

Innovation from the Himalayas: Natural farming paves the way for sustainable apple production

Apple cultivation in Himachal Pradesh faces declining productivity, rising input costs, and soil degradation due to prolonged chemical-based farming. Subhash Palekar Natural Farming (SPNF) has emerged as a sustainable alternative emphasizing soil health, biodiversity, and ecological balance. Trials conducted at RHR&TS Mashobra during 2020–24 evaluated SPNF in apple orchards under different rootstock-variety combinations. The results indicated improved soil microbial activity, higher earthworm population, enhanced organic carbon, and better plant growth. SPNF practices, including Jeevamrit, Ghanjeevamrit, mulching, intercropping, and natural pest management, contributed to superior fruit quality attributes such as firmness and ascorbic acid content. Economically, SPNF recorded higher net returns (₹12,74,640/ha) compared to conventional farming (₹8,30,840/ha), demonstrating its potential as a viable, eco-friendly, and profitable approach for sustainable apple production in Himalayan regions.

Keywords: Apple cultivation, Himachal Pradesh, Natural farming, Subhash Palekar Natural Farming, Soil health, Sustainable agriculture,

THE cultivation of apples in Himachal Pradesh represents a significant case of agricultural transformation and economic empowerment. The region's apple orchards, situated at high altitudes in the Himalayan mountains, have historically played a central role in sustaining local livelihoods. These orchards, characterized by densely planted trees bearing red apples, contribute not only to the scenic landscape but also constitute a primary source of income for numerous farming households.

In recent decades, however, the apple industry has confronted unprecedented challenges. Farmers are increasingly confronted with declining yields, rising production costs, and mounting environmental pressures. Conventional cultivation practices, which once ensured economic prosperity, are now compromising the long-term sustainability of apple production in the region.

To address these challenges, Subhash Palekar Natural Farming (SPNF) has emerged as a promising, eco-friendly alternative. By emphasizing soil health restoration, biodiversity conservation, and alignment with natural ecological processes, SPNF offers a transformative approach to apple cultivation. Its implementation not only targets productivity improvements at the orchard level but also promotes resilience across the entire apple-growing ecosystem of Himachal Pradesh. The adoption of SPNF therefore represents a strategic intervention aimed at securing the long-term viability of a critical agricultural sector while simultaneously conserving the region's unique natural heritage.

APPLES OF THE HIMALAYAS

Historical context

Apples were introduced to Himachal Pradesh in the early 20th century by Samuel Evans Stokes, an American missionary and later Indian freedom fighter. Initially experimental, apple cultivation rapidly evolved into a widespread agricultural practice. The region's temperate climate and fertile soils proved ideal for the crop, and by the mid-20th century, apple cultivation had become synonymous with Himachal Pradesh.

Economic impact

The proliferation of apple orchards significantly transformed the state's economic landscape. Many households transitioned from subsistence farming to commercial horticulture. Presently, apple cultivation occupies approximately 46% of the total fruit crop area in Himachal Pradesh and contributes 76% of the state's total fruit production. The sector has been instrumental in improving living standards, supporting education, and fostering regional infrastructure development.

Current scenario and challenges

Despite its historical success, apple cultivation in Himachal Pradesh has faced several significant challenges in recent years:

Declining productivity: A notable and concerning trend is the substantial decline in apple productivity. From

a peak of 10.84 t/ha in 1981, yields decreased to 4.4 t/ha in 2016 and further to 4.3 t/ha in 2023, representing an approximate decline of 59% from the peak. This decline poses a serious threat to the economic viability of apple farming in the region.

Rising input costs: Conventional apple production relies heavily on chemical fertilizers and pesticides. These inputs account for a major share of production costs and have exhibited diminishing returns over time, thereby reducing overall profitability.

Soil degradation: Prolonged and intensive use of chemical inputs has contributed to soil degradation. Many orchards now experience reduced soil fertility, poor water-holding capacity, and a decline in beneficial soil microbial populations.

Climate change: Alterations in climatic conditions, including warmer winters and irregular rainfall patterns, have begun to adversely affect apple production. Traditional varieties are increasingly facing challenges in adapting to these changing environmental conditions.

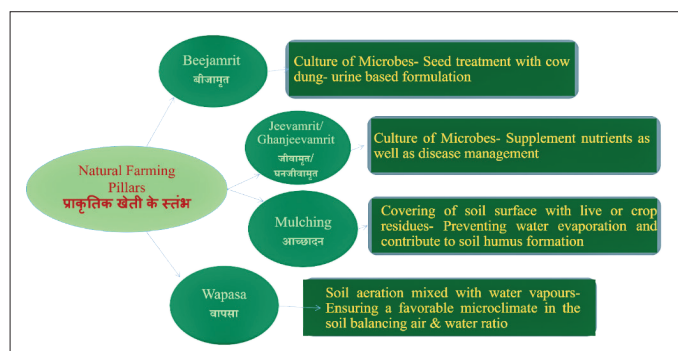
Market competition: With increasing globalization, Himachal apples are subject to competition from imported fruits, compelling farmers to enhance quality while simultaneously reducing production costs.

Health and environmental concerns: Growing awareness regarding the potential health risks associated with chemical residues in fruits, along with the environmental impacts of conventional farming practices, has further intensified the need for sustainable alternatives.

Collectively, these challenges have created a critical situation for the apple industry in Himachal Pradesh, necessitating the exploration of sustainable production systems. In this context, Subhash Palekar Natural Farming has emerged as a promising alternative, offering a pathway toward improved sustainability and resilience.

SPNF four fundamental principles

Subhash Palekar Natural Farming (SPNF) is built on four fundamental principles or pillars, which form the foundation of its ecological approach to agriculture:



Additional practices in SPNF: Beyond these core pillars, SPNF incorporates several complementary practices aimed at enhancing productivity, sustainability, and ecological balance:

- Use of indigenous cow products:** SPNF places significant emphasis on the use of dung and urine from indigenous cow breeds. These are considered rich sources of beneficial microorganisms and natural growth-promoting substances that enhance soil fertility

and plant health.

- » **Natural pest management:** Instead of chemical pesticides, SPNF relies on botanical extracts and fermented preparations known as “Astras” for pest control. These include:

- » **Neemastra:** Prepared from neem leaves and cow urine, effective against a wide range of pests.

- » **Agniastra:** A mixture of tobacco, green chili, garlic, and cow urine, used to control soft-bodied insects.

- » **Brahmastra:** A composite preparation made from multiple plant extracts, effective against diverse pest populations.

- **Intercropping and crop diversity:** SPNF promotes biodiversity through intercropping, crop rotation, and the maintenance of natural vegetation within the farming system, thereby improving ecosystem stability.

- **Minimal external inputs:** The system aims to minimize or eliminate reliance on external agricultural inputs, thereby reducing costs and enhancing farm self-reliance and sustainability.

Adapting SPNF to apple cultivation in Himachal Pradesh

Although Subhash Palekar Natural Farming (SPNF) was initially developed for annual crops, researchers and progressive farmers in Himachal Pradesh have been working to adapt its principles to perennial fruit crops, particularly apples. The Regional Horticultural Research and Training Station (RHR&TS), Mashobra, Shimla, has been at the forefront of this adaptation, playing a key role in evaluating and refining SPNF-based practices under local agro-climatic conditions.



Demonstration on natural farming practices at RHR&TS, Mashobra, Shimla

CASE STUDY AND RESULTS

Work done

During 2020–24, the Regional Horticultural Research and Training Station (RHR&TS), Mashobra, Shimla, under Dr Y S Parmar University of Horticulture and Forestry, implemented a comprehensive Subhash Palekar Natural

Farming (SPNF) programme for apple cultivation across four blocks with different rootstock–variety combinations (M9/Bright-N-Early, Top Red, Vance Delicious and Gale Gala; M7/Red Chief; Seedling/Oregon Spur; MM111/Royal Delicious).

The approach focused on improving soil health through regular applications of bio-stimulants such as *Jeevamrit* and *Ghanjeevamrit*, along with intercropping of legumes and pest-repellent plants. Water conservation measures included contour bunding and the WAPASA technique. Mulching, both dry and live, was adopted to conserve soil moisture. Tree trunks were protected using *Poudhlep* applications applied four times annually. Pest and disease management was carried out using natural preparations at regular intervals. The programme also included seed treatment with *Beejamrit* and the use of *Saptdhanya Ankur* spray to enhance fruit quality. These year-round practices aimed to develop a balanced and sustainable orchard ecosystem while minimizing dependence on synthetic inputs. The study further compared SPNF with conventional chemical farming by assessing soil microbial load, earthworm population, fruit quality attributes, plant growth, and economic returns.

Methodology adopted at RHR&TS Mashobra, Shimla

The study employed several key principles and techniques of natural farming, primarily SPNF practices:

1. Soil microbiome management

- Focused on maintaining a healthy soil microbiome to enhance soil organic matter and fertility.
- Used bio-stimulant formulations (*Jeevamrit*, *Ghanjeevamrit*, etc.) based on fermented cow dung, cow urine and uncontaminated soil.

Soil Application

- *Jeevamrit* drenching at an interval of 21 days:
 - » In rootstock plants: 3 L/plant
 - » In seedling plant: 5 L/plant
- *Ghanjeevamrit* application at the time of field preparation:
 - » In rootstock plants: 200 gm/plant
 - » In seedling plant: 400 gm/plant
 - » Application at time of intercropping @1 t/ha

2. Intercropping

- Implemented leguminous crop intercropping (pea, rajmash, bean, fenugreek) with apple trees
- Cultivated garlic, marigold, and cabbage at orchard borders as insect repellents and trap crops

3. Water Conservation

- Constructed contours and bunds to preserve rainwater and reduce soil erosion
- Implemented WAPASA (Water and Air Percolation for Adequate Soil Aeration) technique
- Trenches of 3–4 inches depth were prepared outside the basin area and covered with dry grass mulch, which helped in conserving and retaining soil moisture.
- *Jeevamrit* was applied through drenching in these



Intercropping of pea



Intercropping of Rajmash



Intercropping of Wheat



Intercropping of cabbage and marigold



Intercropping of Garlic



Intercropping of Fenugreek

trenches, which contributed to an increase in the earthworm population in the soil, thereby indirectly improving soil aeration and enhancing soil fertility.



4. Mulching (*Aachadan*)

- Covered plant basins with dry grass mulch
- Used live mulch (bean, pea, cereals, etc.) between plant basins



5. Poudhlep Application

A protective coating was applied on tree trunks four times a year:

- *First application:* March (first or second week)
- *Second application:* May (second or third week)
- *Third application:* Last week of September or first week of October
- *Fourth application:* Between 21st December and 14th January

6. Natural Nutrient Management

- *Jeevamrit* was applied as a soil drench at 21-day intervals
- *Ghanjeevamrit* was applied during field preparation
- Leguminous crops were cultivated as a source of nitrogen to improve soil fertility

7. Pest and Disease Management

Natural preparations were sprayed at 15-day intervals or as and when required:

- For fungal foliar diseases: *Sonthastra*, *Khatti Lassi*, *Ramban Rognashi*, and *Jeevamrit*
- For insect pest management: *Darekastr*, *Brahmastra*, and *Agniastra*
- For woolly apple aphid control: *Dashparni Ark*

Foliar Application:

- *Jeevamrit*: 10 L in 100 L water
- *Khatti Lassi*: 5 L in 100 L water
- *Ramban*: 7 L *Jeevamrit* + 3 L *Lassi* in 100 L water
- *Sonthastra*: No dilution
- *Darekastr*: No dilution
- *Agniastra*: 5 L in 100 L water
- *Brahmastra*: 5 L in 100 L water
- *Dashparni Ark*: 5 L in 100 L water
- *Saptdhanya Ankur* spray was applied at 80% flowering, at fruit set, and 15 days before harvest to enhance fruit quality.

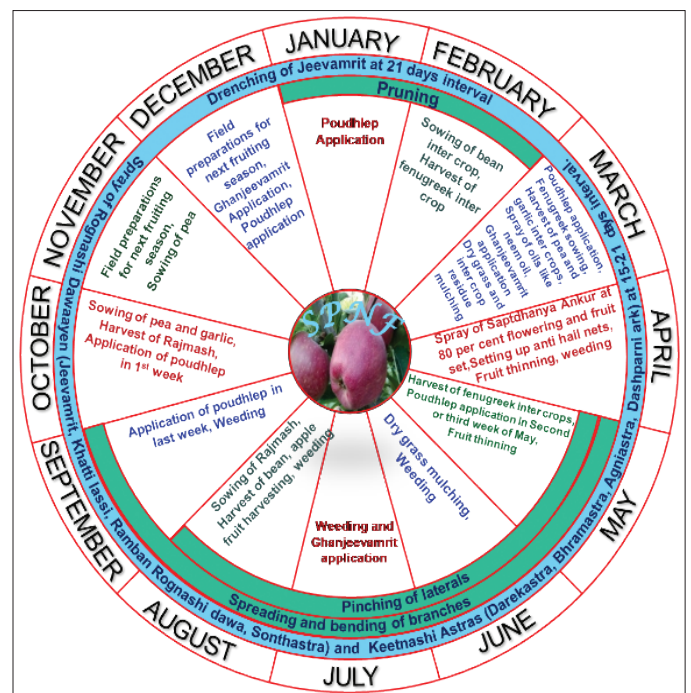
8. Seed Treatment

- Used *Beejamrit* for seed treatment

Achievements

The trials conducted at RHR&TS Mashobra, Shimla demonstrated the following outcomes:

- Successful implementation of Subhash Palekar Natural



Year-round operations of Subhash Palekar Natural Farming in Apple at RHR&TS, Mashobra, Shimla (HP)

Farming (SPNF) in apple orchards, including the integration of eight intercrops alongside the main crop.

- Improved soil health, reflected by increased organic carbon content and enhanced microbial population in SPNF-treated soils.
- Higher Arbuscular Mycorrhizal Fungal (AMF) spore counts in SPNF soils, indicating improved soil biological activity.
- Significant increase in earthworm population in SPNF-managed plots.
- Superior fruit quality parameters under SPNF, including higher fruit firmness, ascorbic acid content, and acidity levels.
- Better preservation of fruit quality under laboratory and refrigerated storage conditions.
- Positive vegetative growth responses, with increased plant height and trunk girth in SPNF treatments.
- Variable but notable effectiveness in managing pests and diseases using SPNF-based practices.
- Higher economic returns from SPNF compared to conventional chemical farming (CF), with net returns of ₹12,74,640.25/ha under SPNF versus ₹8,30,840.01/ha under CF in 2023.

Summary: A sustainable vision for the future

The adoption of Subhash Palekar Natural Farming (SPNF) in Himachal Pradesh's apple orchards represents

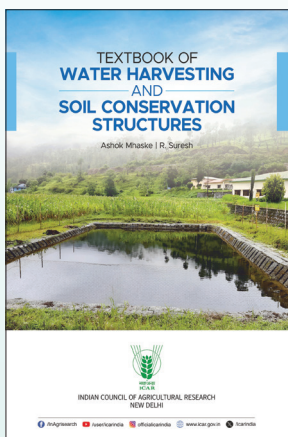
more than an agricultural intervention; it signifies a strategic step toward a more sustainable and resilient production system. As this approach continues to evolve, it holds the potential to influence not only apple cultivation practices but also broader perspectives on agriculture, sustainability, and human interaction with natural ecosystems.

The success of SPNF under Himalayan conditions provides valuable insights for the development of sustainable agricultural systems globally. It encourages a shift from conventional, input-intensive farming toward an ecological approach that emphasizes harmony with natural processes. In this context, apple orchards in Himachal Pradesh are contributing not only to fruit production but also to the development of sustainable farming models that integrate productivity with environmental conservation. The coming decade will be critical in assessing the long-term scalability and impact of this approach in transforming agricultural systems at both regional and global levels.

For further interaction, please write to:

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TECHNICAL ASPECTS

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