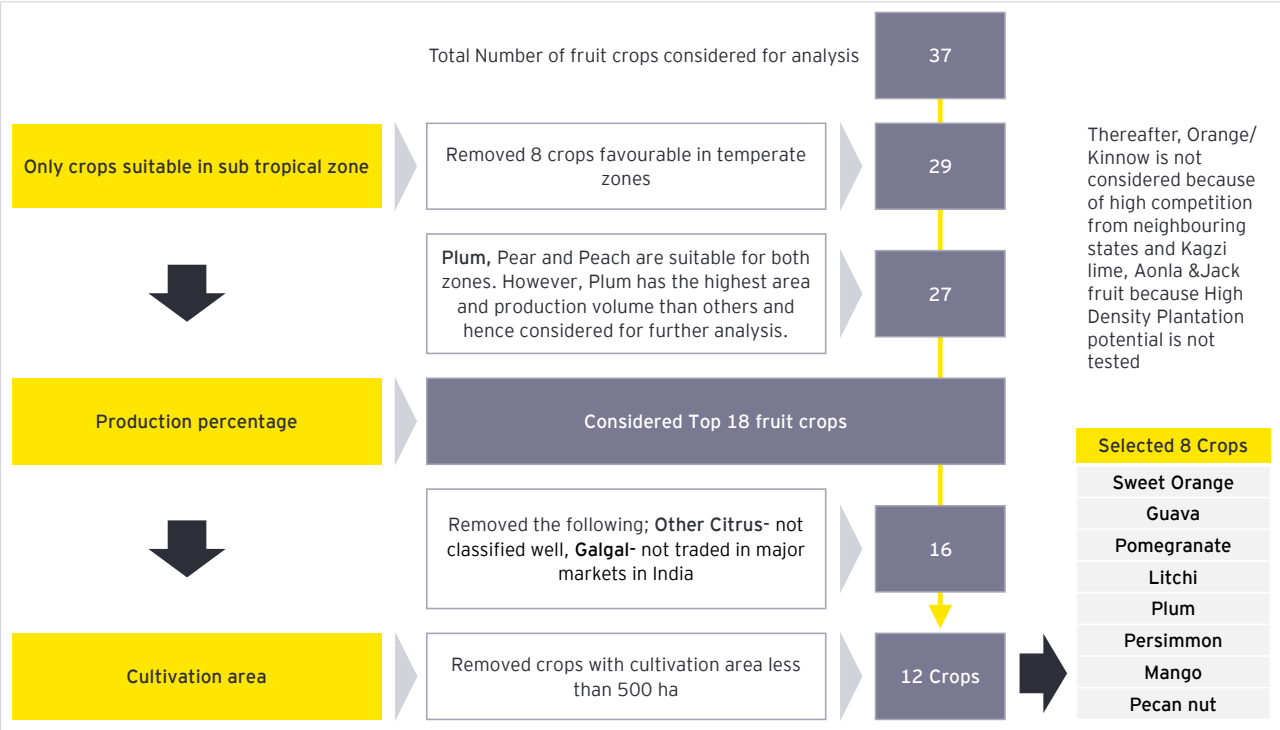
Table 50: Workshop session plan

Workshop Session	
10:00 AM	Arrival of the participants
10:05 AM–10:10 AM	Welcome of the Chief Guest- Honourable Minister/Secretary, Horticulture, and participants by Director, Horticulture, Himachal Pradesh and PMU HPSHIVA
10:10 AM–10:20 AM	Lighting of lamp and inauguration of workshop by the Chief Guest (Chief minister/Secretary Horticulture)
10:20 AM–10:30 AM	Brief Introduction to HPSHIVA project by Project Director, HPSHIVA
10:30 AM–10:45 AM	HP Horticulture Sector Development Strategy, Dr. Satyam Shivam Sundaram, Partner, Ernst & Young (EY)
10:45 AM–11:00 AM	Key Note Address by Director, Horticulture, GoHP
11:00 AM–11:15 AM	Address by the Secretary, Horticulture, GoHP
11:15 AM	High Tea
Technical Sessions	
12:00 PM–12:30 PM	Marketing of subtropical produce by Sh. Naresh Thakur, Chairman, Marketing Board
12:30 PM–1:00 PM	Key learnings from World Bank funded project- Himachal Pradesh Horticulture Development Society by Project Director, HP HDP
1:30 PM– 2:00 PM	Strengthening of subtropical fruit nurseries and Quality planting material production and management in nurseries by Dr. Arun Kumar Johri, Consultant, EY
2:00 PM–2:45 PM	Lunch
2;45 PM–3:15 PM	Experiences from Hi-Tech Nurseries
3:15 PM–3:30 PM	Expectations of the stake holders
3:30 PM–4:00 PM	Compilation of workshop by Procurement Manager, HPSHIVA
4:00 PM–4:15 PM	Vote of Thanks by Nodal Officer

Annexure 2: Key findings from Nursery Development Action Plan and Value Chain report

The nursery development action plan and value chain reports are focused on the recommended fruit crops. The sequence of steps followed to perform crop prioritization are summarized below:

Figure 5: Crop prioritization



Further considerations for crop prioritization:

- ▶ Potential of four crops, i.e., Guava, Litchi, Pomegranate and Sweet Orange have been already tested in high density planting in FLD clusters of the state and found successful
- ▶ As per production cost, marketable price and marketing avenues among citrus crops, Kagzi Lime and Sweet Orange have almost equal potential. However, high density plantation for Kagzi lime is not tried and tested.
- ▶ Kinnow also has similar potential but all the three neighboring states i.e., Punjab, Haryana and Rajasthan are excessively focused on Kinnow. Hence, it will not have competitive advantages in price realization.
- ▶ Persimmon, Pecan nut and Plum have been successful in the region. On middle hills these fruits come early in market giving them market combativeness
- ▶ Aonla and Jackfruit potential in High Density Planting have not been well established in the studies so far. Hence, they are not considered now. However, they may be considered as future potential crops after establishing their potential in HDP

Eight sub-tropical fruit crops namely, Sweet Orange, Guava, Litchi, Pomegranate, Mango, Plum, Persimmon, and Pecan nut were selected for detailed Value Chain study.

The summary of key findings, gaps and recommendations from nursery development action plan report and value chain report are presented below:

Summary of Nursery Development Action Plan Report and recommendations

Nursery Development Plan report presents the strategy for plantation till 2030 covering an area of 10,000 hectare spread over 1000 clusters/villages across 28 blocks in 7 districts to benefit ~25,000 households. **The plantation work of 8 subtropical fruits for plantation phased out as 10% in Year 1, 10% in Year 2, 10% Year 3, 20% in year 4 and 25% each in year 5 and year 6.** In the initial year plantation percentage has been kept low and increased gradually taking into considerations time for the establishment of nurseries.

It is suggested to procure 100% of planting material required from Year 1 to Year 3 covering 30% of the proposed area through procurement only. Simultaneously, it is proposed that 10 nurseries may be established to start production from year 4 onwards which can subsequently phase out the planting material procurement and supply quality planting material to upcoming areas also. It is suggested that procurement should be done through open tendering process keeping technical and financial evaluations. The bidders can be reputed registered nurseries/agencies within/outside the state/country, those who meet the eligibility criteria in terms of years of operation, quality of planting material, safe logistics and timely supply. During procurement, certification that planting material is insect pest & disease free is also a necessity and few samples should also be tested in accredited laboratory for the same.

The proposed procurement of planting material also taking into consideration maximum mortality rate comes to 93.58 lakhs out of which 10.62 lakhs planting material are required in year 1, 2 and 3 each, 19.32 lakhs in year 4, 22.62 lakhs in year 5, 19.62 lakhs after factoring in extra 7% for mortality and transportation losses. It is assumed that planting material production from proposed nurseries will start from year 4 onwards and the established nurseries can substitute planting material requirement by 7% in Sweet Orange, 8% in Guava, 9% in Litchi, 8% in Pomegranate, 42% in Persimmon, 57% in Plum 6% in Mango and 38% in Pecan nut in year 4 and subsequently increase supply. 100% planting material requirement for Persimmon and Plum can be met in year 6 with surplus production.

Table 51: Year wise planting material procurement (in lakhs)

Crop/Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Sweet Orange	4.161	4.161	4.161	7.756	9.272	8.707	38.217
Guava	3.566	3.566	3.566	6.568	7.786	7.221	32.273
Litchi	1.003	1.003	1.003	1.816	2.203	1.899	8.928
Pomegranate	1.189	1.189	1.189	2.195	2.565	1.752	10.078
Mango	0.297	0.297	0.297	0.556	0.553	0.172	2.173
Pecan nut	0.074	0.074	0.074	0.092	0.072	0.015	0.401
Persimmon	0.167	0.167	0.167	0.193	0.133	-	0.828
Plum	0.167	0.167	0.167	0.144	0.038	-	0.684
Total	10.625	10.625	10.625	19.320	22.622	19.766	93.583

The plantation in each year happens in two seasons February – March and July- August. Since a majority of plantation happens in the July- August period, planting material has been divided in the ratio of 30: 70 in February- March and July- August respectively. The varieties that may be considered in each fruit crop are as follows:

- i. **Sweet Orange (8):** Valencia, Hamelin, Natal, Pera, Westin, Jaffa, Blood Red, Mosambi (Andhra)
- ii. **Guava (3):** Lalit, Shweta,
- iii. **Pomegranate (1):** Bhagwa
- iv. **Litchi (2):** Dehradun, Calcuttia
- v. **Persimmon (2):** Fuyu, Jiro
- vi. **Plum (2):** Angeleno, Friar
- vii. **Mango (2):** Mallika, Pusa Arunima
- viii. **Pecan Nut (2):** Mahan, Nellis Burkett

Taking into consideration the spacing and planting material requirement, we propose establishing two nurseries each for Sweet Orange and Guava and one nursery each for Litchi, Persimmon, Plum, Mango and Pecan nut fruit and one Tissue culture Lab for Pomegranate. The locations for fruit crops have been suggested based on the altitude of the region. We suggest establishing nurseries for Sweet Orange, Guava, Litchi, Mango and Pomegranate in altitudes ranging between 600-800 above mean sea level whereas nurseries of Plum, Pecan nut and Persimmon are suited for the higher altitude 800-1200 amsl.

Table 52: Establishment of nurseries

S. No.	Fruits Crops	Tentative Cost (INR)	Outcome at full capacity (Nos)	Number of Nursery	Altitude (amsl)
1	Sweet Orange including virus indexing lab	630 lakhs	2.0 lakh	2	600-800
2	Pomegranate (Tissue culture lab)	552 lakhs	1.0 lakh	1	600-800
3	Guava	226 lakhs	2.0 lakh	2	600-800
4	Litchi	101 lakhs	1.4 lakh	1	600-800
5	Persimmon	115 lakhs	0.80 lakh	1	800-1,200
7	Plum	112 lakhs	1.0 Lakh	1	800-1,200
7	Mango	128 Lakhs	1.0 Lakh	1	600-800
8	Pecan nut	122 Lakhs	0.66 Lakh	1	800-1,200

In these nurseries we propose the maintenance of a mother block along with facilities of naturally ventilated poly house, fan and pad controlled green house, shade/net house electricity and perennial water source depending on the crop. Tissue culture with virus indexing is the major requirement for sweet orange which is further propagated through micrografting. Depending upon the crop different propagating methodology has been proposed for different crops as patch budding for guava, air layering for litchi, chip budding for persimmon, T budding for plum and veneer and whip grafting for mango and pecan nut respectively. The crop wise root stock is represented below. It is important to note that pomegranate is proposed to be multiplied only through tissue culture. The rootstock for each of the crops is listed below.

Table 53: Crop wise- Root stock

Crop	Rootstock
Sweet Orange	Rangpur Lime/Rough Lemon
Guava	Common guava cultivars
Litchi	Common litchi cultivars
Plum	wild apricot / wild peach
Persimmon	Amlok
Mango	Wild mango seedlings
Pecan Nut	Burkett & Nellis

For small and medium enterprise financing for developing the state of Himachal Pradesh's internal capacity, the project is focused on developing nursery models for 10 fruit nurseries, of which one is a tissue culture lab cum nursery for pomegranate. For establishment of nurseries, it is proposed to develop separate block for mother plant of a single fruit crop variety, production of plants will start from fourth year depending on the crop/variety. The target increase in production for each target fruit crop may be achieved by extending the facilities and also provide production linked incentives for incremental sales.

The estimated investment cost of different nursery models ranges between 1.01 crore to 3.15 crores depending on the variable facilities across the crops. The proposed nurseries for litchi, guava, mango, pecan nut, persimmon and plum are suggested to be established with private sector participation (with government support in the form of back ended subsidy /incentive). Tissue culture lab for nursery and virus indexed nursery for sweet orange may be set up public private partnership or on similar models as others with higher-back-end subsidies.

Quality planting material production and supply should be further strengthened by training programs and exposure visits for different stakeholders along with diligent maintenance of the records. To build the capacity, trainings for DoH officials along with exposure visits, as well as for entrepreneurs, gardeners, and lab technicians.

Establishment of 10 nurseries to start production from year 4 onwards which can subsequently phase out the planting material procurement and supply quality planting material to upcoming areas also.

Considering all these facts the next steps for establishment of nursery development plan is:

- ▶ Setting up the process for prompt and timely procurement of planting material starting from February 2023
- ▶ Creating the provision and release of the subsidy amount in timely manner
- ▶ Selection of the sites in each district for establishment of the nursery
- ▶ Awareness campaigns so that entrepreneurs come forward for establishment of nursery
- ▶ Ensuring that quality standards and recommended procedures are followed both for procurement of planting material and establishment of the nursery
- ▶ Implementation of the capacity building training calendar and inventory management in the nursery

Summary of gaps and recommendations from Value Chain report

The summary of gaps identified during the field visits and as discussed with stakeholders are as follows:

- ▶ Shortage of water harvesting structure and drip irrigation facilities
- ▶ Danger from animals without fencing
- ▶ Even if cold storages are present, they are mostly used for apple and potato
- ▶ Some processing units are old and dysfunctional and operational capacity of the units not fully utilized
- ▶ Lack of market information system and access to markets

- ▶ The procurement of raw materials, and MRP rates of the products are fixed by Department of Horticulture. It may sometimes not match with the cost of production and operation as it is different across the units.
- ▶ The factories have been operating within lesser capacity about 60% utilization, however, there is potential for increasing the capacity utilization to around 90%
- ▶ Though there is potential and scope to improve production and build the brand nationally and also enter export markets, the marketing activities performed are very limited within state and very few neighboring states
- ▶ The current condition of infrastructure is dilapidated and needs immediate action on renovation, especially in government processing units
- ▶ Limited availability of number of trained and skilled manpower in the units
- ▶ As the FLDs have been established by the project, the farmers are dependent on the project officials for almost all works
- ▶ There was no awareness on the production cost and market price
- ▶ The majority of farmers aren't aware of the production or post-production techniques and the skills and capacities in cultivation and fruit production are lacking

The selected eight crop- wise constraints and recommendations are presented below.

Gaps in floriculture production and marketing:

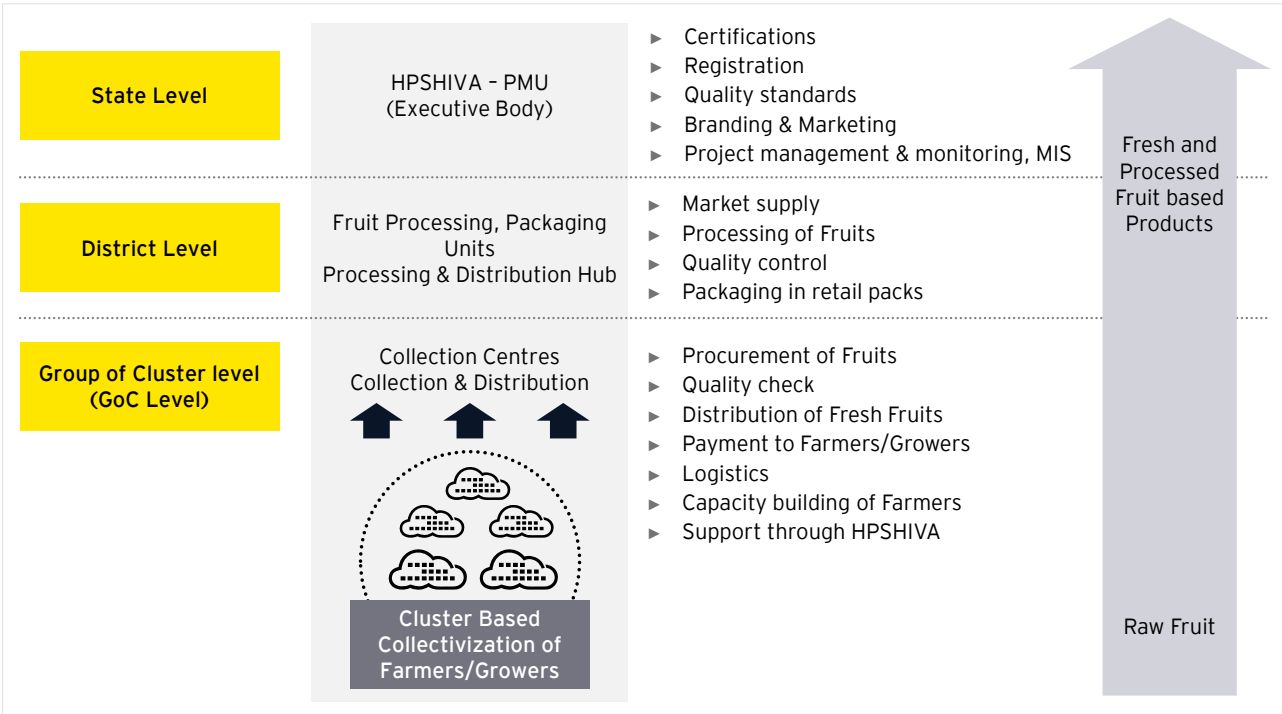
In the area of production, many growers reported

- ▶ Lack of knowledge of latest production techniques
- ▶ Inadequate supply of reliable plant material and that too in time, especially in case of lilium and gladiolus was another important production problem reported by the growers
- ▶ Private sellers generally deceive them by providing poor quality corms and bulbs of these crops and non-availability of skilled labor, especially during times of specific operations hinders production performance
- ▶ Low yields are experienced due to incidence of serious disease and insect pest infestation
- ▶ Most growers do not plan their crops in accordance with the festive seasons and requirements of target markets and therefore, remain deprived of remunerative prices
- ▶ Not following recommended package of practices as a consequence of the gap in the adoption of production technology which results into low production performance
- ▶ Capital intensive nature of flowers cultivation, increases the dependence on external financial small ones, are unable to arrange. Financial problems not only restrain growers to grow flowers under controlled conditions but also affect the marketing process
- ▶ Lack of assured markets for the flower produce renders the production activity to perform at low levels, effecting income status of producers adversely

Proposed Value Chain Development Framework

In the view of scale and complexity involved in the implementation of a project, EY team proposed a three-tiered structure for the development of HPSHIVA value chain. This structure is segmented at 3 levels namely Group of Cluster (GoC level), District level and State level as follows:

Figure 6: Three-tiered structure for development of HPSHIVA Value Chain



The overall monitoring and management of the project is done at the state/apex level which is responsible for quality control, certification, branding, market promotion, monitoring and data management. It will support the fruit value chain management by ensuring optimization of the flow of material, information, and fund. It closely works with district level packhouses and processing units which act as processing and distribution hubs. They will be responsible for overall quality control, processing, packaging and establishing market linkages. These will be connected to group of cluster level namely collection centres (CCs) where majority of ground level aggregation and actual project implementation takes place.

The major interventions at various levels of value chain are detailed in the infograph presented below:

Figure 7: Ecosystem development framework

	Inputs	Production	Collection, PHM & processing	Marketing
State level/Apex	- R&D on TC, varietal evaluation, post entry quarantine - Soil testing, water testing and microbiological testing - Standardization of production and post harvest practices - Disease control, diagnostic research - Stakeholders' Capacity building	- Leveraging policy level support for infrastructure creation - Facilitation of FPOs for registration - Tie - ups with financial institutions	- R&D for improving processing facilities - Product development - Regulatory role for quality labs/standardization - Quality control lab with facilities for checking pest, chemical residues	- Planning for brand development and marketing - Quality control and certifications for export - Facilitation for Organic certifications - Coordination for exports
District level	Integrated Packhouses being developed at this level may support in input activities	Coordination with the Apex body	- Packaging and storage facilities - Processing facility to develop value added products - Leveraging existing infrastructure	- Market supply - Tie-ups with institutional buyers - Contract Farming - Leveraging/augmenting as distribution hub
GoC level/CHPMA	- Promote support services/facilities like input supply like fertilizers, pesticides, GH among CHPMA - Inclusion of non-project farmers as well for business transactions	- Access to harvesting equipment/collection crates/bags/ladders/ logistics - Coordination for capacity building - Leverage institutions like UHF, Neri, HPMC, HPNA	- Collection and aggregation of produce - Washing, sorting, grading and collection of the produce - Preparation of the produce for market - Management of infrastructure/ assets	- Development of separate business lines - Assistance in decision making for fresh fruit marketing or value addition/processing - Follow brand guidelines

The summary of recommendations proposed in the selected value chains considering the overall scenario and gaps are as follows:

- ▶ Implementation of technological recommendations for pre-production, production, harvest, post-harvest, transportation, and marketing level at different nodes of value chain
- ▶ For futuristic value chain, we propose that all produce will go to collection centres in the following order— 10% directly to consumers, out of the remaining 90% produce: 50% produce to packhouse, 10% to processing unit and 30% to wholesaler and from this, as per proposed value chain, the produce will be marketed to institutional buyers, wholesalers, exporters and finally to consumers
- ▶ At the group of cluster level, there is a need to establish 65 collection centres to be constructed in phased manner depending on production capacity, and the business plan must be supported by subsidiary activities like apiculture and mushroom cultivation
- ▶ There is a need for establishment of 13 packhouses at integrated level, 3 processing units (new/upgradation), one cold room in pack house with mango ripening facilities in Bilaspur and one pecan processing unit in Solan
- ▶ One controlled atmosphere storage for pomegranate for INR5.75 lakhs
- ▶ Pack house models have been suggested to implement with 70% grant from government and 30% equity contribution which may be a SME loan taken from a bank by the promoters, or in this case the cluster association, or any entrepreneur
- ▶ To reach the difficult areas 14 material ropeways are proposed to be installed
- ▶ It is proposed to establish a state level body which can be located at the PMU office, and the primary responsibility of this unit will be quality control, certification, branding and market promotion
- ▶ For the capacity building and quality production, at state level 3 trainings are proposed for State Nodal Officer and experts for 3 years
- ▶ Training and capacity building support shall be provided for 17 Managers, 34 technicians and 170 skilled workers
- ▶ DDH, SMS, HDO and HEO from each district should be given one day orientation on value chain management, promotion of linkage with financial and non-financial institutions, 1 day exposure visit within the state and 1 3- days exposure visit outside the state and 1 outside India
- ▶ It is suggested to appoint 1 functionary for every 25 hectares (i.e., 400 functionaries for 10,000 hectares) in proportion with plantation schedule and training shall be conducted accordingly
- ▶ These functionaries will in turn train all the 25,000 farmers which may coincide with the plantation schedule, and with 25 farmers are estimated in each cluster, 1,000 training events will be needed to be organized in proportion with plantation schedule where each training shall be of 1-day duration
- ▶ Out of the clusters, for motivated and diligent individuals will be selected and trained to serve as micro entrepreneurs in the state and the capacity of the microentrepreneurs will be enhanced by conducting 4 trainings every year from 2023 to 2025, 8 in 2026 and 10 each in 2027 and 2028 with participation of 50 in each training

The crop specific recommendations across the value chain of selected fruit crops covering preproduction, production, harvest, post- harvest levels are presented below:

Sweet Orange

Table 54: Recommendations for sweet orange

Components	Objectives	Constraints	Required interventions	Recommended action points
Pre-production and production Level	▶ To provide quality planting materials ▶ Best quality fruits	▶ Lack of quality planting materials resulting in low productivity	▶ Provision of quality planting materials ▶ Scientific cultivation practices to be followed	▶ Nursery for multiplication of citrus planting materials with virus indexing facility ▶ R&D centre at university for standardization of quality plating material
Harvest level	▶ To train and demonstrate farmers on proper harvesting methods	▶ Harvesting with fruit stem leading to puncturing of other fruits in the bag/crates	▶ Training and IEC materials	▶ Conduct training and demonstration on proper harvesting technique and provision for A shaped ladder, clippers, harvesting bags
Post-harvest infrastructure level	▶ To provide grading and packing facilities to farmers near to their farms	▶ Lack of proper sorting and grading leading to low price in the market	▶ Mini pack-houses at common points	▶ Construct mini pack houses near to collection points ▶ Renovate existing pack-houses ▶ Establishment of training cell in university/research centre for both pre and post-harvest training
Supply chain/cold chain logistics	▶ To provide transport facilities for transportation to the market	▶ Lack of transportation leading to high spoilage	▶ Pick-up vans. ropeways in inaccessible areas	▶ Provide pick-up van and build system for its proper utilization and maintenance
Processing	▶ To build capacities in primary and secondary processing ▶ To establish micro-processing units ▶ To strengthen existing processing units, operated by government and private sector	▶ Farmers are selling the fruits without any processing, resulting in lower shelf life and low return	▶ Training and capacity building in processing ▶ Capital grant for strengthening existing processing units and establishing micro-processing unit	▶ To conduct training on processing and provide basic equipment for household level processing

Components	Objectives	Constraints	Required interventions	Recommended action points
Collective action and branding	▶ To establish and promote a common brand for the project products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion ▶ Promotion material in form of materials in form of brochure and digital media

Guava

Table 55: Recommendations for Guava

Components	Objectives	Constraints	Required interventions	Recommended action points
Production Level	▶ Quality fruit production with properly managed orchard	▶ Canopy can become very dense and uncontrolled ▶ High incidence of fruit fly in rainy season crop ▶ Guava wilt can become a serious problem	▶ Training and pruning must be done to get better plant structure ▶ Adoption of bagging technique by farmers to avoid the infestation of fruit fly ▶ Installation of solar traps and pheromone traps ▶ Bio-control agents, <i>Aspergillus niger</i> (AN 17) for guava wilt* ▶ Intercropping with turmeric ▶ Boundary plantation of marigold	▶ Providing growers with ▶ Anti-fog* Polybags (13" 9" dimension) with proper cuts at its base (1" length) – 1 piece per fruit ▶ Paper – Half newspaper size page per fruit ▶ Foam Net (Bottle neck) – 1 per fruit ▶ 1 pheromone trap/acre ▶ Co-cultivation with <i>Curcuma domestica</i>, <i>Allium sativum</i> and <i>Tagetes erecta</i> were found effective in reducing the incidence of wilt in guava
Harvest level	▶ Minimize damage while harvesting	▶ Soft skin leads to early damage	▶ Training for gentle handling of fruits and harvesting with secateurs not pulling by hand	▶ 4 Secateurs per acre. 2 buckets. 5 crates ▶ Smooth crates/buckets/harvesting bags
Post-harvest infrastructure level	▶ Sorted, graded and packaged fruits	▶ Lack of aggregation points and pack house	▶ Establishment of collection centres and pack house	▶ Construction of packhouses at cluster level
Supply chain/cold chain logistics	▶ Taking the fruits to newer markets and arranging transportation in advance	▶ Lack of connectivity leads to localized marketing and increased overhead in transportation	▶ Establishment of transportation and logistics facilities	▶ Aggregating the districts produce and prearranging the transportation at aggregation point and covered

Components	Objectives	Constraints	Required interventions	Recommended action points
		▶ Overhead transportation lead to higher labor cost		trolleys for local market, reefer vans for long distance transportation
Processing	▶ To convert produce into value added products and enhance income of the entrepreneurs	▶ No direct linkage with existing processing units	▶ Linkage with food processing units ▶ guava pulp plant ▶ Entrepreneurs can also be attracted for small processing units for guava leather, nectar, candies, RTS and jelly	▶ Upgrading the existing processing units and linking the CHPMA with processing units
Collective action and branding	▶ To establish and promote a common brand for the project products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion ▶ Promotion material in form of materials in form of brochure and digital media

Pomegranate

Table 56: Recommendations for pomegranate

Components	Objectives	Constraints	Required interventions	Recommended action points
Pre-production and production level	▶ To arrange for tissue culture quality planting material. ▶ Production of best quality fruits	▶ Lack of information for scientific cultivation	▶ To provide facilities for mulching, drip irrigation, bagging and composite	▶ Timely provision of these facilities. ▶ Establishment of Tissue culture facility ▶ Technological knowledge transfer
Harvest level	▶ Gentle and safe harvesting of the produce free from disease and pest incidence	▶ Poor awareness on proper harvesting method	▶ Training and awareness	▶ To conduct training in Package of Practice and maturity indices for proper harvesting.
Post-harvest infrastructure level	▶ Primary processing and packaging of produce	▶ Non availability of infrastructure facility	▶ Establishment of the pack houses at cluster level	▶ Training on practices to be followed at pack house
Supply chain/cold chain logistics	▶ To improve supply chain logistic in transportation and reach of the produce to distant markets for better price like Jammu and Azadpur	▶ Reefer transport not available	▶ Provision of temperature-controlled vehicle for transportation	▶ To procure and provide the temperature-controlled vehicle with established system for utilization and management

Components	Objectives	Constraints	Required interventions	Recommended action points
Processing	▶ To promote processing of pomegranate arils into diverse products	▶ Presently, there is no organized processing unit ▶ High potential for dried Aril (Anardana) and anardana powder not being tapped	▶ Processing units ▶ Training and capacity building	▶ Provision of processing facilities together with training on processing and quality control
Collective action and branding	▶ To establish and promote a common brand for the project products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion, ▶ Promotion material in form of materials in form of brochure and digital media

Litchi

Table 57: Recommendations for litchi

Components	Objectives	Constraints	Required interventions	Recommended action points
Production level	▶ To train farmers on proper package of practice	▶ Litchi is sensitive to production techniques and timings	▶ Awareness and training to the farmers with technical handholding during production cycle	▶ Conduct training at cluster level, and provide handholding support through technical facilitation
Harvest level	▶ Safe and gentle harvesting, collection in harvest bags with no fruit cracking	▶ Fruit cracking is evident in some fruits which can spoil other fruits also	▶ Litchi net harvester and training on its usage and A-type self-standing ladder for facilitation	▶ Facilitation of equipment like harvester, refractometer, ladder, clippers
Post-harvest infrastructure level	▶ To provide pre-cooling chamber facilities to harvested fruits	▶ Due to short shelf life, spoilage is very high	▶ Pre-cooling is required to prolong the shelf life	▶ Promote mini packhouse with pre-cooling chamber
Supply chain/cold chain logistics	▶ To organize temperature-controlled vehicle for transportation	▶ Considering the high degree of perishability of the crop it is essential that temperature-controlled vehicles are used	▶ Provision of temperature-controlled vehicle for transportation	▶ To procure and provide the temperature-controlled vehicle with established system for utilization and management
Processing	▶ To promote proper fumigation by Sulphur di-oxide	▶ Improper fumigation by Sulphur di-oxide leads browning of pericarp besides health hazards	▶ Awareness and training to farmers ▶ Establishment/Equipping pack-houses	▶ To conduct proper training on fumigation practices and

Components	Objectives	Constraints	Required interventions	Recommended action points
	to reduce fruit loss		with proper fumigation technology	facilitate quality control
Collective action and branding	▶ To establish and promote a common brand for the project products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion ▶ Promotion material in form of materials in form of brochure and digital media

Persimmon

Table 58: Recommendations for persimmon

Components	Objectives	Constraints	Required interventions	Recommended action points
Pre-production and production level	▶ Provide quality planting materials ▶ Train farmers in modern cultivation practices in persimmon cultivation	▶ Farmers still follow conventional production practices with very low productivity	▶ Provision of quality planting materials ▶ Training and demonstration in cultivation practices	▶ To multiply and provide quality planting materials by promoting nursery for persimmon ▶ Organize training programs for cultivation technology ▶ Research and development at university level for selection of dwarfing rootstocks
Harvest level	▶ Careful harvesting with no damage to calyx and skin	▶ Rough harvesting leads to damages	▶ Technological capacity development	▶ Organizing training program for farmers to cut fruits and not pull them from the stem
Post-harvest infrastructure level	▶ Pre-cooling, cold storage and packaging facility	▶ No infrastructure facility available	▶ Pre conditioning at 23oC, Waxing of the fruits	▶ Facilities for washing, drying, polishing, waxing, pre cooling, storage and packaging
Supply chain/cold chain logistics	▶ Safe long-distance transportation without chilling injury	▶ Open trolley transport leading to damages	▶ Arrangement of facilities	▶ Pre cooled reefer trucks at 10-12oC with RH 80-85%
Processing	▶ Production of many value added products like jam, slices and preserves	▶ Non- availability of processing units	▶ Establishment of units	▶ Technology transfer for development of processed products

Components	Objectives	Constraints	Required interventions	Recommended action points
Collective action and branding	▶ To establish and promote a common brand for the project products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ Capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion, ▶ Promotion material in form of materials in form of brochure and digital media

Plum

Table 59: Recommendations for plum

Components	Objectives	Constraints	Required interventions	Recommended action points
Production level	▶ To promote varietal diversification with genetically improved cultivars	▶ Santa Rosa is the predominant plum cultivar grown over 90 percent of the total area under plum cultivation in Himachal Pradesh and the predominance of single cultivar leads to monoculture like situation and create gluts in the market and the farmers do not get remunerative prices for their produce	▶ R & D with new cultivars ▶ Promoting demonstration of new cultivars like 'Black Amber' and 'Duarte'	▶ To support horticultural research station in R & D of new cultivars ▶ Promote demonstration of new cultivars at farmers' field
Harvest level	▶ To promote safe harvesting without damage to skin and pedicel ▶ Determination of maturity as per distance from the market	▶ Early harvesting can result in immature fruits and late harvested fruits have a short shelf life	▶ Training and demonstration for safe harvesting methods	▶ Conduct training to farmers for safe and timely harvesting of plum fruits and minimizing damage to the skin
Post-harvest infrastructure level	▶ To provide pre-cooling chamber facilities to harvested fruits	▶ Due to short shelf life, spoilage is very high	▶ Pre-cooling is required to prolong the shelf life	▶ Promote mini packhouse with facilities for washing, sorting, grading, pre-cooling chamber and storage
Supply chain/cold chain logistics	▶ To organize temperature-controlled vehicle for transportation	▶ Considering the high degree of perishability of the crop it is essential	▶ Provision of temperature-controlled vehicle for transportation	▶ To procure and provide the temperature-controlled vehicle

Components	Objectives	Constraints	Required interventions	Recommended action points
		that temperature-controlled vehicles are used.		with established system for utilization and management
Processing	▶ Plum can be converted into many value added products like syrup, spread, jam	▶ Limited processing facilities available in the state	▶ Support for establishment of units and technical training for the same	▶ Encouraging entrepreneur's fir establishment of processing units
Collective action and branding	▶ To establish and promote a common brand for the project products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion, ▶ Promotion material in form of materials in form of brochure and digital media

Mango

Table 60: Recommendations for mango

Components	Objectives	Constraints	Required interventions	Recommended action points
Production level	▶ To promote cultivation of frost resistance varieties	▶ Mango is highly susceptible to frost	▶ Improved cultivars of Mango ▶ Selection of frost-free locations for cultivation	▶ Promote cultivation of drought resistance varieties like Chausa ▶ Promote cultivation in lower elevation where frost incidences are very low/negligible
Harvest level	▶ To promote bagging practices in mango fruits		▶ Bagging prevents pests, especially fruit flies, from reaching and damaging the mangoes and prevents latex burns and fungal spots on the fruits	▶ Provide training to farmers in bagging technology ▶ Establish demonstration sites ▶ Procure and provide bags to the farmers at subsidized rate
Post-harvest infrastructure level	▶ Preparing and marketing the fruits as per demand	▶ Lack of infrastructures facilities at post-harvest level	▶ Establishment of pack houses	▶ Packhouse with facilities for precooling, desapping, washing, ethereal ripening, packaging, and storage
Supply chain/cold chain logistics	▶ To organize temperature-controlled vehicle for transportation	▶ Considering the high degree of perishability of the crop it is essential that temperature-	▶ Provision of temperature-controlled vehicle for transportation	▶ To procure and provide the temperature-controlled vehicle with established

Components	Objectives	Constraints	Required interventions	Recommended action points
		controlled vehicles are used		system for utilization and management
Processing	► Processing facilities at household level	► Organized processing facilities suggested	► Improve farmers' accessibility to existing processing units	► No fresh establishment of mango pulp unit as cost economics will not work out
Collective action and branding	► To establish and promote a common brand for HPSHIVA products	► Lack of branding and collective action in marketing leads to low price realization	► Promotion of branding and trademark ► capacity building about branding, awareness activities etc.	► Get expert service for branding and market promotion ► Promotion material in form of materials in form of brochure and digital media

Pecan nut

Table 61 Recommendations for pecan nut

Components	Objectives	Constraints	Required interventions	Recommended action points
Production level	► To produce best quality pecan nuts free from any pest and diseases	► Pecan nut cultivation suffers from lack of suitable methods of propagation, inadequate vegetatively propagated plants, and lack of standard rootstocks and cultivars	► Arranging quality planting material, root stocks, inputs	► Establishment of nursery Timely supply of irrigation, fertilization and plant protection measures. ► Training on production practices particularly canopy management
Harvest level	► Safe harvesting when husk split open and separated from the nuts	► Non availability of mechanical shakers	► Training on harvesting and usage of mechanical shakers	► Arrangement of mechanical shakers before harvesting season
Post-harvest infrastructure level	► Shelling, drying and packaging	► Non availability of units	► Shelling units near the production area	► Encouraging entrepreneurs for establishment of shelling, drying and packaging units
Supply chain/cold chain logistics	► Linking production area and processing unit and then safe transportation to the wholesale and retail markets	► Currently no linkage available	► Non reefer transport with humidity between 65-70% so there is no development of molds	► Arrangement of transportation facility with dehumidifier

Components	Objectives	Constraints	Required interventions	Recommended action points
Processing	▶ To promote processing of pecan at in developing different value-added products like pecan nut butter	▶ No units for processing/shelling	▶ Training on development of value-added products	▶ To conduct training to micro-entrepreneurs and provide processing equipment
Collective action and branding	▶ To establish and promote a common brand for HPSHIVA products	▶ Lack of branding and collective action in marketing leads to low price realization	▶ Promotion of branding and trademark ▶ capacity building about branding, awareness activities etc.	▶ Get expert service for branding and market promotion ▶ Promotion material in form of materials in form of brochure and digital media

Annexure 3: Year wise area under cultivation of horticulture crops 2014-15 till 2020-21

Table 62: Year wise area under cultivation

Name of Fruits	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average	CAGR
Apple	1,09,553	1,10,679	1,11,896	1,12,634	1,13,154	1,14,144	1,14,646	1,12,387	0.8%
Citrus	23,704	24,063	24,475	24,649	24,869	25,051	25,654	24,638	1.3%
Plum	8,582	8,601	8,683	8,786	8,816	8,790	8,790	8,721	0.4%
Peach	5,113	5,076	5,090	5,090	5,042	4,971	4,934	5,045	-0.6%
Apricot	3,660	3,661	3,650	3,680	3,642	3,399	3,343	3,576	-1.5%
Pear	7,106	6,977	6,948	6,864	6,803	6,712	6,668	6,868	-1.1%
Cherry	450	449	448	448	453	446	446	449	-0.1%
Kiwi	121	123	123	145	182	183	187	152	7.5%
Pomegranate	2,332	2,482	2,670	2,771	2,847	2,818	2,828	2,678	3.3%
Olive	36	34	34	31	29	27	27	31	-4.7%
Persimmon	416	421	435	476	523	536	577	483	5.6%
Strawberry	55	55	54	51	49	46	42	50	-4.4%
Almond	5,221	5,105	4,981	4,923	4,850	4,726	4,675	4,926	-1.8%
Walnut	4,513	4,471	4,453	4,436	4,406	4,436	4,434	4,450	-0.3%
Pecan nut	874	903	918	930	926	896	908	908	0.6%
Hazel nut	13	12	12	12	12	12	12	12	-1.3%
Mango	41,105	41,523	41,765	41,989	42,248	42,390	42,419	41,920	0.5%
Litchi	5,231	5,409	5,673	5,875	6,028	6,179	6,354	5,821	3.3%
Guava	2,193	2,266	2,292	2,319	2,344	2,447	2,662	2,360	3.3%
Aonla	2,323	2,524	2,536	2,562	2,587	2,582	2,565	2,526	1.7%
Jackfruit	857	1,068	1,181	1,287	1,474	1,637	1,752	1,322	12.7%
Papaya	212	226	223	227	213	211	211	218	-0.1%
Grapes	93	86	85	80	77	73	68	80	-5.1%
Loquat	60	59	58	58	56	54	53	57	-2.0%
Karonda	11	11	12	17	14	17	19	14	9.5%
Ber	31	31	31	31	30	30	30	31	-0.5%
Sapota	49	48	45	46	45	55	52	49	1.0%
Fig	10	10	12	11	10	11	10	11	0.0%
Banana	88	87	84	83	79	72	70	80	-3.7%
Jamun	258	250	247	254	247	267	265	255	0.4%
Bael	15	11	11	12	13	14	13	13	-2.4%
Total	2,24,285	2,26,721	2,29,137	2,30,789	2,32,080	2,33,232	2,34,714	2,30,137	0.8%

Annexure 4: Introduction of new crops in Sub-Tropical region

Under the HPSHIVA project, nine fruits have been proposed for planting on different elevations and weather conditions, which is highly diversified. However, many fruits are becoming important for health-conscious consumers. Promotion of further diversification in the sub-tropical region of the state and providing improved farm income, emerging crop of subtropical region are proposed to be introduced and promoted. Many of these fruits are avocado, dragon fruit, which are already under trial in few pockets by individual farmers.

Table 63: Potential of the proposed fruits in sub-tropical region

Fruits	Climatic suitability	CAGR (%)	Water requirement	Farm gate price	Medicinal value	Industrial importance	Processing potential
Avocado	Yes	6.30	Low	INR200-300/kg	High	Pharmaceutical, cosmetics	High
Dragon	Yes	3.9	Low	INR125-200/kg	High	Food and Textile	High

Avocado (*Persea americana*):

Considering the climate and soil in subtropical area of Himachal Pradesh, Avocado would be a potential crop, as fruit contains cholesterol free fat and demand is increasing from high end market, owing to growing health conscious population and increasing expandable income. The avocado (*Persea americana*) is botanically a large berry containing a single large seed. Depending on the variety, avocado has green, brown, purplish, or black skin when ripe, and may be pear-shaped, egg-shaped, or spherical, is usually 7-20 cm long, weighing between 200 and 400 g. Fruits being climacteric is picked while physiologically mature, and ripened after harvesting. The fruit has a buttery flesh, when ripe. It is cultivated in tropical and Mediterranean climate of many countries, with Mexico as the leading producer of avocados in 2019, supplying 32% of the world total trade.

As a subtropical fruits, avocados need a climate without frost and with little wind. High winds reduce the humidity, dehydrate the flowers, and affect pollination. When even a mild frost occurs, premature fruit drop may take place, although few cultivars can tolerate temperatures down to -1 °C. Several cold-hardy varieties are like Hass, Gainesville, Florida can survive mild frost. The trees also need well-aerated soils, ideally more than 1 m deep. It takes an average of approximately 70 litres fresh ground or surface water, not including rainfall or natural moisture in the soil. However, the amount of water needed depends on where it is grown. Avocado being evergreen has high water requirements. Commercial orchards produce an average of seven tonnes per hectare each year, with some orchards achieving 15-20 tonnes per hectare.

Avocado is a climacteric fruit, which matures on the tree, but ripens off the tree. Thus, fruits are picked hard and green and kept at 3.3 to 5.6 °C, until it reaches their destination. Avocados must be mature to ripen properly. Generally, the fruit is picked once it reaches physiological maturity. Dry matter content between 23 and 25 percent is an index for harvesting. Once picked, avocados ripen in one to two weeks depending on the cultivar at room temperature and ripen fast if stored with bananas, because of the influence of ethylene gas. Use of an ethylene gas in ripening room is advocated for ripening. In some cases, avocados can be left on the tree for several months, which is an advantage to commercial growers, who seek better return for their crop, but if the fruit remains unpicked for too long, it falls to the ground.

Dragon fruit (*Hylocereus spp*)

Dragon fruit (*Hylocereus spp*) has become important for high nutritive values and are being promoted in Gujarat, Maharastra, Andhra Pradesh on commercial scale as price realized is highly remunerative. The crop was introduced few years back, has been commercially grown in many of the states. In sub-tropical region of Himachal Pradesh, in clustered with lower humidity and frost-free environment, this fruit can be successfully grown.

Initially, dragon fruit was introduced as a new crop to adopt in low rainfall zone for rocky barren land, which is gaining rapid popularity amongst farmers. Botanically, dragon fruit is available in three variants viz., red skin with white pulp (*Hylocereus undatus*), red skin with red pulp (*Hylocereus polyrhizus*) and yellow skin with white pulp (*Hylocereus megalanthus*). Generally, cultivation of white fleshed dragon fruit (*Hylocereus undatus*) has been promoted. The red and purple colours of some fruits are due to betacyanins, a family of pigments that includes betanin, the same substance that gives beet its red color.

Dragon fruit is propagated mostly by vegetative means using cuttings. The harvesting time mostly falls between July-November, which comes in 6-7 flushes. During initial fruit development period, the outer skin of immature fruit looks bright green in color and gradually turns red as the ripening progresses. An additional advantage of the crop is that depending upon the market demand, there is a scope for adjusting the harvesting time. For local market, fruit can be harvested three to four days after the skin color changes from green to red/pink color, while for far markets/export purpose it can be harvested a day after color change. Dragon fruit starts fruiting from second year onwards while, the average yield of 13-18 t/ha can be harvested during fourth year with the modified package and practices. The preliminary experiment on shelf-life studies of dragon fruit was also conducted which indicated that the keeping quality of this fruit is good and it can be stored up to 5-7 days at ambient room temperature, 10-12 days and 20-21 days in cold storage at temperature of 18 °C and 8 °C, respectively. With an initial investment of INR6.0-7.5 lakhs per ha, and intensive management operations net return of INR4-6 lakhs per year per ha at optimum growth, in 4th year onward could be obtained.

Annexure 5: Horticulture Tourism

The development of horticulture tourism clusters will require coordinated efforts of multiple agencies including urban, tourism, agriculture, forest, and rural development department both at central and state levels. The Department of Horticulture shall act as the nodal agency for the development of these clusters. The department, in consultation with key agencies, shall identify land parcels in 12 districts of the state which can be further developed through the convergence of funds under various schemes of the Ministry of Rural Development, Agriculture and Tourism.

These clusters development shall have two major components:

- **Hard interventions:** infrastructure development, tourism products and related activities
- **Soft interventions:** digital infrastructure, capacity building and marketing and promotion

Estimated cost of development of horticulture tourism clusters

Considering the interventions and Himachal Pradesh's average land holding size of 1.04 hectares*, the cost of developing one horticulture tourism cluster could be as follows.

Table 64: Estimated cost of horticulture tourism clusters

Particular	Unit	Rate/sq.m.	Amount (In Lakhs)
Site development (10,400 Sq.m.)	Sq.m.	1,000	104.00
Building and civil structures (2600 Sq.m.) <i>Considering 25% of total land area including stay facilities</i>	Sq.m.	27,090	704.00
Accommodation facility log huts (10 Nos) <i>Considering one log hut of 50 Sq.m.</i>	Sq.m.	60,000	300.00
Tourism activities <i>(Gaming Activities, Nature Trails, Trekking, etc.)</i>	Lumpsum	-	250.00
Digital interventions	Lumpsum	-	50.00
Capacity building programs	Lumpsum		25.00
Marketing and promotion	Lumpsum	-	50.00
Development Cost of One Cluster (A)			1,483.00
Other charges <i>(include Administrative Charges, Contingency and Project Development Fee)</i>	10% of A		148.30
Total Budget			1,631.30

*As per the Distribution of land holdings according to Agricultural Census 2010-11

Annexure 6: Estimation of nurseries for additional area under cultivation

Table 65: Nursery establishment plan for additional area

Nursery establishment	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Fruits (other fruits excluding world bank and ADB)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Area expansion every year	1,444	1,444	1,444	1,444	1,444	1,444	1,444	10,105
Spacing (4*4 sq. m)	9,02,232	9,02,232	9,02,232	9,02,232	9,02,232	9,02,232	9,02,232	-
Procurement quantity %ge	100%	100%	100%	70%	50%	10%	10%	-
Remaining quantity through Nursery	0%	0%	0%	30%	50%	90%	90%	-
Planting material through procurement	9,02,232	9,02,232	9,02,232	6,31,563	4,51,116	90,223	90,223	-
Planting material through nurseries	0	0	0	2,70,670	4,51,116	8,12,009	8,12,009	-
Number of Nurseries required	-	-	-	3	5	8	8	-
Nursery establishment plan	0	3	2	3	0	0	0	8

Annexure 7: Proposed area under cultivation of horticulture and floriculture crops and cultivation cost

Table 66: Assistance provided under MIDH scheme - Category wise

Category	INR Lakh/ha	Percentage contribution by government
Cost intensive crops	4	50%
Strawberry	2.8	50%
Banana TC	3	50%
Papaya	2	50%
High density plantation	1.5*	50%
Non cost intensive crops	1	50%

* As per proposed policy, it is suggested to provide an assistance up to INR5 lakhs and thus calculations presented below are based on this.

Table 67: Crop wise categorization and total cost calculation

Fruit crop	Category	Area proposed (ha.)	Cost per ha	Total cost (INR Lakhs)
Sweet orange	HDP	3,500	5	17,500
Guava	HDP	3,000	5	15,000
Litchi	HDP	1,500	5	7,500
Pomegranate	HDP	1,000	5	5,000
Persimmon	HDP	250	5	1,250
Plum	HDP	250	5	1,250
Mango	HDP	250	5	1,250
Pecan nut	HDP	250	5	1,250
Aonla	Non cost intensive	770	1	770
Jackfruit	Non cost intensive	530	1	530
Orange/Kinnow	HDP	700	5	3,500
Kagzi lime	Cost intensive	980	4	3,920
Galgol	Cost intensive	200	4	800
Grape fruit	Cost intensive	5	4	20
Pear	HDP	1,700	5	8,500
Peach	HDP	1,270	5	6,350
Almond	Cost intensive	1,540	4	6,160
Walnut	Cost intensive	1,360	4	5,440
Apricot	Cost intensive	760	4	3,040
Jamun	Cost intensive	80	4	320
Kiwi	Cost intensive	60	4	240
Sapota	Cost intensive	20	4	80
Karonda	Non cost intensive	10	1	10
Papaya	Papaya	40	2	80
Banana	Banana TC	10	3	30

Fruit crop	Category	Area proposed (ha.)	Cost per ha	Total cost (INR Lakhs)
Grapes	Cost intensive	10	4	40
Loquat	Non cost intensive	10	1	10
Strawberry	Strawberry	10	2.8	28
Olive	Cost intensive	10	4	40
Ber	Non cost intensive	10	1	10
Bael	Non cost intensive	5	1	5
Hazel nut	Cost intensive	5	4	20
Avocado	Non cost intensive	5	1	5
Dragon fruit	HDP	5	5	25
Total		20,105	-	89,973

In case of rejuvenation, the net area under each crop is considered in the above table, as per details below:

Table 68: Net area under each crop in case of rejuvenation

Crop	Proposed new area under Category B	Proposed rejuvenation area under Category B	Total under Category B	Under HPHDP	Net Area
Pear	530	1,670	2,200	500	1,700
Peach	390	1,230	1,620	350	1,270
Almond	370	1,170	1,540	-	1,540
Walnut	350	1,110	1,460	100	1,360
Apricot	270	840	1,110	350	760

Table 69: Investment of summary of plantation

Plantation	Total cost (INR Lakhs)	Government share	Government cost (INR Lakhs)	Private share (INR Lakhs)
High Density Plantation	68,375	50%	34,188	34,188
Other Plantation	21,598	50%	10,799	10,799
Total	89,973		44,987	44,987

Table 70: Assistance provided under Himachal Pushp kranthi Yojana scheme - category wise

Category	INR Lakh/ha	Percentage contribution by government
Open cultivation		
Cut flowers	1	50% of cost per beneficiary max. of 2 ha
Loose flowers	0.4	50% of cost per beneficiary max. of 2 ha
Category	INR/sq.m.	Percentage contribution by government
Protected cultivation		
Cost of planting material and cultivation of carnation and gerbera under poly house/shade net house	INR610/sq.m.	50% of cost limited to 4,000 sq.m. per beneficiary

Category	INR Lakh/ha	Percentage contribution by government
Cost of planting material & cultivation of Rose & Lilium under poly house/shade net house	INR426/sq.m.	50% of cost limited to 4,000 sq.m. per beneficiary

Table 71: Crop wise categorization and total cost of calculation

Name of flower	Proposed area (ha)	Category	Assistance lakh/ha	Government share percentage	Total cost (INR Lakhs)	Government cost (INR Lakhs)
Chrysanthemum (loose)	240	open- Cut	1	50%	240	120
Chrysanthemum (cut)	240	Open- Loose	0.4	50%	96	48
Marigold	300	Open- Loose	0.4	50%	120	60
Gladious	120	open- Cut	1	50%	120	60
Others	120	Open- Loose	0.4	50%	48	24
Alstroemeria	12	Open- Loose	0.4	50%	5	2
Name of flower	Proposed area (ha)	Category	INR/sq.m.	Government share percentage	Total cost (INR Lakhs)	Government cost (INR Lakhs)
Carnation	60	Protected	610	50%	3,660	1,830
Rose	60	Protected	426	50%	2,556	1,278
Lilium	36	Protected	426	50%	1,534	767
Gerbera	12	Protected	610	50%	732	366
Total					9,110	4,555

Table 72: Cost of cultivation for establishment of orchards (INR Lakhs)

Cost cultivation (INR Lakhs)	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Fruits (other fruits excluding world bank and ADB)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	
Area expansion (others) every year in lakhs	3,873	3,873	3,873	3,873	3,873	3,873	3,873	27,110.5
Area expansion (SHIVA)	10%	10%	10%	20%	25%	25%	0%	
Area expansion (SHIVA) every year in lakhs	1,500	1,500	1,500	3,000	3,750	3,750	0	15,000
Area expansion (Floriculture)	1,301	1,301	1,301	1,301	1,301	1,301	1,301	9,110
Total cost in lakhs	6,674	6,674	6,674	8,174	8,924	8,924	5,174	51,220.9

Annexure 8: Estimated cost of Collection centre, Pack house and Processing units

Table 73: Cost of collection centre for fruits

Particular	No of unit	Unit cost	INR (in lakh)
Land development (500 sq.m.)	1	150	0.75
Building and civil structures 350 sq.m.	1	800	2.8
Machinery and equipment:			
Weighing scale			2.5
SS preparation table	1	45,000	0.45
Pre- cooling units of ecozen (5 MT/hr)	1	12	12
Fruit washer	1	1.5	1.5
Round fruit grader 1 MT/hr	1	2	2
Supporting equipment's like crates, MS trolleys	1	1	1
Pick up van (5 MT)	1	6.5	6.5
Tan 90 boxes for transport	10	4,000	0.4
Total Budget (INR in lakh)			29.9

Table 74: Cost of collection centre for flowers

Particular	No of unit	Unit cost	INR (in lakh)
Land development (500 sq.m.)	1	150	0.75
Building and civil structures 350 sq.m.	1	800	2.8
Machinery and equipment:			
Weighing scale			2.5
SS preparation table	1	45,000	0.45
Pre- cooling units of ecozen (5 MT/hr)	1	12	12
Supporting equipment's like crates, MS trolleys	1	1	1
Pick up van (5 MT)	1	6.5	6.5
Packaging and handling			2
Total Budget (INR in lakh)			28

Table 75: Cost of pack house for fruits

Investment Inputs	Unit area	Cost (INR Lakhs)	Total cost (INR Lakhs)
Land development (sq.m.)	2,500	250	6.25
Boundary wall (RM)	200	500	1.00
Pack house building of 1500 sq.m. @3000/sq.m.	1,500	3,000	45.00
Post-harvest unit -Structure, washing, sorting, drying, waxing, grading, packing -lines, 260 lakhs for 1,000 sq.m.	1,000	26,000	260.00
Weighing Scale/Weighbridge -60 MT	1	7,00,000	7.00
Weighing scale small	1	2,50,000	2.50
Dock shelter, leveller, motorized overhead door	5	7,00,000	35.00
Material handling equipments Forklifts, etc. for 10 men for 10 m	10	17,000	1.70

Investment Inputs	Unit area	Cost (INR Lakhs)	Total cost (INR Lakhs)
Servo Stabilizer 200 KVA	1	1,85,000	1.85
Genset 100 KVA	1	7,10,000	7.10
SS tables for manual sorting /grading packing, etc. Length 3-5 m width 1-1.5 m	1	1,50,000	1.50
Pre- cooling unit (6 MT)	1	25,00,000	25.00
Cold Room Cum Staging Unit 30 MT	30	18,000	5.40
Refrigerated Truck 5MT	1	15,00,000	15.00
Plastic crates (20 kg capacity) crates	275	2,000	5.50
Guard room (sq.m.)	10	3,000	0.30
Office inside pack house shed (sq.m.)	15	3,000	0.45
Water source/tube well	1	2,50,000	2.50
Labor change room with washroom outside /inside packhouse shed (sq.m.)	15	3,000	0.45
Laboratory -Inside or outside pack house shed (sq.m.)	10	3,000	0.30
Store room inside the pack house shed (sq.m.)	10	3,000	0.30
Rainwater harvesting arrangement	1	1,50,000	1.50
Sub-total			425.60

Table 76: Cost of Pack house for flowers

Investment Inputs	Unit area	Cost (INR Lakhs)	Total cost (INR Lakhs)
Land development (sq.m)	2,500	250	6.25
Boundary wall (RM)	200	500	1.00
Pack house building of 1500 sq.m. @3000/sq.m.	1,500	3,000	45.00
Weighing scale small	1	2,50,000	2.50
Dock shelter, leveler, motorized overhead door	5	7,00,000	35.00
Servo stabilizer 200 KVA	1	1,85,000	1.85
Genset 100 KVA	1	7,10,000	7.10
SS tables for manual sorting /grading packing, etc. Length 3-5 m width 1-1.5 m	1	1,50,000	1.50
Pre cooling unit (6 MT)	1	25,00,000	25.00
Cold Room Cum Staging Unit 30 MT	30	18,000	5.40
Refrigerated Truck 5MT	1	15,00,000	15.00
Packaging and Handling	500	250	1.25
Guard room (sq. m)	10	3,000	0.30
Office inside pack house shed (sq.m.)	15	3,000	0.45
Water source/Tube well	1	2,50,000	2.50
Labour change room with washroom outside /inside packhouse shed (sq.m.)	15	3,000	0.45
Store room inside the pack house shed (sq.m.)	10	3,000	0.30
Rainwater harvesting arrangement	1	1,50,000	1.50
Total			152

Table 77: Cost of Processing unit

Investment Inputs	Unit	Cost (INR)	Total Cost (INR Lakhs)
Land Development (2025 sq.m)	2,025	250	5.06
Electricity (including 3 phase meter and transformer 100 KVA)	1	1,50,000	1.50
Water provision	1	3,00,000	3.00
Waste Disposal	1	1,00,000	1.00
Building Construction	600	3,000	18.00
Plant and Machinery			-
Fruit washing machine (5 MT)	1	1,50,000	1.50
Sorting or inspection conveyer	1	1,60,000	1.60
Screw Feeder (2MT/hr)	1	3,33,000	3.33
Industrial Mixer Systems with Screw Feeder, Capacity: 350 Kg/Batch	1	1,70,000	1.70
Twin pulper (3 MT)	1	2,70,000	2.70
Industrial Juice Processing Machine (500 kg/hour)	1	1,10,000	1.10
Autoclave	1	1,50,000	1.50
Automatic Natural Fruit Juice Bottle Packaging Machine (50-60 bottles per minute)	1	60,000	0.60
Steam jacketed kettle (500 kgs)//	1	90,000	0.90
Miscellaneous	1	6,00,000	6.00
Aseptic processing line	1	1,75,00,000	175.00
Total			224.49

Annexure 9: Apiculture and Mushroom

i. Apiculture

Apiculture is a significant sustainable, and environmental sound activity involving integration of forestry, social forestry and horticulture supporting activity since it provides nutritional, economic, and ecological balance, while providing employment and income. It is an established fact that the value of increased fruit harvests, as a result of honeybee pollination, is 14 to 20 times more than the value of honey obtained directly from the bee colonies. According to the modest estimates about 2,00,000 bee colonies are needed for appropriate pollination for the bearing orchards in the state.

The greatest added value of Apiculture lies in the fact that the fruit plants selected under HPSHIVA namely, citrus, litchi, mango, plum, persimmon and pecan nut need pollination. Crops pollinated by honeybees have been proven to produce higher yields and better quality.

Beekeeping not only produces a nutritious and high-value food product which generates income, but it also creates employment possibilities along the honey value chain. Apiculture does not consume large amounts of land, so it releases people from land-demanding activities and reduces pressure on land.

Honey Mission was adopted by Ministry of MSME in 2017 under its Beekeeping program and customize the same for establishing Apiculture clusters. The proposed cluster can be given a maximum grant of INR5 crore for more than 500 beekeepers, and a proportionate grant for lesser number of beekeepers, which, however, shall not be less than 350 beekeepers in view of the viability of the cluster²⁹. Khadi and Village Industry Commission (KVIC) is the Nodal Agency (NA) for implementing the clusters under Honey Mission.

It is recommended that the department integrates the 'Honey Mission'; and promotes one such cluster each at district level. The department should collaborate with KVIC to:

- ▶ Identify and select potential beekeepers, with priority to women, small/marginal farmers, unemployed rural youth, and persons from marginalized sections of the society
- ▶ Organize skill development training in collaboration with State Beekeeping Extension Centre, KVIC, Kangra to train selected beekeepers
- ▶ Facilitate provision of bee boxes and tool kits to the trained beekeepers to start the beekeeping activity Each beekeeper shall be provided with bee boxes with live bee colonies, a tool kit
- ▶ Provide handholding support to the successful trained beekeepers for honey extraction and multiplication of bee colonies
- ▶ Organize buyer -seller meets for honey and other beehive products for making available marketing platform and also processing the raw honey through Institutional Honey Processing Plants

The estimated budget consists of capacity building activities, material cost, Honey processing unit cost, etc. The total estimated cost will be INR19.12 crores which include capacity building activities and infrastructure development. The details of each of the components are described below:

²⁹ "Bee Keeping", Ministry of Micro, Small & Medium Enterprises, <https://msme.gov.in/>

Table 78: Budget estimate for Apiculture

S. No.	Item	Rate (INR)	Number	Total Cost (INR) In Lakhs	Government contribution	Cost to government (In Lakhs)	Private/farmer cost (INR Lakhs)
1	Bee boxes and tool kits for Beekeeper (containing a smoker, bee veil, Knife and hive tools), Comb Foundation (CF) sheet)	26,000	1,000	260	50%	130	130
2	Honey Processing Unit Establishment Cost	1,00,00,000	1	100	70%	70	30
3	Honey processing unit operational expenses for 3 years @INR30,00,000 per year per unit	90,00,000	1	90	70%	63	27
4	Purchase of pick-ups van for district clusters	6,50,000	10	65	70%	46	19.5
5	Assistance to bee-keepers for migration	2,00,000	1,000	2,000	50%	1,000	1,000
6	Integrated Beekeeping Development Centre	10,50,00,000	3	3,150	100%	3,150	0
7	Quality testing lab	20,00,00,000	1	2,000	100%	2,000	0
	Grand Total			7,665		6,459	1,207

The Apiculture activity should be promoted in all districts of Himachal Pradesh. For calculations, it is considered that infrastructure and all training activities will be conducted at 10 district level clusters out of 12 districts (i.e., each district level cluster may consist of beekeepers from 1 or more districts).

The bee boxes, tool kits, Comb foundation sheet and other Apiculture equipment may be distributed to the beekeepers. One Honey processing unit may be established at a central location in the state which costs approximately INR1 crore and assumed operational expenses per year as INR30 lakhs for 3 years. The processing unit will also have pick up vans for each district level cluster to facilitate transportation.

Value added products from apiculture

i. Honey

The Food Safety and Standards (Food Safety Standards and Food Additives) Regulations, 2011, in regulation 2.8 related to sweetening agents including honey defines honey as - honey is a natural sweet substance produced by honey bees from the nectar of plants or from secretions of living parts of plants or excretion from plant sucking insects on living parts of plants, collected by bees and transformed by combining specific substances, deposit, dehydrate, store and leave in honeycomb to ripen and mature.

- ▶ Blossom honey or nectar honey is derived from nectars of plants
- ▶ Honeydew honey is honey which comes mainly from excretions of plant sucking insects (Hemiptera) on living part of plants or secretions of living parts of plants
- ▶ Honey derived from Carviacallosa plant which is thixotropic and gel like when undisturbed and liquid like when agitated or stirred
- ▶ Mono-floral honey when minimum pollen count of any of the plant species exceeds 45% of the total pollen count

- ▶ Multi floral honey when pollen count of any plant species does not exceed 45% of the total pollen count

ii. Beeswax

Beeswax is derived from the honeycombs of bees, after honey harvest through centrifuge or draining. The wax is melted using hot steam, or solar heat and the molten product is filtered and cast into cakes of yellow beeswax. Yellow beeswax when bleached with oxidizing agents like hydrogen peroxide, sulfuric acid, or sunlight becomes white beeswax. It consists of esters of fatty acid and fatty alcohols, hydrocarbons, and free fatty acid. Beeswax is used for comb foundation in beekeeping, thickeners, emulsifiers, and stiffening agents in cosmetics. Beeswax absolutes are also used to polish pills.

India is the largest beeswax producer in the world, contributing 38.15% (~24,000 MT) of the global beeswax production. However, China is the largest exporter of beeswax and India is the 14th largest exporter of beeswax in 2020. US, Australia and Egypt were the top exporting destinations for beeswax from India.³⁰

iii. Propolis

Propolis or bee glue is a natural resinous mixture produced by bees for hive defence. It is of waxy nature and mechanical properties, hence used by bees for construction and repair of hives, protective barrier against external intruders (snakes, lizards, etc.). Current applications of propolis are into health foods, beverages and cosmetics, due to its antimicrobial, antifungal, and antioxidant properties, it is also used in pharmaceutical sector. The various methods for extracting propolis are as follows – Ethanol Extracted Propolis (EEP)

- ▶ Quick Extraction
- ▶ Glycol Extracted Propolis (GEP)
- ▶ Aqueous Extracted Propolis (AEP)
- ▶ Oil Extracted Propolis (OEP)
- ▶ Propolis Paste
- ▶ Dry Propolis Extract
- ▶ Water soluble, dried powder ethanol extract
- ▶ Free-flowing, non-hygroscopic propolis powder
- ▶ Water Soluble Derivatives

iv. Pollen

Bee pollens are small yellowish – orange to dark brown or black granules with floral taste which is dependent on the plants from which it is gathered. It is an anti-inflammatory agent with antioxidant properties and considered a “superfood”. Hence, there’s an increased demand from nutraceutical, pharmaceutical, food and beverage industry.

v. Royal jelly

Royal jelly is a protein rich secretion from worker bees. As it is highly nutritious, it is used as feed for larvae and adult queen bee. It is also used as a nutritional supplement, antioxidant. However, royal jelly extraction requires trained manpower having larvae grafting skills. Commercially, royal jelly is produced by stimulating queen bee production outside natural habitat. Royal jelly is harvested in 5-days’ time when maximum volume is accumulated upon the larva. It needs to be stored in sub-zero

³⁰ “Beeswax”, Tridge, <https://www.tridge.com/intelligences/beeswax/production>

temperature after harvest, during packaging and at consumer's end. Estimated yield of royal jelly is 900 grams in 5-6 months from a well-maintained hive³¹.

³¹ "How Indian Royal Jelly came up to mark, beat top-quality products from Thailand, Taiwan", The India Express, 1 September 2021, <https://indianexpress.com/article/>

vi. Bee venom

Melittin is the active component of bee venom and has anti-inflammatory and anti-coagulating properties. Bee venom is in high demand in the pharmaceutical and cosmetic industry due to its application in anti-ageing creams and treatment of arthritis. However, the yield of venom is quite low i.e., 4.5-5 g from 100 bee boxes per month. Market price of bee venom is INR7,000 - 10,000 per gram, however buyers generally demand for 1 kg quantity in bulk, which is difficult for an individual beekeeper.

Quality Parameters

Honey quality parameters

Food Safety and Standards Authority of India (FSSAI) parameters for honey³²

Table 79: FSSAI parameters for honey

S. No.	Parameter	Limits
1	Specific Gravity at 27°C, min.	1.35
2	Moisture percent by mass, max.	20
3	(a) Total Reducing Sugar by Mass, min. (b) Carviacallosa and honey dew honey, percent by mass, min. (c) Blends of honey dew honey with blossom honey, percent by mass, min.	65 60 45
4	(a) Sucrose percent by mass, max. (b) Carviacallosa and honey dew honey, percent by mass, max	5 10
5	Fructose to glucose ratio (F/G)	0.95 - 1.50
6	Total ash, percent by mass, max.	0.5
7	(a) Acidity expressed as formic acid percentage, by mass, max. (b) Free acidity milliequivalents acid /100g, max.	0.2 0.5
8	Hydroxymethyl Furfural (HMF) mg /kg, max.	80
9	Diastase activity, Schade units, max.	3
10	(a) Water insoluble matter, percent by mass, max. (b) For pressed honey, percent by mass, max.	0.10 0.5
11	C4 Sugar, percent by mass, max.	7.0
12	Pollen Count /g, min.	25000
13	Specific marker for Rice Syrup (SMR)	Negative
14	Trace marker for Rice Syrup (TMR)	Negative
15	Foreign Oligosaccharides percent, max.	0.1
16	Proline, mg/kg, min.	180
17	Electrical conductivity (a) Honeys not listed under honeydew, max. (b) Honeys listed under honey dew, min.	0.8µS/cm 0.8µS/cm
18	(a) Δ-δ 13C, max. (max difference between all measured δ13 C values), per mil (b) Δ-δ 13C Fru-Glu (the difference in 13C/12C ratio between fructose and glucose), per mil (c) Δ-δ 13C, percent Protein-Honey (the difference in 13C, 12C between honey and associated protein content), per mil	±2.1 ±1.0 >= -1.0

³² As per direction under section 18 (2)(d) read with section 16 (5) of Food Safety and Standards Act, 2006 regarding operationalisation of Food Safety and Standards Amendment Regulations, 2019 dated 1 July 2020

Honey is not included in “tissues” (foods) stated in Annex I of Regulation (EEC) Number 2377/90 and related regulations. Hence presence of antibiotics in honey is unauthorized.

Table 80: Antibiotics in honey with maximum residue Level

S. No.	Antibiotic	Maximum Residue Performance Level (µg/kg)
1	Chloramphenicol	0.3
2	Nitrofurantoin and its metabolites	1
3	Sulphonamides and its metabolites	10 either individually or collectively
4	Streptomycin	10 either individually or collectively
5	Erythromycin	10
6	Tetracycline	10
7	Oxytetracycline	10
8	Ampicillin	10
9	Enrofloxacin	10
10	Tylosin	10
11	Ciprofloxacin	10

Further, honey sample is tested for presence of heavy metals and pesticide and rice marker. Nuclear Magnetic Resonance (NMR) test is done for profiling honey with export orientation. This test is used for scanning quality, adulterants, and authenticity of honey. It can even detect inaccurate declaration of botanical and geographical origins of honey. NMR is a rapid, but database driven detection and quantification method. Thus, prior database should be available for effective utilization, however there is no such database for Indian Honey at present. Hence NMR is not included in FSSAI standards for honey currently.

Beeswax quality parameters

As per the Food Safety and Standards (Food products Standards and Food Additives) Regulations, 2011 version IX dated 29 March 2019, specifies that test method for beeswax should be in accordance with method specified in Joint FAO /WHO Expert Committee on Food Additives (JECFA) (INS Number 901) conforming to the following requirement -

Table 81: FSSAI parameters for Beeswax

S. No.	Parameter	Limits
1	Solubility	Insoluble in water; sparingly soluble in alcohol; very soluble in ether
2	Melting point range, °C	62 - 65
3	Acid value	17 - 24
4	Peroxide value, max.	5
5	Saponification value	87 - 104
6	Carnauba wax	Absent
7	Ceresin, paraffins and certain other waxes	Absent
8	Fats, Japan wax, rosin and soap	Absent
9	Glycerol and other polyols, per cent by mass, max.	0.5
10	Lead mg /kg, max.	2.0
11	Ash per cent by mass, max.	0.5
12	Total volatile matter, per cent by mass, max.	0.75

Royal jelly quality parameters

The Food Safety and Standards (Food products Standards and Food Additives) Regulations, 2011 version IX dated 29 March 2019, specifies that color, taste, and composition of royal jelly are determined by bees fed with the following type of food during royal jelly production -

- ▶ Type - 1: Only Bee's Natural Foods (pollen, nectar, and honey)
- ▶ Type - 2: Bee's natural food and other nutrients (proteins, carbohydrates)

Table 82: FSSAI parameters for Royal Jelly

S. No.	Parameter	Permissible Limits	
		Type 1	Type 2
1	Moisture percent by mass, max.	62 - 68.5	
2	10 - HDA percent by mass, min.	1.4	
3	Protein percent by mass	11 - 18	
4	Total sugar, percent by mass	7 - 18	
5	Fructose, percent by mass	2 - 9	
6	Glucose, percent by mass	2 - 9	
7	Sucrose, percent by mass	3	NA
8	Erlose, percent by mass	0.5	NA
9	Maltose, percent by mass	1.5	NA
10	Maltotriose, percent by mass	0.5	NA
11	Total acidity, ml of 1 mol/l NaOH l/100 g	30.0 - 53.0	
12	Total lipid, percent, by mass	2 - 8	
13	C13 /C12 Isotopic ratio (δ ‰)	- 29 to - 20	- 29 to - 14

Furosine is an additional, optional quality parameter which shows freshness of royal jelly.

ii. Mushroom

As per statistics, the mushroom production in Himachal Pradesh at 500 metric tonnes during 1996-97 has increased to 14,500 metric tonnes during 2017-18 and 15,600 metric tonnes in 2019. At present, the production in Himachal Pradesh is approximately 16,000 metric tonnes. Several large and small growers are engaged in the production of mushrooms, but total production is much less as compared to its demand. There are not many large-scale units in Himachal Pradesh and most of the small-scale mushroom production units capacity varies from 50- 500 TPA, with most of the units have capacity below 200 TPA.

Button mushroom dominates production (70%) followed by oyster mushroom (18%), paddy straw mushroom (8%), milky mushroom (3%) and shiitake mushroom (1%) are being cultivated. In Himachal Pradesh, however, the focus is on button mushroom. ICAR-DMR, is in this state and has developed the cultivation technologies of dozens of medicinal and edible mushrooms. The notable ones are *Flammulina velutipes*, *Agrocybe aegirita*, *Hericium erianaceus*, *Pleurotus eryngii*, *Cordyceps militaris*, *Schyzophyllum commune*, etc. However, in Himachal Pradesh farmers are cultivating only three mushrooms. Button mushroom is the most popular that contributes more than 95%, oyster and shiitake are the other two mushrooms which many mushroom growers are cultivating. Solan, Shimla, Kullu and Sirmour are the main mushroom cultivating districts in the state. Young farmers are learning from progressive mushroom producers. They also get good compost and mushroom spawn here at this farm.

Two bulk pasteurization units for compost have been established with total production capacity of 1,350 MT of pasteurized compost (Chambaghat 350MT and Palampur 1,000 MT). The pasteurized compost from these units is being made available to the registered mushroom growers of Shimla, Solan, Sirmour, Kinnaur, Kangra, Chamba, Hamirpur, Una and Bilaspur Districts. Two more bulk compost pasteurization units have also been established at Dharbaggi (Bajinath) in Distt. Kangra and Bajaura in Distt Kullu with the assistance of the central Government. These two units cover District of Kullu, Mandi, parts of Kangra, Bilaspur & Hamirpur. With the installation of these units the production capacity of pasteurized compost under public sector has been increased to 3,000 MT per annum. One such unit is established in district Shimla that will cater the demand of compost of growers living in Kinnaur district, upper areas of Shimla district, adjoining area of Mandi district and outer Seraj area of Kullu district. At present, 33 compost production units and 12 spawn production units have been established under the private sector in Solan, Shimla, Sirmour, Bilaspur, Hamirpur, Kullu and Kangra districts. The Department of Horticulture is implementing Himachal Khumb Vikas Yojna for promotion of mushroom in the state. The scheduled caste, scheduled tribe, IRDP, small and marginal farmers and unemployed graduates are being given preference under these projects. Government of Himachal Pradesh is also promoting shiitake mushroom cultivation in the State. Already, one ready to fruit facilities for shiitake promotion has been established at HPKV, Palampur in collaboration with Japanese International Cooperative Agency (JICA).

ICAR-DMR, Solan organizes 'Mushroom Mela' on 10th September, every year, the day on which Solan was declared as 'Mushroom City of India' in the year 1997. Every year a large number of farmers, mushroom growers, mushrooms industry people and extension workers from across the country participate in this event. Due to the hilly nature of the state, agriculture land in many places is not best utilized for cropping. Reasons for that include undulating topography, weather conditions, water scarcity and rocky soil. Under such circumstances mushroom cultivation is a viable option and will be a future crop of the state. Because mushroom cultivation is a vertical farming and does not require fertile land and demand for water is also low (25 litre to produce one kg of button mushroom). The state has to strengthen both its technical and non-technical manpower needed to operate mushroom growing activities. Mushroom cultivation can effectively utilize agro residues for production of protein rich food. The development of rapid infrastructure facilities and well-organized distribution network has to be developed for marketing of mushrooms. The R&D, government schemes, policymakers and entrepreneur are contributing towards the initiation and growth of the mushroom industry in Himachal Pradesh. Further, Government of Himachal Pradesh should take more initiatives to conserve this heritage of the state and country and divert more funds especially towards R&D.

Though, Himachal Pradesh is the state where the foundation for mushroom research was laid in 1961, despite the favorable climatic conditions for the cultivation of temperate mushrooms, the state has not

made attainable progress. Unstable markets, poor economic base of the farmers, lack of policy support are some of the reasons. There is urgent need to establish mother composting units/ready to fruit bag units in every district so that farmers could get ready to fruit bags and cultivate mushrooms at their homes. There is need to promote merits of mushrooms so that the consumption can be enhanced. The government can take a decision to include mushroom in the mid-day meal for the school children. There is need for uniform policies for income tax, electricity tariff, and minimum support price to promote mushroom industry in the state. Mushroom is highly perishable commodity; there is need for organized market and proper infrastructure for the post-harvest management.

Summary and proposed interventions:

The agro-climatic conditions prevailing in Himachal Pradesh are highly congenial for production of mushroom and the development of mushroom-based industry. Since mushroom growing can be done with limited land resources to provide nutrition to consumers and employment to people it needs utmost attention for its effective promotion. It has all essential nutrients and important phytochemical which may help in fight against anemia, under nutrition and malnutrition. Technological advancement in mushroom cultivation has pushed the adoption of mushroom in a big way for enhancing the production and productivity, processing and value addition. Interestingly, mushroom production has doubled in ten years. In India, research support for technological advancement and innovations is done through National Centre for Mushroom Research and Training (NCMRT) and AICRPM with 32 coordinating centres located in different agro-climate of different states. The National Research System is working for harnessing the potential of mushroom diversity available, innovations quick in spawn production technology, improved crop production technology, processing/preservation technologies and marketing potentials of various mushrooms. Biodiversity in mushroom has been harnessed and many medicinal mushrooms are now grown. Existing conditions can help mushroom growing into a cottage as well as commercial scale industry.

Among all edible species of mushrooms, the production of oyster mushroom (*Pleurotus* spp.) per unit area is the highest. The production of *Pleurotus ostreatus* in a standard size green house (667m²) without air handling is 15-20 tons within 3-4 months. Thus, mushroom cultivation has enormous scope of converting a voluminous quantity of agro waste, forest waste and industrial wastes into the highly nutritious food with lots of nutritional and medicinal values and ample opportunities for generating employment to the rural population in and around the country. It has high potential to effectively make use of the waste and transform it into the best food. Mushroom farming has enormous scope in livelihood up-gradation due to cheap agro resources, utilizing air space, diminishing land, higher production rate and huge labor force. Practicing tropical mushroom cultivation can double or triple the income within 25-45 days.

Government of Himachal Pradesh is implementing program of Mushroom development of MIDH and has state level program for the development of mushroom by aiding for training, training visits, support for spawn production, assistance for compost production. Since the development of mushroom in India is highly connected with Himachal Pradesh and the district Solan, where the first mushroom initiative was taken, is called Mushroom City and hosts National level Mushroom Research and Training System, there is need for more support on research and development, so that mushroom can serve for nutritional security and livelihood of the people. In the given scenario to expand and provide leadership it is imperative to provide support through HPSHVA project. Modern spawn unit with automation be set up to produce high quality spawn. Similarly compost unit be set for quality production of compost.

For future development in the state, it is suggested to establish following facilities:

- ▶ Oyster mushroom spawn production unit
- ▶ Shitake (*Lentinula edodes*) spawn production unit¹³³

³³ <https://www.iihr.res.in/sites/default/files/Mushroom%20production%20technologies.pdf>

Table 83: Automated Spawn production unit

Item	Rate (INR)	Number	Total Cost (INR Lakhs)	Cost to Government Total Cost (INR Lakhs)	Private cost (INR Lakhs)
Automated Spawn production unit - 1 Ton/day Investment cost: 2.5 Crore Recurring expense: 1 lakh/month for 3 years	2,86,00,000	1	286	215	71

For calculations, it is considered that infrastructure and all training activities will be conducted at 10 district level clusters out of 12 districts (i.e., each district level cluster may consist of beekeepers from 1 or more districts).

Annexure 10: Investor database

Some of the potential investors which can be contacted for establishment of units in Himachal Pradesh are:

Table 84: Investor database

S. No.	Name of investor company
1	Allfresh Supply Management Pvt Ltd, New Delhi
2	B.N. International, New Delhi
3	BD Agro Foods, Punjab
4	Beejapuri Dairy Pvt Ltd (Country Delight), Gurugram
5	BTW Foods Pvt Ltd, Sonipat
6	Chifu Agritech Pvt Ltd (Vegrow), Hyderabad
7	Crofarm Agriproducts Pvt. Ltd, Gurugram
8	DA Old Dairy Farm, Faridabad
9	Farmbridge Agri & Food Processing Company, Haryana
10	Go4Fresh (Fresh Produce value creation Service Pvt Ltd), Navi Mumbai
11	Haldiram Snacks Pvt Ltd, Noida
12	Hands-On Trades Private Limited (Grofers), New Delhi
13	iCognitive Global Pvt Ltd (Agri 10x), Pune
14	IND Group, New Delhi
15	Indocan Honey Pvt. Ltd, Sonipat
16	Innoterra India Private Limited, Mumbai
17	Kool tech, Punjab
18	Madhav Food and Agro Products, Punjab
19	Mandi Gate Private Limited, Delhi
20	Mehta Bishan Dass & Associates, Punjab
21	Nurture Farm AGTech Pvt Ltd
22	Parkash Golden Masale, Punjab
23	Rajput General Stores, Faridabad
24	Roshanlal and Co, Punjab
25	Siddhi Vinayak Agri Processing Pvt Ltd, Pune
26	Technico Agri Science Ltd, (ITC subsidiary), Chandigarh
27	Uniqueleaf Agri Business Pvt. Ltd, Madhya Pradesh
28	Pepsico India Pvt. Ltd, New Delhi
28	Tops Food and Beverages, Janakpuri, New Delhi

Annexure 11: Sample Package of Practices for Mango Organic farming

Compost or FYM can be partially or completely substituted with Vermicompost and in this case the quantity required will be only about 50%. Green leaves (25 kg /plant), Oil cake (10 kg /plant) and wood ash (10-15 kg/plant) may be applied additionally. Apply organic manures in May-June with the onset of monsoon. Apply the manures in trenches 30 cm deep taken at 2.5 to 3 m from the base of the tree.

Plantation

Season plant one year old grafts with the onset of monsoon showers so that they get established before the rains. If rainfall is heavy, planting should be done during August-September.

Manuring For Organic Mango Production

FYM or compost may be applied along with 50-100 g of PGPR mix I from first year onwards and the quantity should be increased as the tree grows, as shown in the table below.

Figure 8: Manuring of organic mango production

Age of plant (years)	FYM/compost (Kg/plant/year)
1-2	15
3-5	30
6-7	50
8-10	75
Over 10	100

After Cultivation

Irrigate twice a week during summer months till the plants are 4-5 years old. Grow intercrops vegetables, and legumes in young orchards. Carry out intercultural operations by ploughing or digging twice during the year in June and October. For reducing fruit drop and to improve productivity and fruit size, irrigate the plants at 10 -15 days interval from fruit set stage onwards.

Plant Protection

Important pests of mango are hoppers, stem borers, shoot midges, leaf feeding insects, fruit flies and mealy bugs. The common diseases are powdery mildew, anthracnose and dieback. Under organic production system, to protect the orchard and the trees, following steps may be practiced.

- ▶ Keep the orchard and tree surroundings clean by proper sanitary measures.
- ▶ Lime brushing on tree trunks will help to control some of the pests
- ▶ Cuts and wounds on plant parts should be pasted with coal tar, used engine oil or Bordeaux paste.
- ▶ Smoking in low intensities in the orchard during flowering season will reduce the number of pests including the hoppers
- ▶ Spraying *Pseudomonas fluorescens* (10g /litre) on trees before flowering and at flushing times will improve the general health, flowering and resistance of the trees

Fruit flies

- ▶ Collect and destroy attacked fruits that rot and drop down
- ▶ Fruit fly traps can be used: Trap is prepared by mixing banana fruits (*Palayanthodan*) and jaggery (3-5% level) poisoned with 2 ml malathion and kept either in hanging containers or used for swabbing the tree trunks at weekly intervals from flushing time onwards
- ▶ Set up methyl eugenol trap @ 10 numbers/ha
- ▶ *Spathiphyllum* (Peas Lily) plants can be planted as trap crop which attract the insects and they are to be destroyed by manual means

Stem borer

Apply paste made of crude carbolic acid (130 ml), soft soap (1 kg) and hot water (3.7 litres) to holes in the bark and plug the holes.

Against sucking insects (Mealy bugs, Thrips, Mites etc.) spray with neem oil (0.5 to 1%) - soap emulsion. Sticky bands or stem traps with mud slurry, jack latex, vaseline, greece, coal tar or gel will prevent the upward movement of the pests from soil.

Red ants

They become serious problem sometimes. If the number of ant colonies is maintained at a moderate level, this will guard the trees from common insect pests. If the number is huge, control to a certain extent can be obtained by introducing predatory ant, *Plagiolepis* (Chonal ants).

Mechanical means like breaking the ant nets and sprinkling wood ash or common salt pellets and trapping ants by sticky threads hung with fresh bones from slaughter houses followed by destruction also can be tried.

Dieback of twigs and branches

Cut the affected twigs below the infected region and spray 1% Bordeaux mixture.

Pink disease

Remove the bark at the point of infection and 30 cm above and below the point of infection and apply 10% Bordeaux paste.

Annexure 12: Phasing of investment cost

Table 85: Phasing of total investment cost

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
A. Infrastructure Development								
Irrigation infrastructure	7,858	7,858	7,858	7,858	7,858	7,858	7,858	55,006
Integrated laboratory with plant tissue analysis labs	200	200	400	400	400	400	400	2,400
Input Shops by FPOs under HPSHIVA	0	0	10	10	0	20	90	130
Input shops by entrepreneurs	30	40	40	0	0	0	0	110
Collection Centre (HPSHIVA)	0	0	120	120	90	240	1,380	1,950
Collection Centre (Others)	750	750	750	750	750	750	750	5,250
Collection Centre flower	0	28	28	28	28	28	56	196
Packhouses (HPSHIVA)	0	0	426	426	0	852	3,834	5,538
Packhouse (HPHDP)	2,130	2,556	0	0	0	0	0	4,686
Packhouses (Other fruits)	426	852	852	852	852	852	852	5,538
Packhouse- automated packaging lines, specialized High Reach Material Handling Equipment	15	49	64	64	49	98	298	637
Packhouses (flower)	76	76	0	0	0	0	0	152
Processing units (HPSHIVA)	224	224	224	0	0	0	0	672
Pecan nut processing unit	0	0	0	0	10	0	0	10
Processing units (HPHDP)	448	224	0	0	0	0	0	672
Other processing unit	0	224	0	0	0	0	0	224
Freeze dehydration unit	0	50	0	0	0	0	0	50
Marigold Extraction Unit	0	750	0	0	0	0	0	750
Ripening Chamber	0	0	0	300	300	300	300	1,200
Controlled Atmosphere storage	0	0	0	375	375	375	375	1,500
Hi-tech markets	0	16,667	16,667	16,667	16,667	16,667	16,667	1,00,000
Export hubs	0	2,500	2,500	2,500	2,500	2,500	2,500	15,000
Material Ropeways	0	0	360	540	540	540	540	2,520
Sub Total (A)	12,157	33,048	30,299	30,890	30,419	31,480	35,900	2,04,191

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
B. Augmentation of Value Chain								
FPOs								
FPOs for area covered under 10000 ha	378	378	378	756	918	972	0	3780
FPOs for new area expansion HPHDP	108	108	270	432	540	540	648	2,646
FPOs for area under other fruit crops	162	162	378	540	810	810	918	3,780
FPOs in existing area	756	756	1,512	2,268	3,078	3,078	3,834	15,282
Floriculture	0	54	54	54	54	54	108	378
Honey	54	54	54	108	162	162	162	756
Mushroom	0	54	54	54	54	54	108	378
Sub Total	1,458	1,566	2,700	4,212	5,616	5,670	5,778	27,000
Nurseries								
Investment under HPSHIVA	840.5	840.5	0	0	0	0	0	1,681
Investment for other fruit crops Nurseries	0	551	236	354	0	0	0	1,141
Upgradation of two Nurseries	200	0	0	0	0	0	0	200
Sub Total	1,040.5	1,391.5	236	354	0	0	0	3,022
Establishment of Orchards								
Investment under HPSHIVA	5,000	5,000	5,000	10,000	12,500	12,500	0	50,000
Investment for other fruit crops	5,710	5,710	5,710	5,710	5,710	5,710	5,710	39,973
Investment for Floriculture plantation	1,301	1,301	1,301	1,301	1,302	1,302	1,302	9,110
Fencing	26,361	26,361	26,361	26,361	26,361	26,361	26,361	1,84,525
Anti hail nets	18,453	18,453	18,453	18,453	18,453	18,453	18,453	1,29,168
Anti hail nets- support system	9,490	9,490	9,490	9,490	9,490	9,490	9,490	66,430
Crop Insurance	257	257	257	257	257	257	257	1,800
Improved Productivity	8	8	8	8	8	8	8	53
Product development for indigenous commodities and value addition	15	15	15	15	15	15	15	105
Good Agricultural Practices	3	3	3	3	3	3	3	21
Integrated Pest and Nutrient Management	2,109	2,109	2,109	2,109	2,109	2,109	2,109	14,762
Organic Farming	71	71	71	71	71	71	71	500

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Natural Farming	135	135	135	135	135	135	135	943
Packaging Material	17,857	17,857	17,857	17,857	17,857	17,857	17,857	1,25,000
Green Technology	3	3	3	3	3	3	3	20
Horticulture Mechanization	714	714	714	714	714	714	714	5,000
Drone Technology	29	29	29	29	29	29	29	200
IoT driven Value Chain	1,429	1,429	1,429	1,429	1,429	1,429	1,429	10,000
Sub Total	88,944	88,944	88,944	93,944	96,445	96,445	83,945	6,37,609
Total (B)	91,442	91,901	91,880	98,510	1,02,061	1,02,115	89,723	6,67,631

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
D. Research and Development								
Bioenhancers	20	0	0	0	0	0	0	20
Biofertilizer unit	50	0	0	0	0	0	0	50
Biopesticide unit	90	0	0	0	0	0	0	90
Organic farming	143	143	143	143	143	143	143	1,000
Natural farming	143	143	143	143	143	143	143	1,000
Genetic engineering lab	1,600	1,700	1,700	0	0	0	0	5,000
Hydroponic lab	80	80	80	0	0	0	0	240
Aeroponic lab	70	70	70	0	0	0	0	210
PHM lab	2,857	2,857	2,857	2,857	2,857	2,857	2,857	20,000
Sub Total (D)	5,053	4,993	4,993	3,143	3,143	3,143	3,143	27,610

Table 86: Phasing of total government investment cost

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
A. Infrastructure Development								
Irrigation infrastructure	7,072	7,072	7,072	7,072	7,072	7,072	7,072	49,505
Integrated laboratory with Plant tissue analysis labs	200	200	400	400	400	400	400	2,400
Input Shops by FPOs under HPSHIVA	0	0	8	8	0	16	72	104
Input shops by entrepreneurs	15	20	20	0	0	0	0	55
Collection Centre (HPSHIVA)	0	0	96	96	72	192	1,104	1,560
Collection Centre (Others)	600	600	600	600	600	600	600	4,200

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Collection Centre flower	0	22.4	22.4	22.4	22.4	22.4	44.8	157
Packhouses (HPSHIVA)	0	0	220	220	0	440	1,980	2,860
Packhouse (HPHDP)	1,100	1,320	0	0	0	0	0	2,420
Packhouses (Other)	220	440	440	440	440	440	440	2,860
Packhouse- automated packaging lines, specialized High Reach Material Handling Equipment	15	49	64	64	49	98	298	637
Packhouses (flower)	41.8	41.8	0	0	0	0	0	84
Processing units (HPSHIVA)	123	123	123	0	0	0	0	370
Pecan nut processing unit	0	0	0	0	6	0	0	6
Processing units (HPHDP)	246	123	0	0	0	0	0	370
Other processing unit	0	123	0	0	0	0	0	123
Freeze dehydration unit	0	28	0	0	0	0	0	28
Marigold Extraction Unit	0	412.5	0	0	0	0	0	412.5
Ripening Chamber	0	0	0	165	165	240	240	810
Controlled Atmosphere storage	0	0	0	300	300	206.25	206.25	1,013
Hi-tech markets	0	11,667	11,667	11,667	11,667	11,667	11,667	70,000
Export hubs	0	1,750	1,750	1,750	1,750	1,750	1,750	10,500
Material Ropeways	0	0	180	270	270	270	270	1,260
Sub Total (A)	9,634	23,992	22,662	23,074	22,813	23,414	26,144	1,51,732

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
B. Augmentation of Value Chain								
FPOs								
FPOs for area covered under 10000 ha	189	189	189	378	459	486	0	1,890
FPOs for new area expansion HPHDP	54	54	135	216	270	270	324	1,323
FPOs for area under other fruit crops	81	81	189	270	405	405	459	1,890
FPOs in existing area	378	378	756	1,134	1,539	1,539	1,917	7,641
Floriculture	0	27	27	27	27	27	54	189
Honey	27	27	27	54	81	81	81	378
Mushroom	0	27	27	27	27	27	54	189
Sub Total	729	783	1,350	2,106	2,808	2,835	2,889	13,500

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Nurseries								
Investment under HPSHIVA	373.5	373.5	0	0	0	0	0	747
Investment for other fruit crops Nurseries	0	250	100	150	0	0	0	500
Upgradation of two Nurseries	200	0	0	0	0	0	0	200
Sub Total	573.5	623.5	100	150	0	0	0	1,447
Establishment of Orchards								
Investment under HPSHIVA	2,500	2,500	2,500	5,000	6,250	6,250	0	25,000
Investment for other fruit crops	2,855	2,855	2,855	2,855	2,855	2,855	2,855	19,987
Investment for Floriculture plantation	651	651	651	651	651	651	651	4,555
Fencing	18,453	18,453	18,453	18,453	18,453	18,453	18,453	1,29,168
Anti hail nets	14,762	14,762	14,762	14,762	14,762	14,762	14,762	1,03,334
Anti hail nets- support system	4,745	4,745	4,745	4,745	4,745	4,745	4,745	33,215
Crop Insurance	129	129	129	129	129	129	129	900
Improved Productivity	8	8	8	8	8	8	8	53
Product development for indigenous commodities and value addition	15	15	15	15	15	15	15	105
Good Agricultural Practices	1.6	1.6	1.6	1.6	1.6	1.6	1.6	11.2
Integrated Pest and Nutrient Management	1,054	1,054	1,054	1,054	1,054	1,054	1,054	7,381
Organic Farming	71	71	71	71	71	71	71	500
Natural Farming	98	98	98	98	98	98	98	684
Packaging Material	4,464	4,464	4,464	4,464	4,464	4,464	4,464	31,250
Green Technology	3	3	3	3	3	3	3	20
Horticulture Mechanization	429	429	429	429	429	429	429	3,000
Drone Technology	14	14	14	14	14	14	14	100
IoT driven Value Chain	1,429	1429	1,429	1,429	1,429	1,429	1,429	10,000
Sub Total	51,680	51,680	51,680	54,180	55,431	55,431	49,181	3,69,262
Total (B)	52,983	53,087	53,130	56,436	58,239	58,266	52,070	3,84,209

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	
Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
D. Research and Development								
Bioenhancers	20	0	0	0	0	0	0	20
Biofertilizer unit	25	0	0	0	0	0	0	25
Biopesticide unit	45	0	0	0	0	0	0	45
Organic farming	143	143	143	143	143	143	143	1,000
Natural farming	143	143	143	143	143	143	143	1,000
Genetic engineering lab	1,600	1,700	1,700	0	0	0	0	5,000
Hydroponic lab	80	80	80	0	0	0	0	240
Aeroponic lab	70	70	70	0	0	0	0	210
PHM lab	2,857	2,857	2,857	2,857	2,857	2,857	2,857	20,000
Sub Total (D)	4,983	4,993	4,993	3,143	3,143	3,143	3,143	27,540

Annexure 13: Detailed calculations

Table 87: Farmer Producer Organizations (FPOs)

Particular	Maximum Loan	Interest (say)	Existing interest subvention	Additional Interest Subvention	State share	Central share	Government share	Remaining amount by FPO
Term loan	2,00,00,000	12%	3%	3%	6,00,000	6,00,000	12,00,000	12,00,000
Maximum matching Equity Grant							15,00,000	15,00,000
Total (1 FPO)							27,00,000	27,00,000
Total (500 FPOs) in Lakhs							13,500	13,500

Table 88: Achievement of productivity

Productivity	Amount	Number	Years	Amount (INR)
FPOs	1,00,000	5	7	35,00,000
Farmers	50,000	5	7	17,50,000
Total (INR)				52,50,000
Total (INR Lakhs)				52.5

Table 89: Crop insurance

Particular	Amount (INR)
Estimate cost of cultivation	1,50,000
1.3 times cost of cultivation	1,95,000
Total Premium	5% 9,750
By farmer	2.5% 4,875
By Government	2.5% 4,875

Table 90: Product development for indigenous commodities and value addition

Number of patents every year	Number of years	assistance per patent	Total (INR)
3	7	5,00,000	1,05,00,000
Total (INR Lakhs)			105

Table 91: GAP certification

Domestic GAP Certification cost	Total certifications (4 per year for 7 years)	Total
75,000	28	21,00,000
Maximum limit	Government share	Private share
40,000	40,000	35,000
Total (INR Lakhs)	11.2	9.8

Table 92: Organic and Natural farming

Particular	Area (ha.)	Assistance	INR Lakhs
Organic Farming	5,000	10,000	500
Natural farming	5,000	2,500	125
Total (INR Lakhs)			625

Table 93: Natural farming additional subsidy

Particular	Cost Norms	Units	Total	%ge	Government (INR Lakhs)	Private (INR Lakhs)
For changing the cowsheds to make the cowsheds firm and collect cow urine and dung.	8,000	5000	400	80%	320	80
Drum cost per farmer	2,250	5000	112.5	75%	84.375	28.125
Gratuity on cows	60,000	500	300	50%	150	150
Natural farming resource reserves (50 villages)	10,000	50	5	100%	5	0
Sub total			817.5		559.375	258.125
Direct benefit transfer assistance as above			125		125	
Total (INR Lakhs)			942.5		684.375	258.125

Annexure 14: Team structure for Project Consultancy and Management Unit (PCMU)

Table 94: Proposed team structure

Experts	Minimum education qualification	Number	Unit rate per month as per NICS*	Rate per month	Number of months	Amount per annum
Team leader	Masters/PGD in Business Administration/Agri Business Management/Rural Development/Engineering or equivalent. Minimum 15 years of relevant work experience	1	3,50,000	3,50,000	12	42,00,000
Deputy team leader: strategy and policy expert	Masters/PGD in Business Administration/Agri Business Management/Rural Development/Engineering or equivalent. Minimum 10 years of relevant work experience	1	3,00,000	3,00,000	12	36,00,000
PPP development expert	Master's in business administration/Engineering or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Skill development expert	Master's in Business Administration/Agriculture/Horticulture/Agribusiness or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Market led transaction expert	Master's in Business Administration/Agriculture/Horticulture/Agri business Engineering or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Horticulturist	Post-graduation or Masters in Horticulture or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Post-harvest expert	Post-graduation or Masters in Post-harvest/Horticulture/Agribusiness or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Finance expert	Master's in business administration/Engineering or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Irrigation expert	Master's in Civil Engineering/Agriculture engineering or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Rural resurgence/economy expert	Masters in Rural development/ABM/Business Administration/Engineering/Economics/Agriculture/Horticulture or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000

Experts	Minimum education qualification	Number	Unit rate per month as per NICS*	Rate per month	Number of months	Amount per annum
IT expert	Masters in IT/Engineering or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Institutional/regulatory expert	Bachelor's in law or equivalent. Minimum 6 years of relevant work experience	1	2,75,000	2,75,000	12	33,00,000
Zonal officers (post harvest, irrigation and rural resurgence expert)	Bachelor's in business administration/Engineering/Agriculture/Horticulture/economics or equivalent. Minimum 3 years of relevant work experience	3	2,35,000	7,05,000	12	84,60,000
						4,92,60,000

*Excluding GST @18% and National Informatics Centre Services Inc. (NICS) rate @7%

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