



Cost Benefit Analysis of Old (Traditional) and Ultra High Density (New) Varieties of Apple: A Study on District Baramulla.

Imtiyaz Majid, Dr.Tawheed Nabi

Mittal school of Business (Lovely professional university)

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Abstract

Apple is the main fruit for the consumption and has changed the State Gross Domestic Product of UT of Jammu and Kashmir with USD 10 million exports from India, in which USD 5 million earned from J&K Apples. It is very encouraging for the apple growers of UT of J&K. The Ultra HDS apple orchards are a new approach for the cultivation of apple fruit. This is a new way of farming, in which the apple trees are planted or grown in a very dense and systemic manner. Every detail counts when planting and managing a new apple orchard in the Ultra high-density system. By the end of the planting year, growers will have invested more than 2 to 3 Lakh per hectare to get the site ready. So, in this study, the farm size of sampled orchards and the development of apple production has been taken from 2012 -2021 in district Baramulla; cost with respect with tree density a comparison of cost and total cost between old and new varieties of apple system has been explained. This paper also analysis the payback period analysis and yield/ hectare with orchard density.

Key Words: Maturity; New Variety Apple; Old variety Apple; Payback; Ultra HDS apple

Introduction:

U.T. of J&K has a unique topography all over India. Warm in summer and cold in winter give more and more plants and help to improve productivity. There are more than 200 varieties of apple in J&K. Apple has improved the lives of people at an individual level and the social-economic condition of the people of our state. It will not provide a huge amount and a remuneration-based income, which is good to develop the standard of apple growers. The Apple sector has shown good growth in the last 3-4 decades. Technology has also helped the fruit growers to earn a handsome amount of money for their produce. With the help of technology, they can sell their production anywhere in the country (Naqash F. et al. 2018). 24% of the production of apples increased in between 2010 to 2020 in the world. The Golden revolution in 1993 in horticulture focused on horticulture products. Before, the horticulture sector was not a priority of the govt. In the Kulu district of Himachal Pradesh, an apple was introduced by Britishists in 1917. A delicious apple was introduced in Himachal Pradesh. There are only 9 states in India which produce apples. The apple growers of U.T. of J&K made an agreement with the land entrepreneurs on land at an interest of INR 30 on each box of apples. If the growers can not complete the agreement fully, the agreement continues till the end of the contract. The

money which he and she borrow from entrepreneurs, the interest rate will be more than 12%. For the last decade, the govt. has provided loans like KCC to the farmers with an interest of 7% up to 3 lakh and 12% more than Lakh (Amin, I.U., & Jan, A.). Traditional apple cultivation gives 2.5% less production as compared to high-density apples. India contributes 3.02% of total apple production in the world. J&K and Himachal Pradesh contribute 85%(area) and 92% (production) in India. India's average production is (6-8) tons per hectare as compared to developed nations like the Netherlands (40.40) tons per hectare, which is much less from India's point of view. In India, Rs. 38355 is needed for spraying per hectare of land of the apple orchard. Apple accounts for 51% of the total area & 2.72 lakh hectares of total production (Wani, S.A., et al, 2021).

Literature Review:

The apple is an important fruit to produce jam. Pakistan has an area of 110.8 thousand hectares under apple cultivation. There is a variety which is used for mixing jam of apple and pear, which is famous all over the world. Jam needs 45% of fruit and 55% of sugar. This paper tells us about the jam industry and the losses which they face during preservation. They need cold storage to preserve fruit and after they make jam from the fruit, they need transportation so that the jam will reach the market as soon as possible (Shakir, I., et al 2008). In the last decade, the Fruits plays major role for the development of U.T of J&K. People earn a good amount of wealth from these 2 fruits. It gives Rs. 43 thousand crores to the state economy, which is 7% of the SGDP of the U.T. of J&K. Area increased from 73.10 thousand hectares in 1993 and 1994 to 161.37 per thousand hectares in 2013-14 of apple and 12.23 per thousand hectares. In 1993-94 to 14.83 thousand hectares in 2013-14 of pears. Production increased from 7.93 lakh tons in 1993-94 to 16.62 lakh tons in 2013-14 of apples and in pears from 0.16 lakh tons in 1993-94 to 0.73 lakh tons in 2013-14. The price of both fruits has a positive effect on each other, as has the prices of pears. The price of apples is increasing day after day, year after year, but it cannot reach a satisfactory level in the eyes of growers of U.T. of J&K. (Wani, M.H., et al 2015). People of Azad Kashmir face huge losses due to the unavailability of storage. Lots of growers' fruit does not reach a mark due to transportation. Due to the unavailable transportation, the fruit is ripe and growers face losses. Apricots and apples are used to produce jam, which has a huge market in Azad Kashmir. The apple with 44.980 thousand metric tons and Apricot with 25.66 thousand metric tons are produced in Azad Kashmir (Hussain, I., et al 2008). The main problem of this industry is marketing. People do not know the marketing techniques, especially small growers. The middleman can take advantage of this and they earn huge amounts of money. People prefer the Azad fruit mandi of Delhi but they do not know the other state mandi where they can sell their apple and earn a good amount. From apples we can make jam, jellies, and juice (Bhat, T.A., & Choure, T., 2014). Apple Pomace means the waste we get after we get juice from apples. In India, the scale is 75% and 25%. 75% percent we get juice and 25% we get pomace. For one million tons of apple, after we get the juice, we take 10 thousand metric tons of pomace. 5.26-million-hectare area the world produces 58 million tons of apples. Apple pomace is full of carbohydrates and minerals that can also cause environmental pollution (Shalini, R., & Gupta, K.D., 2009). In the last one and a half century, the greenhouse gases have increased rapidly. In the last two decades, snowfall has happened two to three times in Himachal Pradesh, which causes a negative effect on the cultivation of apples. It needs a cool and moderate temperature of nearly 20 degrees Celsius. During the peak season, rainfall is important, but in present times, hail fall can damage the flower of the apple trees loss of forest cause drought which is the main cause of high rate of mortality of apple trees. For the good production of apples, night temperatures should be cool and days should be warm. But in the present scenario, the climate is not suitable

to produce apples, i.e. why the production of Himachal Pradesh is declining day by day (Singh, N., et al, 2016). Apples are available half a year on the market from September to February in the whole country, with the help of cold storage. The five mandis are important with respect to Apple. They are Srinagar, Delhi, Kolkata, Bangalore, and Mumbai. They buy a large portion of fruit production in India. The fruit market faces a few problems: lack of information, transportation facilities and price stability. The market for apples has shown improvement but the strategies were not beneficial for the apple market (Wani, M.H., et al, 2015). A large number of pollinators help to achieve better crop yields in J&K. In U.T. of J&K, bee pollinators are main pollinators. Use of pesticides is the main cause of death of pollinators. Lots of farmers face the problem of pollinators (Riyaz, M., et al., 2018). The benefits of natural farming are more than chemical farming. A study shows 99.1% of people like natural farming. It will also help him to earn more money than chemical farming. The growers of apples in Himachal Pradesh are interested in adopting natural farming. It is low cost and sustainability is good for natural farming. It will help to improve the quality of apples in Himachal Pradesh (Chandel, R.S., et al, 2023). Hyderabad mandi is important for apple growers in India. It is intertwined with other mandis in India. The main cause of the Hyderabad mandi is to develop the whole sales market for the growers of apples all over India. It also helps to develop better connectivity, marketing, and lower cost for the sellers in Hyderabad and other cities. In our country, one Kg of apple was sold in Hyderabad for Rs. 100 in 2003. Hyderabad has become the centre of National and International apples, and it does not compromise with the quality of apple. That is why a large number of growers and sellers come to Hyderabad mandi to buy and sell apples (Fayaz, A.B., & Singla, N., 2014). Re-establishing means, to establish new orchards on old land or to use branches of new varieties of apple on old trees. This is a complex phenomenon. The rate of survival is less in this technique. Due to this technique, the plants face less growth in which they give fruit from the year onwards. The plant size and height also affect it and new plants do not survive. This kind of problem is faced by high-density apple trees which will be replaced after 20 years. Sometimes the soil can cause damage and the plant cannot survive. (Sharma N.C. et al 2020). More than one thousand varieties of apple are in the world. Apples are used to prepare juice, jam, ice cream and jelly. These things help growers to produce more and more apples. Through these things, the income of the apple grower's increases and growing apples helps to improve their economic condition (Ucar, K., et al 2016). With 41% of apple production, China tops in the world. In the Toya district in China, the apple is a profitable fruit for cultivation. From the last two decades, 1990-2010 in apple production has decreased by 13.4 metric tons in 2011. But after 2011, the production has steadily increased to 50 metric tons. It will help small land holders to earn their livelihood and get a good return for their fruit. The 11 kg of apples were harvested from a single tree in Ethiopia in a year (Tegenie, Y.A., 2014). Advanced breeding techniques such as MAS (Marker Assisted Selection) are much better cost effective than conventional breeding techniques. The M.A.S application programme removes, on average, >25% of labour in apple production. It has also resulted in labour cost reduction over the last 5 years, viz. 10% reduction, 15 and 20% in the production of apples (Vannemuehler, S.D., et al, 2019). For the growth of the apple plant, a few things are important. Water daily, and especially for high density apples, two to three times a day in summer. The weather will be dry for the fast growth of apple plants. Hails can damage fruits because anti-hail facilities should be available, especially high-density apple growers. Apple has taken a huge share in terms of area and production in our state. They dominated all other fruits in marketing and profitability (Randev, A.K., & Parmar, Y.S., 2009). Presently, Himachal Pradesh occupies 2nd position after J&K in apples in our country. From last few years, Apple has become

unprofitable, uneconomical, and less productive. With these drawbacks, Himachal Pradesh Apple's image is going lower every year as compared to J&K Apple. The main problem behind it is the weather. Weather creates a huge problem during the growth of apples in every stage. In size, in color and less juice content, the Himachal Pradesh apple is also attacked by pests because of unpredictable weather. (Singh, I.J., 2013). After bifurcation, UT of J&K faces a new problem, i.e. roadway which is closed during the harvest season. That is why, in 2022, the price of an apple is nearly less than Rs. 250 per box. For the last two decades, J&K has shown an upward trend in horticulture. Horticulture contributes 30% to the agricultural GDP in our country, and ranks 2nd in the world. Baramulla tops the list of districts in horticulture and contributes 19.61% of total horticulture products in the whole valley. Recently, the government has shown keen interest in increasing the horticulture of UT of J&K. In 2012, the Govt. of J&K introduced high density apple followed by high density cherry, high density walnut and other products. It is a future strategy so that in future our horticulture will increase its productivity (Ahmad, R., et al, 2021). After adopting improved high yield varieties of apple. The production has improved and the income of farmers has also increased. The choice of varieties has improved and apple cultivation has dominated other horticulture produce. But adopting high yield varieties of apple cultivation is low in J&K as compared to Himachal Pradesh. It is not good sign for the horticulture sector of UT of J&K. The main reason behind is the unawareness of the people regarding these high-yield varieties-which are also known as high density apple or ultra high-density apple. There are marginal and small land holdings in J&K. The focus of horticulture and other Govt. departments or on the adaptation of new techniques so that these small and medium land holdings will get good production and earn their livelihood.(Bhat, A., et al, 2022). In 2016, a high density apple scheme was launched at 2200 plants per hectare and at 3300 plants per hectare. The Govt. provides support for these two types of plans and provides subsidies of 50% on these plans. With the passage of time, the govt. provides support to other marginal and small farmers, even if 1 kanal of land is given a high-density apple with 50% subsidy. The growth rate of agriculture is increasing day after day. India's agricultural growth rate is 2.9% and 8.4% of J&K in 2016-2017. J&K has higher production per hectare as compared to Himachal Pradesh. Himachal Pradesh has production of 6 metric tons per hectare and J&K has more than 10 metric tons per hectare (Bakhtaran, H., et al., 2020). The average yield per hectare of apple was 9.43 tons per hectare, which is very low. The reason behind the low productivity is less education for farmers, not because of the use of new technology, credits were not available on time, pesticides and fungicides information was not available on time, weather condition was going worst day by day like floods, soil erosion and hail storms are often and marketing which is important for the product. With USD 10 million export from India, in which USD 5 million earn from J&K Apples. It is very encouraging for the apple growers of UT of J&K. (Shah, Z.A., et al, 2022).

Objectives:

To Study the cost benefit analysis of production in apple in district Baramulla.

To examine how Ultra high-density apple reduces the gestation period of apple cultivation in district Baramulla.

Data Collection:

Primary will be collected directly from old and new apple growers, 31 from Ultra high density and 39 from traditional apple growers from district Baramulla. The sample size was 415. The total population of new varieties of apple is 31 in Baramulla district. So the total sample size of both (old + new) varieties of district Baramulla is 415. Secondary data will be collected from

Government Websites like National Horticulture Board of India, Jammu and Kashmir Horticulture Board, Financial Commissioner Revenue, and Economic Survey 2021-2022, Horticulture planning and Marketing, Horticulture Surveys etc.

Research Methodology:

Cost benefit analysis was used to know the Establishment costs, material costs and labour costs and calculate the benefits received by old and new apple growers.

Tree Density of (New) and (Old) apple.

Varieties	Trees per Hectare	Apple Boxes per Hectare
Traditional apple	3000 per Hectare	6000 Boxes per Hectare
New apple	400 per Hectare	4000 Boxes per Hectare

In old varieties of apple 400 trees and in high density apple (new variety) 3000 plants were planted in one ht. of land. After the maturity new apple which is 7 years. A grower can harvest 6000 boxes in one hectare of land where as 15 years is the maturity period for old varieties of apple. A grower can harvest 4000 boxes of apple.

Establishment cost in Lakhs (in Indian rupees) of old and new varieties of apple in one hectare of land.

Components	Old variety of apple	New variety of apple
Orchard leveling cost	0	300000.00
Orchard fencing cost	0	300000.00
Digging cost	0	50000.00
Plant cost	10000.00	1500000.00
Trellises cost	0	1000000.00
Drip cost	0	1000000.00
Anti-hail system cost	0	0
Borewell cost	0	200000.00
Apple Store cost	100000.00	100000.00

Source: field survey.

From above table we see that the establishment cost of old varieties of apple is very low as compared to new varieties of apple. Establishment cost of old varieties is rupees 1-2 Lakhs per hectare as compared to new varieties, establishment cost is rupees 40-45 Lakhs per hectare.

Labour cost in Lakhs (in Indian rupees) of old and new varieties of apple in one hectare of land.

Components	Old variety of apple	New variety of apple
Fertilizer costs	50000.00	30000.00
Pesticides spray cost	30000.00	30000.00
Weeding cost	50000.00	20000.00
Drip costs	0	20000.00
Pruning cost	50000.00	25000.00
Harvest cost	60000.00	30000.00
Grading cost	10000.00	5000.00
Packing cost	20000.00	30000.00
Loading cost	10000.00	5000.00

Source: field survey.

The labour cost of both old and new varieties of apple is same except drip cost in new varieties. New machines have been introduced like grading machine for the grading of apple, which was done through manually by the labours. It has reduced the cost of grading and save time.

Material cost in Lakhs (in Indian rupees)of old and new varieties of apple in one hectare of land.

Components	Old variety of apple	New variety of apple
Fertilizer costs	50000.00	30000.00
Pesticides spray cost	50000.00	50000.00
Oil cost	10000.00	10000.00
Packing cost	320000.00	300000.00
Transportation Cost	140000.00	200000.00

Source: field survey.

Material cost for old and new varieties of apple is almost same, but the gestation period makes it different. From the first year we receive benefits in new varieties as compared to old varieties which have 1st to 15th year of gestation period.

Benefits received in Lakhs (in Indian rupees) by apple (old and new) grower in 20 years.

Year	Old variety of apple	New variety of apple
Establishment	0.00	1
1 st	0.00	1
2 nd	0.00	2
3 rd	0.00	6
4 th	0.00	10
5 th	0.00	12
6 th	0.00	20
7 th	0.00	50
8 th	0.00	50
9 th	0.00	50
10 th	0.00	50
11 th	0.00	50
12 th	0.00	50
13 th	0.00	50
14 th	0.00	50
15 th	1	50
16 th	2	50
17 th	3	50
18 th	4	50
19 th	6	50
20 th	8	50

Source: field survey.

The data shows benefits received from 1st year till 20th year makes different clearly. Ultra high density (new varieties) receives benefits from 1st year and the benefits are so huge that old variety is just like a burden for growers. The maturity of old variety is 15th year and the maturity of new variety is 7th year. An apple grower who makes money of half a crore from a land of one hectare in the 7th year of apple plantation is a revolution in apple cultivation. Whereas there is

another grower of apple who makes 1 lakh in the 15th year of apple plantation .After the period of maturity in old(15th) and new (7th) the margin is old different. Old variety has faced a lot of difficulties as compared to new variety. Anti-hail facility is available to new variety growers of apple which is not available to old varieties of apple growers.

The software which was used for the study will be MS Office, SPSS etc.

Suggestions:

Government should provide 75% subsidy for those who adopt Ultra high-density apple scheme. Interest rate of ultra-high density apple scheme should be same as KCC. Proper training should be given to those who adopt ultra-high density apple scheme. More fruits should be introduced in ultra-high-density scheme like, peach, Almond, walnut, cheery etc. Government should provide proper transportation in harvest season of apple, so that apple will reach quick and easily at national level mandi.

Conclusion:

There is a huge difference between the old and new varieties of apple. The gestation period of new varieties of apple is 1-7 years whereas the gestation period of old varieties is 1-15 years. 3000 trees were planted on the new variety of apple on one hectare of land but only 400 trees were planted on the old variety of apple on one hectare of land. After the maturity period, old variety growers harvest 4000 apple boxes as compared to new varieties. A grower will harvest 6000 boxes on one hectare of land. The size and quality of new varieties is best to compete with international standards. Costs are high for new varieties of apple but the profit from the 2nd year is unbelievable. The profit of new varieties is just like an industry, not an orchard. New varieties of other fruits like cherry, walnut and almond are on a trial basis and in future we will see orchards of these fruits also. Fresh and dry fruits will become a significant feature of the growth of State Gross Development Product (SGDP).

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