
GREEN INDIA: UNVEILING THE CLEAN PLANT PROGRAM FOR SUSTAINABLE AGRICULTURE AND ENVIRONMENTAL RESILIENCE

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ABSTRACT

Horticulture is an important part of India's agricultural industry, helping to improve food security, increase income, and create a lot of employment opportunities. In world ranking India stands 2nd in horticulture crop production. But this sector can grow further and have a better export opportunity. The availability of high-quality disease-free planting materials, proper pests and diseases control measures, innovative cultivation practices and post-harvest measures for managing crops after harvest are the prime focus of the Government to meet the growing demand for horticulture production. Also, the wide range of plants and fields in the country has the potential to grow even more. As a way to meet these needs, the Indian Government has started the ambitious Atmanirbhar Clean Plant Programme. This important project is expected to lead to growth that will improve India's horticulture scenario and make the country richer in the future. The effort, as outlined in the 2023-24 Union Budget, seeks to focus disease-free and superior planting material for esteemed horticultural crops. The programme proposed to start 10 "Clean Plant Centres" across the nation, with a budget allocation of Rs. 2,200 crore spread over a period of seven years. These centres will actively participate in research, diagnostics, and therapies, consequently enhancing the accessibility of certified planting material and diminishing the duration of quarantine periods. This programme has the potential to bolster India's agricultural economy, foster sustainable practises, and enhance the country's international position in horticultural commerce through the improvement of quality and production of horticultural crops. This paper provides an overview of the strategies employed by the programme, examines the advantages it offers to both farmers and consumers. This program bears a resemblance to the comparable programmes like National Clean Plant Network implemented in the United States. It emphasises the importance of India's efforts to achieve self-sufficiency and enhance competitiveness within the horticulture industry. This article additionally examines the responsibilities and opportunities as well of the financial institutions to support and onboard the participants involved in the implementation of this program.

KEYWORDS

Atmanirbhar Clean Plant Programme, Disease-Free Planting Material, Horticultural Commerce, Horticulture Growth, scope for financing.

INTRODUCTION

Horticulture can be defined as the cultivation and management of many plant species, including fruits, flowers,

vegetables, spices, plantation, medicinal and ornamental plants, its post-harvest management and marketing. Horticulture holds significant importance in the Indian perspective, as it supports nutritional security, generating revenue, and creating employment possibilities for a substantial portion of the population. India holds the position of being the second-largest global producer of horticulture crops, following China. The horticulture industry accounts for approximately 33% of the Gross Value Addition (GVA) within the agricultural sector. (source:<https://agricoop.gov.in/>)

According to the official report spanning a period of seven years, the cultivation of horticulture has witnessed an increase in area from 23.4 million hectares to 27.5 million hectares. Concurrently, there has been a growth in production by 18.63%, with the quantity rising from 280.9 million MT to 333.25 million MT. India holds the distinction of being the foremost global producer of various fruits such as bananas, mangoes, pomegranates, and papaya. However, India's share in the global market is nearly 1% only as our product does not meet the importing countries regulation.(source: <https://apeda.gov.in/>)

Major Challenges in the horticulture sector in India:

One of the primary obstacles hindering the growth of horticulture is the lack of disease-free, high-quality planting material. To tackle this significant issue, the Government of India has launched the Atmanirbhar Clean Plant Programme. This programme aims to capitalise on the numerous opportunities and growth potential in the horticulture sector, given India's diverse agro-climatic zones, expansive domestic market, and increasing demand for horticultural products both domestically and globally.

a) Availability of disease free quality planting material : The horticulture sector in India faces a significant challenge in the form of pests and diseases, which cause substantial damage to crops and have adverse effects on the lives of farmers. Horticultural crops are susceptible to several pests and illnesses, including fruit flies, mealybugs, aphids, mites, nematodes, fungal infections, bacterial infections, viral infections, and other similar afflictions. Pests and illnesses have a detrimental impact on both the quantity and quality of yields, resulting in increased production costs. To address these challenges, it is imperative for farmers to embrace integrated pest management strategies, employ resistant cultivars, and utilise biocontrol agents and biopesticides.

b) Assured minimum support price (MSP): Horticulture commodities are highly perishable in nature and possess a high susceptibility to spoilage, prompting farmers to often sell their produce at a significantly reduced price to mitigate losses ,particularly during peak harvesting season. The absence of Minimum Support Price (MSP) for this particular segment acts as a disincentive for farmers to make investments in horticulture infrastructure and get high-quality supplies.

c) Post-harvest management practises:

Farmers face challenges at each stage of value chain in using Post harvest Infrastructure facilities such as pre-cooling, cold storage, grading, packing, transport, and marketing. This causes post-harvest losses and impedes domestic and overseas trade in horticultural products. Based on a report published by NITI Aayog, it has been observed that the cold storage capacity in India now stands at a 37.4 million metric tonnes (MT). This capacity isn't enough considering that storage requirement of 127 million MT of fresh goods. Furthermore, it is worth noting that a mere 10% of the available cold storage capacity is allocated for the storage of fruits and vegetables. Consequently, India has a significant reduction of approximately 30-40% in its horticulture yield because of post-harvest losses.

d) Productivity Levels: India's horticulture sector, while ranking as the second-largest global producer, exhibits

comparatively low productivity levels in relation to other nations. As an illustration, the average mango production in India is recorded at 6.8 tonnes per hectare (TPH), while China's yield is at 12.7 TPH. In comparison, the average tomato output in India stands at 19.8 metric tonnes per hectare (TPH), whereas Turkey's harvest amounts to 27.3 TPH. One of the contributing factors to diminished production is the inadequate uptake of enhanced cultivars and technology among agricultural practitioners. Another contributing factor is the limited variety of horticultural crops in relation to both geographical coverage and overall yield. In India, the primary fruits cultivated include mangoes, bananas, citrus fruits, grapes, apples, and guavas. In addition, the country cultivates six main vegetables, namely potatoes, onions, tomatoes, brinjals, cabbages, and cauliflowers. These fruits and vegetables collectively contribute to over 70% of the overall horticulture production in India. (source: krishi.icar.gov.in) In order to enhance productivity and foster diversity, it is imperative for the Government to actively facilitate research and development endeavours, facilitate the widespread adoption of enhanced varieties and technologies, and promote the implementation of agricultural diversification and intercropping systems.

About Atmanirbhar Clean Plant Program :

The Atmanirbhar Clean Plant Programme is a Government initiative aimed at promoting self-reliance and sustainability in the field of clean energy production.

The Atmanirbhar Clean Plant Programme is a Government project that was introduced in the Union Budget 2023-24. Its primary objective is to enhance the accessibility of disease-free and high-quality planting material for horticultural crops of significant value. A budgetary allocation of INR 2,200 crore has been allocated for the implementation of this programme over the course of the following seven years, till the year 2030. The programme will additionally strive to incorporate climate-resilient types, enhance the yield of horticultural crops, and proactively manage viruses and diseases to protect the ecosystem. The National Horticulture Board will function as a central pillar for the programme.

The proposed initiative entails the establishment of 10 Clean plant centres nationwide, which will serve as sources of certified planting material for farmers and nurseries. The centres will also engage in research and development pertaining to tissue culture, micropropagation, virus identification and removal, as well as the establishment of quarantine facilities. The programme is anticipated to enhance the efficiency and calibre of horticulture crops, which make up approximately 30% of the agricultural gross domestic product (GDP).

The Implementation body i.e. NHB will provide full support for the establishment of the ten centres, which will specialise in the cultivation of various fruit crops such as apple, walnut, almond, grapes, mango, pomegranate, and others. The centres will be built under a Public-Private Partnership (PPP) approach, in partnership with research organisations, agricultural institutions, and business sector partners. The Clean Plant Centres will provide a range of services encompassing illness diagnosis, therapeutic treatments, plant multiplication, and mother plant generation.

Over the course of time, there has been a significant surge in the demand for imported planting material for various fruit plants. For instance, the quantity of imported apple plants witnessed a notable rise from 21.44 lakh in 2018 to 49.57 lakh in 2020 in India. The procedure of importing plants is highly labor-intensive due to the requirement of subjecting them to a two-year quarantine period. The duration of this term will be reduced to a period of six months subsequent to the establishment of the Clean Plant Centres.

Proposed Guidelines for The Implementation Of A Plant Cleaning Programme:

By implementing effective strategic planning, the Clean Plant Centres aim to establish themselves as prominent authorities in the distribution of superior, locally suitable, genetically authentic propagating materials that are devoid of specific plant pests and pathogens. This endeavour not only fosters a thriving business landscape and facilitates global trade, but also safeguards our nation's environment. The strategic plan delineates a set of five strategies and their corresponding goals that serve as the core components for the execution of the programme and the allocation of resources to various projects:

1. **Organization, Governance, and Structure :** The Nodal implementing agency i.e. NHB will collaborate with research institutions, state Governments, and private sector to ensure quality standards and certification of the planting material. This will allow industry, research, and regulatory organisations to identify the resources and organisational structure required for ensuring a viable and fully functional clean plant system.
2. **Program Operations; including Plant Pathogen Diagnostics, Therapeutics, and the Establishment of Foundations of Clean 'Starter' Plants :**
 - o The centre will establish, maintain, and improve a network of facilities and experts for testing and offering therapy for clones of specialty crops determined by climatic suitability, existing infrastructure and expertise, regional requirements, and disease and insect pest security protocols.
 - o Clean Plant Centers will facilitate adoption of clean plant seeds and nurseries by stakeholders such as farmers, entrepreneurs, exporters, etc.
3. **Methods and Technologies Development :**
 - o The implementing agency will discharge pathogen and insect pest-tested propagating material for planting in a safe and prompt manner using the best available methods.
 - o It will help the industry by providing foundation stock with related certification schemes.
 - o It will establish diagnostic criteria and national standards for certification and maintenance of various crop species.
 - o It will investigate, identify, and implement the most effective and rapid methods for eliminating pathogens and insect pests coming from specialty crops for sowing
 - o It will devise best management practises that the industry will use in order to preserve the pathogen- and pest-indexed status of the plants that are suitable for planting.
4. **Extension, Education, and Outreach :**It will also provide training and capacity building for the stakeholders on best practices of horticulture production and management
 - o The implementing agency will promote, develop, and engage all possible extension, education, and outreach resources that interact with and educate important stakeholders, for instance commercial nurseries as well as growers who propagate their own material, to ensure the efficient dissemination and use of products and services.
5. **Program Performance, Quality Assurance, and Review :** The NHB will develop a plan to assess the performance of the programs.

Benefits Of Clean Plant Programme:

The Clean Plant Programme aims to offer disease-free and high-quality planting material for horticulture crops

of significant value, including apples, almonds, grapes, avocados, and blueberries. Availability of such high-quality and pest and disease resistant planting materials, enables farmers to diversify from the traditional cultivars to high quality cultivars and it will help them to increase the remuneration from the activity.

The implementation of the Clean Plant Programme will facilitate their entry into untapped markets and enhance their export capabilities in the realm of horticulture crops. India, as a nation, holds the distinction of being the second most significant contributor to the worldwide production of fruits and vegetables. However, it is noteworthy that India's proportionate representation in the realm of international exports of these agricultural commodities stands at a modest 1.6%. The enhancement of horticulture crop quality and standards through the implementation of the Clean Plant Programme will facilitate farmers in meeting the demands of international buyers and consumers, hence augmenting their competitiveness within the global market.

The Clean Plant Programme will additionally facilitate the development of novel and exotic horticultural crops that exhibit a substantial demand and value in both domestic and international markets. Avocados are known for their high content of beneficial fats and antioxidants, rendering them increasingly favoured by individuals who prioritise their health and well-being. Nevertheless, it is noteworthy that a significant portion of India's avocado supply is sourced from imports from nations such as Mexico, Peru, Chile, and Kenya. The Clean Plant Programme aims to promote domestic cultivation of avocados and decrease reliance on imports by supplying farmers with uncontaminated planting material.

The Clean Plant Programme also helps in reducing the expenditure on importing disease free quality planting material every year for high value horticultural crops like apple, olive, palm etc. by maintaining mother plants for meeting the future requirements. It also reduces the quarantine period from 2 years to 6 months for the imported planting material through proper disease diagnostic and therapeutic measures and maintaining mother plant stocks.

The Clean Plant Programme aims to facilitate the growth of the agri-startups and agri-tech sector in India by granting them access to uncontaminated planting material for horticultural crops. This will empower individuals to cultivate inventive and cost-effective resolutions for the various change encountered by farmers, encompassing but not limited to crop planning, crop health, farm inputs, credit, insurance, and market data.

National Clean Plant Network (NCPN) In USA :

The National Clean Plant Network (NCPN) in the United States is a programme that focuses on maintaining and distributing disease-free plant materials to ensure the health and productivity of agricultural crops.

The clean plant model implemented in the United States entails a comprehensive framework for the production and upkeep of plant material that is devoid of detrimental pathogens and pests, including viruses and virus-like organisms. The National Clean Plant Network (NCPN) is a federally funded programme administered by the United States Department of Agriculture (USDA) that provides assistance for the clean plant paradigm.

Graft-transmissible plant pathogens – viruses, viroids, phytoplasmas and bacteria – are spread through infected propagation material. These infections can result in significant economic loss due to poorer yields, decreased product quality, and increased management costs. The best control method is prevention, which involves utilising planting material made from foundation plant stock that is clean and free of harmful diseases. The National Clean Plant Network (NCPN) provides facilities and programmes that examine plant materials for specific infections, get rid of those pathogens, and create, keep, and distribute plant materials that have undergone pathogen testing. Currently, fruit trees, grapes, berries, citrus, hops, sweet potatoes, and roses are

among the crops covered by NCPN centres.

(Source : nationalcleanplantnetwork.org)

Potential For Financial Institutions:

Financial institutions, including banks and specialised agricultural financing associations, through its existing large gamut of products and specially designed products as per the requirement, can offer horticultural segment financial assistance to meet its capex requirements as well as production credits. These financial resources can be used for a variety of requirements, including upgrading farming practises, implementing sustainable practises, and purchasing machinery and technology that boost output while reducing environmental effect.

1. Financial institutions have the ability to extend services/loans/products to horticulture value chains in a way that is both efficient and sustainable. To reduce post-harvest losses and improve overall operational performance, this may include providing financial resources for the construction of cold storage facilities, transportation networks, and processing facilities.

2. Technology: Financial institutions can collaborate with technology vendors to offer financing options for the adoption of sophisticated agricultural technologies, such as precision farming, Internet of Things (IoT)-based monitoring systems, and more effective irrigation techniques. These scientific developments have the potential to maximise agricultural output by raising crop yields while at the same time lowering resource use.

3. R&D (research and development) can be extremely important to the clean plant initiative. In this situation, financial institutions may offer funds for various horticulture-related research initiatives, alliances, and partnerships. These initiatives would primarily concentrate on the creation of disease-resistant plant types, environmentally friendly techniques to pest control, and other novel strategies aimed at advancing the program's goals.

4. Sustainable Infrastructure: Financial institutions may provide financial support for these initiatives if the clean plant programme includes the establishment or improvement of horticultural infrastructure, such as environmentally friendly packaging facilities or greenhouses powered by renewable energy.

5. Financial institutions may offer specialised green financing options, such as green loans or green bonds, that are intended to make it easier to finance environmentally friendly projects. These solutions may be appealing to businesses looking for ways to include ecologically sustainable practises. Through the facilitation of partnerships between financial institutions, Governmental organisations, trade associations, and private sector organisations, public-private partnerships (PPPs) have the ability to promote sustainable horticulture practises and investments.

6. Financial institutions can develop mitigation strategies to address the particular risks ,the horticulture industry faces. These tools may include insurance plans that cover risks associated with the weather, illness outbreaks, or market fluctuations.

Suggestive approach for the successful onboarding:

Financial institutions and banks are known for offering a wide range of financial products that are suitable to meet the capital expenditure and crop production requirements of stakeholders. The Stakeholders involved in this domain include farmers, integrated farms, processing units and exporters. Prominent capital investments, such as the establishment of polyhouses, cold storage facilities, and farm mechanisation, can be efficiently

facilitated through loans provided under governmental initiatives such as the Agriculture Infrastructure Fund and the Pradhan Mantri Formalisation of Micro Food Processing Enterprises scheme. This comprehensive framework highlights the commitment of the institution to effectively incorporate stakeholders into the clean plant programme.

The successful integration of stakeholders within the framework of the clean plant programme necessitates the implementation of well devised initiatives. Financial institutions (FIs) and banks possess a strategic advantage in their ability to implement a cluster-oriented approach, which facilitates the development of collaborative synergies among various stakeholders. This collaborations within the value chain help to improve this strategic approach and create an operational structure that is unified and linked.

A crucial aspect of this activity requires the implementation of a complete support platform that spans the entire value chain. This platform should incorporate a wide array of services that have been carefully customised to meet the specific requirements of various stakeholders. By implementing this approach, it creates a comprehensive and immersive environment that guarantees a smooth and efficient onboarding process. Moreover, the integration of risk-mitigated instruments, such as insurance and credit guarantee schemes, helps to alleviate uncertainties, fostering increased confidence among stakeholders. To enhance the effectiveness of the onboarding process, financial institutions (FIs) and banks can partner with non-governmental organisations (NGOs), self-help groups, farmer producer organisations and other relevant multilateral entities. The smart utilisation of a blockchain network that is specifically designed for lending purpose can significantly improve transparency and credibility throughout the process of onboarding.

CONCLUSION

In conclusion, the introduction of India's clean plant programme promises a multitude of benefits for farmers, consumers, and now even financial institutions. The production and quality of horticultural crops are expected to increase as a result of this strategic execution, directly boosting farmers' financial well-being. Its importance is further highlighted by its effect on customers' nutritional health and food safety. The programme creates new economic opportunities by supporting both domestic markets and India's international horticultural exports. Notably, this programme expands beyond agriculture by giving financial institutions new avenues to explore. It stimulates financial activity for agricultural lending and makes export financing easier, broadening the reach of financial institutions and boosting the economy as a whole. With this innovative strategy, India's clean plant programme not only secures horticulture self-sufficiency and competitiveness, but also opens the door for overall economic progress.

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