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"AN ECONOMIC OVERVIEW AND CHALLENGES OF APPLE PRODUCTION IN HILLY REGIONS OF HIMACHAL PRADESH."

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Abstract: India is also gradually finding its place on the fruit map of the world. This research paper aims to explore the pivotal role played by the apple industry in driving economic growth in Himachal Pradesh. Apple industry is the backbone of the economy of Hilly districts namely Shimla, Kullu, Kinnaur and Mandi in Himachal Pradesh. Due to its good backward and forward linkages it provides employment to about 50% of the population and is the main source of livelihood of many households. Through a thorough examination of various economic indicators and case studies, this paper seeks to elucidate the multifaceted contributions of the apple sector to employment opportunities created across the entire apple value chain, income generation, export revenue, and a brief overview of Himachal Pradesh's geography and climate conducive to apple cultivation. In this paper an effort has been done to study the Growth of apple production and identify the challenges faced by the apple industry in H The present study is both descriptive and analytical in nature.

Key Words: Horticulture, Employment, Apple, Fruit, Production,

1. Introduction

The fruit subsector plays a vital role in today's agricultural production and the national food security of people across the world as well as in India. The production and consumption of fruits generally have various socioeconomic, environmental, and nutritional advantages. China is the leading apple-growing country, followed by the USA, India, and Turkey in the world. In Himachal Pradesh, more specifically, fruits contribute to improved land productivity, employment opportunities, farmers' socioeconomic welfare, balance of payment, agro-processing industries performances, and a balanced diet. Thus, transformation into fruit production can enable small-scale farmers to embark on a range of production, processing, and marketing activities to complement their income. The large number of people are directly or indirectly associated with apple cultivation in the world, including in India. More than 7500 varieties of apples are grown worldwide, and about 2500 of these varieties are raised in the United States. Apple production significantly contributes to sustainable development through soil conservation and fertility management, carbon sequestration, expanding intercropping system, providing better economic benefits, intensifying agroforestry practices, and fulfilling dietary needs. Apple is one of the most widely cultivated fruit crops globally. It is best grown in areas with high light intensity, warm days, and cool nights. Thus, apple fruit trees grow well in temperate climatic zones where most commercial varieties satisfy the required chilling temperature, which is usually expressed as hours at less than seven degrees Celsius. The main challenge for producing temperate fruit crops in tropical areas is lack of effective accumulated chilling. Apples are generally the most socioeconomically significant (Spengler, 2019) and nutritious fruits that can be consumed in fresh, baked, and processed form as juice, alcoholic cider, sauce, and fillings. Apple Orchids start bearing fruits from 7th to 8th year. However, it all depends on the cultivator selected. Usually, the economic life of apple tree is more than 35 years. When it comes fruit yield, fruit yield increases from 8th to 18th year and thereafter remains stable for 30 to 35 years. Some varieties even produce apple after 35 years based on agro-climatic conditions and variety chosen. The state of Himachal Pradesh is spread over an area 55,673 km (21,495 sq mi) and is bordered by Jammu and Kashmir and Ladakh on the north, Punjab on the southwest, Haryana on the south, Uttarakhand on the southeast, a small border with Uttar Pradesh in the south (touching Sirmaur), and Tibet on the east. Entire Himachal Pradesh lies in the mountainous Himalaya region, rich in natural resources. There is a huge variation in the climatic conditions of Himachal Pradesh due to variation in altitude (360–6500 metres). The climate varies from hot and sub-humid tropical (450–900 metres) in the southern low tracts, warm and temperate (900–1800 metres), cool and temperate (1800–2400 metres) and cold glacial and alpine (2400–4800 metres) in the northern and eastern high elevated mountain.

1.1 History of Apple Production in HP

The rich diversity of agro-climatic conditions, topographical variations and altitudinal differences coupled with fertile, deep and wide drained soil favour the cultivation of temperate to sub-tropical fruits in Himachal. This particular suitability of Himachal has resulted in shifting of land use pattern from agriculture to fruit crops in the past few decades. Apples were first brought into the country from Liverpool in 1838 and planted in Mussoorie. In 1850, the British planted some trees in the Nilgiris hills. In Himachal Pradesh, Captain R C Lee planted the first professionally managed orchard in 1870 in Bandrol in Kullu district. In Shimla – which now produces the largest quantity of apples – the first orchard was planted in 1887 in Mashobra, which is now owned by the state government and presently functions as a research centre. It is also mentioned that the credit of taking up apple cultivation on a large scale in Himachal goes to Samuel Stokes (Late Satyanand Stokes), a resident of Philadelphia who came to India in 1904 as a missionary worker. However, it was in 1918 that large-scale apple plantations first came up in Barubag in Kotgarh area, also called

the apple bowl of the state. Mr. Stoke's efforts to find a suitable variety brought about a horticultural revolution in the western Himalaya and finally, Himachal became the state to be identified with apples. Now, it is the largest commercial activity of that state. Post-independence and especially after the statehood in 1971, there has been a strong backing from the state for apple plantations. Consequently, the area under apple cultivation has increased substantially from a mere 500 hectares (ha) in the 1950s to 81,630 ha in 2001-02 and further to 99,564 hectares in 2009-10. Of the total area under fruit production, apples make up more than 50%. Nine out of the 12 districts in the state now produce apples. The state has witnessed a major shift in area from food grain towards horticulture crops over last few years. Apple accounts for the 49 per cent of total area and 88 percent of the total production among all the fruit crops grown in the state as per Economic survey, 2019-20.

1.2. LITERATURE REVIEW:

Deodhar (2005), Stated there are wide variations in the Apple Price across the country and absence of integration can be attributed to traders, cascading effect of trader margin at various distribution points and absence of competition to agriculture produce marketing committee markets and inadequacy of road and cool chain infrastructure. Ahmad and Rifat (2012), marketing efficiency is important for increasing production and fair returns to apple growers. They talked about three marketing channels and have concluded that marketing channel i.e., Growers to consumer is having less price spread and more returns to growers, but is in rare practice due to lack of marketing information, credit and institutional facilities, small holdings. Gourab Bera (2015), in his research, An Assessment of Apple cultivation in Kalpa (Kinnaur District) Himachal Pradesh, Apple cultivation has found to be the most important horticultural farming in Himachal Pradesh (Kinnaur). It has got great future prospects in terms of export. It does influence in the socioeconomic life of the inhabitants of Kalpa. The growing importance of the Apple Industry is bringing about a revolutionary change in the state. N. Rauf, A. (2017), measured the managerial ability of orchardists in Himachal Pradesh and Jammu & Kashmir, finding variations in managerial ability among small orchardists in different states. They emphasized the significance of managerial skills for orchard productivity. Ismail, Y., Mir, S. A., & Nazir, N. (2018), Analysed past trends in apple production in Jammu and Kashmir, finding that nonparametric and semi-parametric regression models provided better fits for trend analysis compared to parametric regression models. Kumar, S., & Chauhan, V. (2021), focused on almonds, apricots, cherries, and pears, analysing resource efficiencies and productivity in different blocks. They found variations in productivity among blocks for different fruit crops, emphasizing the need for proper resource management and planning.

1.3. OBJECTIVES OF THE STUDY

- ❖To study the Growth of apple production in HP.
- ❖To Analysis of the employment opportunities created across the entire apple value chain.
- ❖To Analyse the Area and Production of Horticultural Products in Himachal Pradesh.
- ❖To Identification and analysis of challenges faced by the apple industry.

1.4. RESEARCH METHODOLOGY

The present study is both descriptive and analytical in nature. It aims to analyse the trends, patterns, and growth rates of apple production in Himachal Pradesh. It is based upon secondary data that has been obtained from the Department of Horticulture, Government of Himachal Pradesh, and some secondary sources such as official websites, reports, and news articles. The study covers a period of 2008 to 2022.

2. Economic Contributions of Apple production:

The introduction and expansion of apple-based agro-forestry practices contribute to eco-environmental sustainability and positively affect small farmers' socioeconomic well-being. Apple (*Malus domestica*) is one of the most popular fruits in the world. Apples (*Malus domestica* Borkh.) represent one of the most produced fruits worldwide, along with citrus and bananas. It is an important temperate fruit, grown in both developed as well as developing countries, including India. Apple is widely popular with both growers as well as consumers for its strong adaptability (ecological) and high nutritional value. Globally it has an important economic impact and it has been estimated that almost 5 million hectares of apples is harvested worldwide. India's overall Apple production is 2.4 million metric tonnes, out of which over 26 percent comes from Himachal. Apple production generates around Rs 5000-5500 crore revenue in the state, contributing to around 5 percent of I t's GDP.

2.1 Growth in Production of apple fruit in Himachal Pradesh

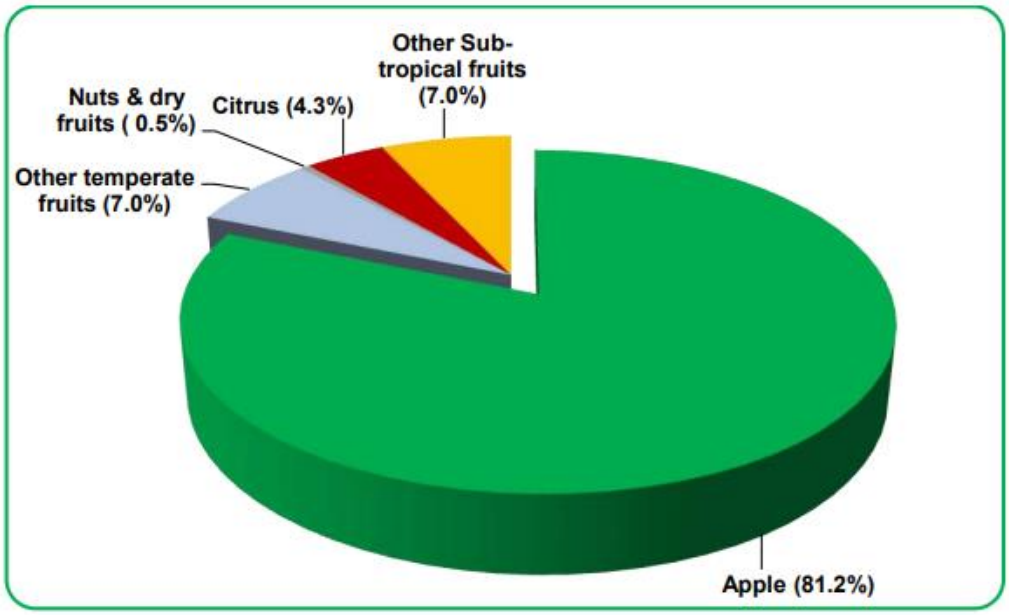
Table1. Production of Apple Fruit in Himachal Pradesh (In Million Tonnes)

Sr. No.	Year	Total production (In Million Tonnes)	Growth rate in percentage
1	2008-09	510161	00
2	2009-10	280105	-45.09
3	2010-11	892112	74.87
4	2011-12	275036	- 46.09
5	2012-13	412395	-19.16
6	2013-14	738723	44.80
7	2014-15	625199	22.55
8	2015-16	777126	52.33
9	2016-17	468115	-8.24
10	2018-19	368580	-27.75
12	2019-20	715220	40.1
13	2020-21	481026	-5.71
14	2021-22	611859	19.93

Source: Economics and Statistics Department, Himachal Pradesh

The Government of Himachal Pradesh is committed to farmer-centric programmes and identified Horticulture sector as one of the growth engines in economic development of the State. Total production of apple fruit has been increased 510161 (MT) during 2008-09 to 777126 (MT) in 2015-16 and decreased 611859 (MT) in 2021-22. The production of apple fruit from 2008 to 2016 has increased 52.33 percent and decreased to 19.93 percent during the years 2021-22 In Himachal Pradesh due to climatic hazards. The area under Horticulture crops increased from 792 Hectares in 1950-51 to 2,35,785 hectares in 2021-22. The area under Horticulture in state is contributing 26 per cent of the total Agriculture area (8, 91,926 hectares), whereas the sector contributes 22 per cent in terms of value of the produce (Agriculture crops value ₹16,076 crore including vegetables, Horticulture crops value ₹3,583 crore). Between 2007-08 and 2021-22, area under horticulture crops has seen a growth of 17.60 per cent. Apple, Mango, Orange, Pear, Plum, Peach, Galgal and Apricot are the major horticulture crops in the state.

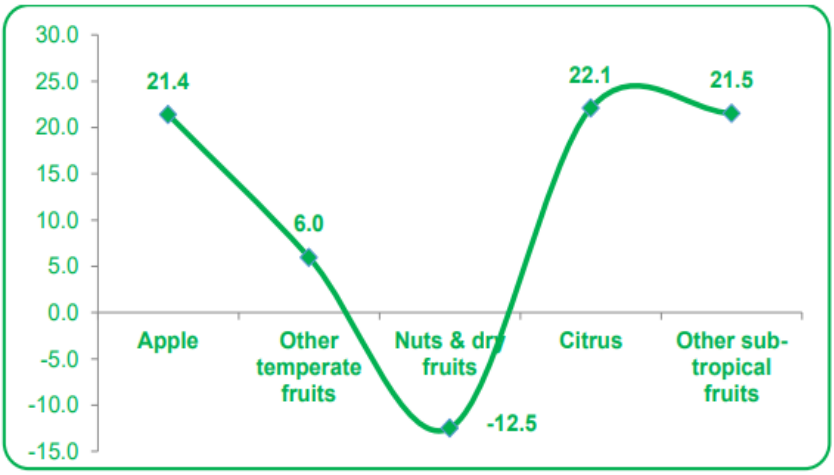
2.2. Fruit Wise Contribution to Horticulture crops (2021-22)



Source: *Economics and Statistics Department, Himachal Pradesh*

Apple is the most important fruit crop of Himachal Pradesh, which constitutes about 48.8 per cent of the total area under fruit crops and about 81 per cent of the total fruit production during FY2021-22. Area under apple has increased from 400 hectares in 1950-51 to 3,025 hectares in 1960-61 and 1,15,016 hectares in FY2021- 22. Between 2007-08 and 2021-22, area under apple has seen a growth of 21.4 per cent.

2.3. Growth Rate in Area (2007-08 to 2021-22)



Source: Economics and Statistics Department, Himachal Pradesh

The area under temperate fruits other than apple has increased from 900 hectares in 1960-61 to 27,911 hectares in FY2021-22. Nuts and dry fruits have seen an increase in area from 231 hectares in 1960-61 to 9,786 hectares in 2021-22, while citrus and other sub-tropical fruits have seen increase from 1,225 hectares and 623 he4ctares in 1960-61 to 26,096 hectares and 56,976 hectares in 2021-22 respectively.

2.4. **H.P. Horticultural Produce Marketing & Processing Corporation** (HP State Government Undertaking) popularly known as HPMC was incorporated on 10th June, 1974 with the financial assistance of World Bank. The mandate of this organization was to provide post-harvest facilities to the fruit growers of the state and to help them to get best returns for their produce from the market. HPMC was established with the objective of marketing of fresh fruits and processing of all types of surplus fruits. It has developed the most modern system of marketing in the country. The unique characteristics of this organization are that It provides supplies of horticultural inputs, tools and implements besides apple grading/packaging and storage facilities to the growers. The infrastructure created way back in seventies and early eighties has now been upgraded in a phased manner by commissioning most advanced computerised apple packing /grading lines with controlled atmosphere facilities in the fruit growing areas of the state. This has helped farmers avail technology to meet the international market requirements. During the FY2021-22 HPMC has registered overall turnover of ₹113.49 crore which is the highest ever in the history of HPMC since its inception. During FY2021-22 HPMC achieved a net profit of ₹2.88 crore. The process of enhancing the overall storage capacity of CA Stores from existing 2680 MT to a total capacity of 7,328 MT is underway and is expected to be completed by the second quarter of FY2023-24. Additionally, new grading and packaging facilities are being built at Tatapani (Shimla), Rohru (Shimla), Giabong (Kinnaur), and Chachyot (Mandi). Each of these grading and packaging facilities has a capacity of 10,000 MT each season.

3. Employment Generation

It is the analysis of the employment opportunities created across the entire apple value chain, from cultivation to processing and marketing. Apple cultivation creates employment opportunities jobs for nursery developers, input suppliers, growers, pre-harvest contractors, transporters, commission agents, wholesalers, traders, cold store operators, retailers, consumers, exporters and processors. They are supported by a range of technical, business and financial service providers Apple Value Chain encompasses the full range of activities and services required to bring the produce from farm to sale in local, national, or international markets. .A brief description of these actors, their roles and position in the value chain is given below:

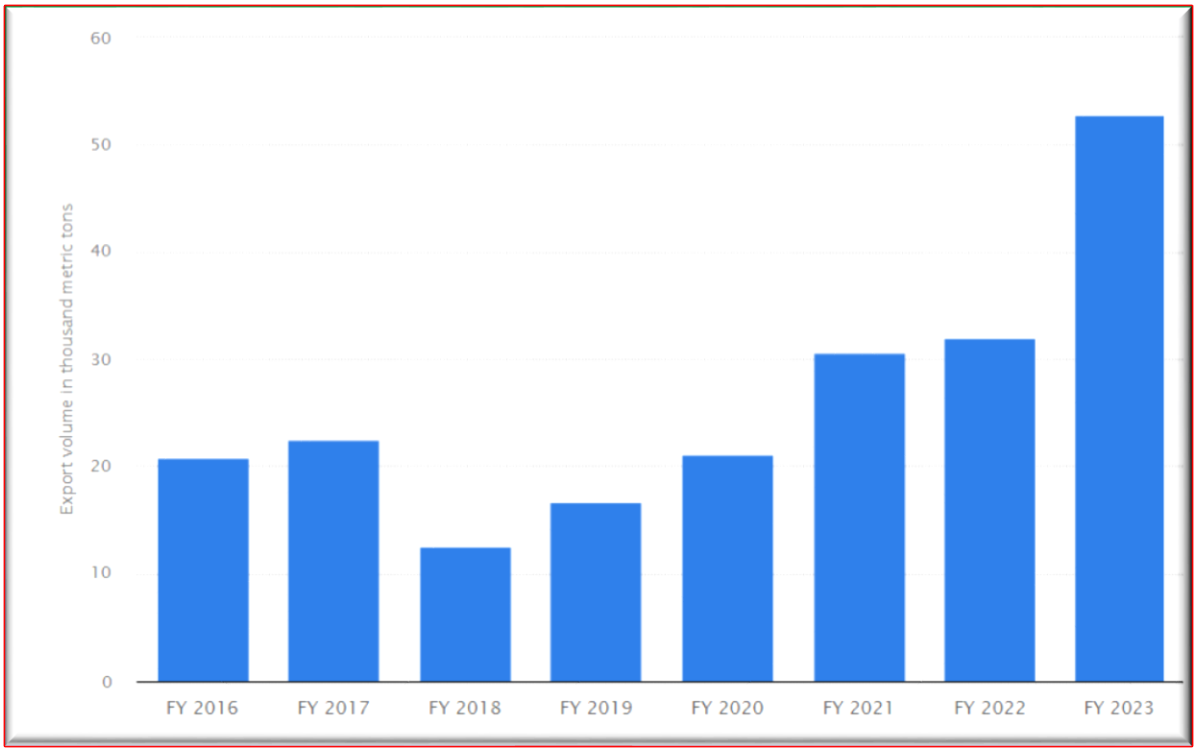
Sr. No.	Type of Employment/ Actor	Types of Activities / Services performed/ Role
1	Input suppliers	Input supply of agro-chemicals, fertilizers, pesticides and micro nutrients is an important requirement to undertake production activities.
2	Nursery Developers	There was a mixed response from producers, regarding availability of reliable planting material in HP. It has been observed during the study that no certified planting material, with guarantee of quality and true to type was available to the producers.
3	Producers	Producers undertake the production activities. In most cases the orchards are sold to the pre-harvest contractors to avoid the risk of loss and hustle involved in it. In case of self-marketing, the producers get finance from commission agents for production activities, with the commitment to sell produce through the commission agent providing finance.
4	Pre-harvest Contractors (PHC)	The PHC purchase the orchards at their maturity stage. Finance for payment to the producer is obtained from the commission agent. Marketing of produce is mostly controlled by the commission agent, providing the finance. The PHC operates in a climate of uncertainty and encounters all sorts of risks.
5	Harvesting Labour	Harvesting labour works in the form of a group/team. It includes harvesters, sorters/graders, packers and one or two persons for finally closing, marking and strapping the cartoons/crates. Each category of the harvesting labour is paid according to the skill required for its specific job.
6	Transporters	They transport the produce from the point of production, or from one market to its destination market.
7	Commission agents	Commission agents perform the important function of linking sellers with the buyers to fill the supply-demand gap. They perform their activities on a commission basis and, normally, do not accept title of goods.
8	Wholesalers	Wholesalers buy the lots in auction in big markets and sell onward as per requirement of buyer. They mostly buy from the commission agents on credit basis, and make payment after the onward sale of produce.
9	Traders (Ladania)	The produce lots are purchased in auction by the traders (Ladania) and is further marketed to surrounding smaller markets.
10	Cold Store Operator	Cold store operator provides the facility and gets his charges, does not accept any responsibility, in case of damage to the produce.
11	Retailer	Retailer is the last link of the domestic marketing chain. They make their purchases of required quality and quantity mostly from the wholesalers. they play a significant role in promoting consumer and production sustainability.

12	Exporter	Due to non- availability of required facilities a very small portion of the produce is exported. Exporters export the produce, in a traditional manner, to nearby countries of Afghanistan and UAE.
13	Processor	A very small part of the produce is processed to prepare value added products which include jam, jelly, squash, juice, vinegar, pulp, nectar and clear concentrate. Mostly C and D grade produce is procured by the processors.

4. Income Generation for Farmers

Apple cultivation is highly profitable economic activity in the state of Himachal Pradesh, which is famous for its quality apple. It is farm-based, labour intensive and commercially attractive economic activity. The income per acre is much higher than any other horticulture crops, if it is done in systematic way. Apple production plays an important role in improving the standard of living, per capita income and employment generation. More than half percentage of the population in Shimla, Kullu and Kinnaur districts are engaged in the cultivation of apple directly or indirectly in the state. Apple is the most important fruit crop of Himachal Pradesh. It constitutes about 49% of the total area under fruit crops and about 85% of the total fruit production. The apple economy of the State is an estimated ₹5,500 crore-6,000 crore.

5. Export Potential:



Source: Economic survey 2022-23

Export volume of fresh apples from India FY 2016-2023

In fiscal year 2023, the volume of Indian apples exported from India amounted to over 52 thousand metric tons. This was a significant increase from the previous year's production volume of 31 thousand metric tons. Bangladesh, the neighbouring country imported the largest volume of fresh apples from India in financial year 2023. Increase in exports is helping the growers in Kashmir and Himachal Pradesh to further push the outbound shipments in different parts of the world.

6. Challenges of apple production in HP

Apple producer farmers in the study area were challenged by lack of agricultural inputs; limited production capacity; harvesting of unripe apple fruit; the increase of thefts on apple fruit and seedling; knowledge gaps on apple-tree management; lack of good market opportunities; and absence of legally binding document for apple production and marketing.

❖**Shortage of agricultural inputs**–Apple producers' farmers stated that inputs like saw, harvesting, scissors, and packing materials are crucial in fruit production, rarely supply domestically produced pruning and thinning materials; however, most are less quality, easily broken, and did not work correctly.

❖**Climate change**- Apple production is, as any other output has been the consequence of action and interaction of numbers of inputs. There are a number of factors, change in snowfall pattern, low chilling hour etc. Any variations in weather also bring huge variation in productivity. The need of the hour is to put together the developmental efforts in such a way that the climatic hazards are minimized.

❖**Low production capacity**–the majority of farmers traditionally produce apples; hence, it is not commercialised. as expected, the Inadequate proportion of pollinizers, Lack of pollinators and Poor canopy management can lead to poor fruit set and low apple productivity in the state.

❖**Lack of long-term apple cultivation plans**- The ageing farming workforce and young people's rural-to-urban migration was a frequently mentioned problem and acted as a barrier to the long-term plan for improving apple production.

❖**Technical Knowledge gaps in apple Growers** –farmers in the area still lack the technical knowledge about pests, fertilizers, planting material, logistics, market awareness and on apple tree management. There is need to minimise such gaps through different extension programmes like training's, demonstrations, and exhibitions etc. in order to create horizons of hope among the apple growers in HP.
❖**Financial difficulties**-Farmers had limited budgets for investment in technologies. As such, farmers' access to financial support might significantly affect their investment in apple production. For those who planned to expand their orchard sizes, the difficulty of getting loans from financial institutions could act as a barrier to shift to more environmentally friendly technologies and practices.
❖**Limited market opportunities**– Apple marketing in the Himachal Pradesh is virtually in its entirety is carried out by the private sector comprising of pre-harvest contractor, forwarding agent, commission agents, wholesalers and retailers. It is claimed that complicity among middlemen and exploitation of weaker producers is common practice.

7. Policy Implications for development of apple cultivation in State:
The pre-liberalisation period experienced tremendous growth in apple production, backed by substantial support from the state. While this is not to undermine the efforts of the government, it was the massive peasant movement that demanded such a support system. Some of the measures taken by the state which have contributed to an increase in apple production are:
(1) Establish a separate horticulture department and a separate university of horticulture in the state. (2) setting up nurseries and giving plants to the farmers on a large-scale, (3) installing a packaging carton factory with world class quality material at subsidised rates with offering a transport subsidy on cartons, (4) Installation of Anti Hail Gun/net and opening cold stores, packaging and grading stores, (5) offering heavy subsidy or concession on tools like cutters, spray pumps hail nets, plastic trays, etc; and providing subsidy on fertilisers, insecticides and fungicides, (6) offering special monetary help for the poor and dalits to plant apple orchards, (7) Incentive and subsidy for establishment of individual orchard: 50% to SC/ST/IRDP, 25% to Small farmers, 33.33% to & Marginal farmers maximum limit-Rs. 3000. 8. Organising training, Exposure visits, seminars and workshops for orchards in the state. 9. Intervening in the market by opening subzi mandis. In addition, a support price under the market intervention scheme was offered to apple and other fruit producers in the state.

8. Conclusion:
Apple production in Himachal Pradesh is a significant part of the horticulture-based economy in the region. The state has varied climatic conditions that are suitable for apple cultivation, particularly in the sub-temperate regions. However, the production of apples in Himachal Pradesh is facing various challenges and constraints. These include factors such as diseases of the plants, changes in the prevailing climate, and constraints in the supply chain management. Efforts are being made to address these challenges and enhance apple production in the region. Strategies such as implementing a well-managed gardening system, there is a need to introduce weather tolerant plants, hybrid varieties of apple and disease free plants should be introduced. developing infrastructural facilities, establishing and expanding apple orchard-based food processing units, and promoting tourism activities have been suggested to ensure the prosperity and sustainable development of apple farming in Himachal Pradesh. Apple is the most important fruit crop of Himachal Pradesh. It constitutes about 49% of the total area under fruit crops and about 85% of the total fruit production. The apple economy of the State is an estimated ₹5,500 crore-6,000 crore.The apple cultivation is considered to best way to utilize the natural resources of the hills which gives significantly more remuneration than the field crops and generates more income and employment and thus turns has resulted in the farming shifting their area from field crops to horticulture.

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