

Cost Benefit Analysis Of Ultra High Density Apple Plantation: A Comparative Study Of Baramulla And Budgam Districts Of Jammu And Kashmir

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Abstract

There are several varieties of high density apple such as super chief, Gale Gala, Jeromine, Red Chief, King Rout etc. In old varieties of apple average productivity is 6-8 metric tonnes per hectare, but in high density it is 40-60 metric ton per hectare. The study was conducted in the two districts of Jammu and Kashmir, Baramulla and Budgam to measure the cost benefit analysis of Ultra High Density apple cultivation. 42 Ultra High Density Apple growers were selected by simple random sampling out of 140 growers of districts of Baramulla and Budgam. The UT of Jammu and Kashmir had 400 thousand hectares of land are under cultivation in which 330 thousand hectares are under fruit production (S.R.D-2020). Horticulture plays a significant role in the economy of Jammu and Kashmir. About 8-10 percent of GDP of the UT comes from Horticulture (DHK-2020). Fertilizers play an important role on the production of Ultra High Density apple. Kashmir consume huge amount of fertilizers, but growers spray only 8-10 sprays in a year as compared to Netherland which sprays 20-25 spray in a year. From the last few years horticulture of J&K is facing loses due to various factors, 2016 unrest and 2020 Covid-19 pandemic being the notable ones. But in present scenario Iranian apples make hue and cry because of low cost. The transportation and marketing of the horticulture produce during the previous year also effects. Further, the unavailability of the pesticides and insecticides caused due to the pandemic also affected the sector from 2019 to till date.

Keywords: - Apple, Ultra High density, Horticulture, pesticides, Transportation, Covid-19.

Introduction

India ranks 2nd after China in Horticulture. During 2018-19, horticulture production of the country was 310.74 million metric tonnes (NHB-2018). UT of Jammu and Kashmir is known for horticulture all over in India. Horticulture is important for the economic growth of UT of Jammu and Kashmir. In (2019-20) peak season of fruits, the sector on J&K faced big setback due to the Covid-19. The majority of products produced in the UT have markets outside the UT, notably Azadpur mandi Delhi. A little amount of Ultra high density apple goes to fruit mandi Mumbai. It is very difficult to transport such a huge production by road that is why some times

growers face huge losses during transportation. Thus the supply of horticulture products was hit hard in Covid-19 (Hassan, The wire, 2020). One Hectare of land provides employment to 860 persons annually in Jammu and Kashmir (Darzi, M.I.-2016). In Jammu and Kashmir, High Density scheme was launched in 2016. High Density apple productivity has increased as compared to traditional apple varieties. There is need to support farmers especially small farmers, who do not have enough money to adopt such schemes. Government should provide them loan to support these farmers (Hassan B. et al., (2020). The Golden Delicious (G696 & G935) have higher production than M9, T337. In orchards the introduction of dwarf rootstocks

reduces input cost, increases productivity and the production of high quality fruits. Fruit color is important for the grower because when the fruit is ready to sell, it gives more price than a normal fruit which don't have radish color (Dallabetta, N. et al., 2021). The High density was introduced by the world to increase the productivity and improve the quality of fruits. The main factor that influences the quantity and quality of the high density apples is the rootstocks. Sometimes the main distributor sells fake rootstocks on the name of high density and after 2 or 3 years later the farmer realise that the distributor cheated him (Lauzike K. et al., 2021). From 60 years of old varieties of apple trees which use wide spacing have to be replaced by high density apple trees that use dwarf trees with close spacing. High density trees reached their maturity with only height of 16-18 feet and some varieties in between 13-16 feet. In economical analysis it shows high density apple plantation is profitable not only in initial stage, but also maturity stage. That is why Prime Minister Agriculture Modernisation Project-Nepal (PMAMP) has been prioritizing high density plant and has been distributing high density plants at subsidized rates to promote high density apples (Kafle.R. et al., 2021). The study has found that High Density farmers grow 2000-3000 apple trees per hector,

which helps the fruit growers to get more productivity than traditional apple growers. It also reduces gestation period, which is 10-15 years in traditional varieties, but in High Density varieties, it is 2-3 years. Choice of varieties has increased with the introduction of High Density (Bhat, a., et al 2020). The Kisan Credit Card is an important scheme for fruit growers. The interest rate should reduce from 8% and 4% to only 2%. The future of fruit industry is wholly depending on today's youth. Uneducated and old fruit growers don't accept the new techniques especially high density (Ahmad R. et al., 2021). Pennsylvania is an important state in apple production in USA. They grow high density apple in the beginning, but their main concern related to high density is water crises. They found that soil moisture-based irrigation used less water than evapo-transpiration or conventional methods. Drip irrigation helps to increase the crop yield and quantity in high density apples (Jiang X. et al., (2021). If we look at the period of Covid -19, a lot of labours who come from other states returned back. With that the availability of labor became lesser as compared to other years. Horticulture needs labour at the appropriate time, otherwise the farmers are bound to face loses. That is what actually happened during Covid-19.

Year	Area of Apple production in J&K(Hectors)	Production of Apple in J&K (M.T)
2010-2011	141717	1852412
2011-2012	154720	1756192
2012-2013	157280	1348149
2013-2014	127795	1311845
2014-2015	163432	1170306
2015-2016	161773	1966417

2016-2017	162971	1726834
2017-2018	164411	1882774
2018-2019	164742	1882319
2019-2020	164852	2026472

Data from the website of Directorate of Horticulture Jammu and Kashmir.

From the above data, we find that the area is increasing every year. Production is also increasing from 2015-2016 onwards. Lot of steps have been taken to increase the productivity of apple in Jammu and Kashmir notably introduction of ultra high density apple. It not increases the productivity but also quality of the fruit.

Objectives

1. To measure the Economic impact of Ultra High density apples on Horticulture of districts of Baramulla and Budgam during 2014-2020.
2. To examine the effect of Ultra High Density apples on labour employment driven by the Horticulture sector.

Study Area

Area of study is Baramulla and Budgam districts (Union Territory of J&K). Baramulla district is the one of the largest District of the Kashmir valley in terms of area. The District is having 16 Tehsil, 26 CD Blocks and 402 Panchayats, highest in Kashmir Valley. The total population of District is 1015503 (3rd largest in Kashmir Valley) as per census 2011. Major fruit crops of district Baramulla are Apple, Walnut, Almond, Pear, Cherry, Plum, Apricot etc. Baramulla is the largest producer of Horticulture products in the state having 546101 metric tons of fresh fruits, with 529265 metric tons of apples, being 1ST in the

valley, 13598 tones pears 2nd in the Kashmir valley. The District is having highest production of all fruits (dry+fresh fruits) (560610 metric tons). The District is having highest production of Apple cultivation at about (404089) metric tons, which is about 38 percent of total apple production of the State in the year 2018-19. The district is having (10199) metric tons of productivity of walnut in the state. The District Budgam is having 09 Tehsils, 17 CD Blocks and 281 Panchayats. The total population of District Budgam is 753745 (4th largest in Kashmir Valley) as per census 2011. Major fruit crops of district Budgam are Apple, Walnut, Almond, Pear, Cherry, Plum, Apricot etc. Budgam produces 181002 metric tons of fresh fruits, with 148276 metric tons of apples, being 6th in the valley. Pears 1st in the Kashmir valley with 17648 metric tons. The Districts Budgam is having total production of all fruits (dry+fresh fruits) (181002 metric tons).). The district Budgam is having (9858) metric tons of productivity of walnut in the state. The district Budgam has 109 high density apple growers till December, 2021.

Research Methodology and Data Collection.

The data was collected primary as well as secondary. The primary data was collected on directly from the respondent by using multistage (random sampling) method, by on ground analysis and also forming schedule by selecting 30% of high density apple growers of districts of Baramulla and Budgam. Out of 140 high density

apple growers, 10 from district Baramulla and 32 from district Budgam.

The Secondary data was collected from Govt. of India reports, Govt. Departments like District Statistical and Evaluation Office, Departments of Agriculture and Horticulture, Chief Horticulture office Budgam, Chief Horticulture Office Baramulla, Directorate of Horticulture J&K, National Horticulture Board, Agricultural Surveys, Horticulture Survey, Economic Survey (2018-19) etc.

The information is collected by on ground survey and using software like MS-Office and SPSS.

Cost- Benefit analysis.

For cost benefit analysis, we have fully aware of total establishment cost, total material cost and total labour cost then we calculate what will be the benefit of ultra high density apple. It will give us Cost Benefit Analysis of Ultra High Density Apple.

1. Establishment cost of Ultra High density Apple from Plantation year to Maturity Year per hecter annually in Indian Rs.

The establishment cost (TEC) of ultra high density apples growers are land development, digging cost for planting, plant cost, trellising cost, drip cost, fencing cost, Borewell, drip installation cost, shed for packing and anti hail cost.

Table 1: Establishment cost of Ultra High density Apple from Plantation year to Maturity Year per hecter annually in Indian Rs.						
Year	Land development / Digging cost:	Plant Cost	Trellising cost/drip cost	Fencing cost	Borewell/drip installation cost	Anti-hail system
Cost 0 Year	300000.00	1800000.00	1800000.00	500000.00	200000.00	0
Cost 1st Year	0	0	0	0	0	0
Cost 2nd Year	0	0	0	0	0	0
Cost 3rd Year	0	0	0	0	0	0
Cost 4th Year	0	0	0	0	0	0
Cost 5th Year	0	0	0	0	0	0
Cost 6th Year	0	0	0	0	0	0
Cost 7th Year	0	0	0	0	0	0

Cost 8th Year	0	0	0	0	0	0
Cost 9th Year	0	0	0	0	0	0
Cost 10th Year	0	0	0	0	0	0
Cost 11th Year	0	0	0	0	0	0
Cost 12th Year	0	0	0	0	0	0
Cost 13th Year	0	0	0	0	0	0
Cost 14th Year	0	0	0	0	0	0
Cost 15th Year	0	0	0	0	0	0
Cost 16th Year	0	0	0	0	0	0
Cost 17th Year	0	0	0	0	0	0
Cost 18th Year	0	0	0	0	0	0
Cost 19th Year	0	0	0	0	0	0
Cost 20th Year	0	0	0	0	0	0

The establishment cost is very high, that is why fruit growers are hastate to adopt the scheme of ultra high density. Initial cost for establishment is around 2 Lakh Indian rupees per kanal which means 40 Lakh rupees per hecter. Government of

Jammu and Kashmir is giving subsidy of 50% for every grower who is adopting it. There is no subsidy given by government of Jammu and Kashmir on fencing and land development .No

one in district Baramulla and Budgam have installed Anti hail facility in their apple farms yet.

Total variable cost (TVC) consist of organic manures cost, Inorganic Fertilizers cost, petrol/diesel/electricity cost, Packaging Boxes and Pesticide.

2. Material cost of Ultra High density Apple from Plantation year to Maturity Year in (Lakh) in Indian Rs.

Table 2: Material cost of Ultra High density Apple from Plantation year to Maturity Year in (Lakh) in Indian Rs.				
Year	Organic manures/ Inorganic Fertilizers	petrol/diesel/electricity cost	Packaging Boxes	Pesticide
Cost 0 Year	30000.00	10000.00	10000.00	20000.00
Cost 1st Year	30000.00	10000.00	10000.00	20000.00
Cost 2nd Year	35000.00	10000.00	20000.00	25000.00
Cost 3rd Year	35000.00	10000.00	50000.00	30000.00
Cost 4th Year	40000.00	10000.00	60000.00	35000.00
Cost 5th Year	45000.00	10000.00	100000.00	40000.00

Cost 6th Year	50000.00	10000.00	300000.00	45000.00
Cost 7th Year	50000.00	10000.00	500000.00	50000.00
Cost 8th Year	50000.00	10000.00	500000.00	50000.00
Cost 9th Year	50000.00	10000.00	500000.00	50000.00
Cost 10th Year	50000.00	10000.00	500000.00	50000.00
Cost 11th Year	50000.00	10000.00	500000.00	50000.00
Cost 12th Year	50000.00	10000.00	500000.00	50000.00
Cost 13th Year	50000.00	10000.00	500000.00	50000.00
Cost 14th Year	50000.00	10000.00	500000.00	50000.00
Cost 15th Year	50000.00	10000.00	500000.00	50000.00
Cost 16th Year	50000.00	10000.00	500000.00	50000.00

Cost 0th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	10000. 00	10000.00	10000.00	10000.00
Cost1^s t Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	15000. 00	20000.00	20000.00	20000.00
Cost 2nd Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	20000. 00	30000.00	30000.00	30000.00
Cost 3rd Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	30000. 00	40000.00	40000.00	40000.00
Cost 4th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	30000. 00	50000.00	50000.00	50000.00
Cost 5th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 6th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 7th Year	5000.0 0	5000.00	16000.0	20000.0	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 8th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 9th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 10th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 11th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 12th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00
Cost 13th Year	5000.0 0	5000.00	16000.00	20000.00	40000 0.00	35000. 00	50000.00	60000.00	60000.00

Cost 14th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00
Cost 15th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00
Cost 16th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00
Cost 17th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00
Cost 18th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00
Cost 19th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00
Cost 20th Year	5000.00	5000.00	16000.00	20000.00	40000.00	35000.00	50000.00	60000.00	60000.00

Weed management is helpful for high density apple growers. Apple is called king of temperate fruits. M9, T337 rootstock was grafted in SKUAST-Kashmir, which was imported from Holland in March 2017, that was found beneficial for the high density apple growers(Din, S. et al.,

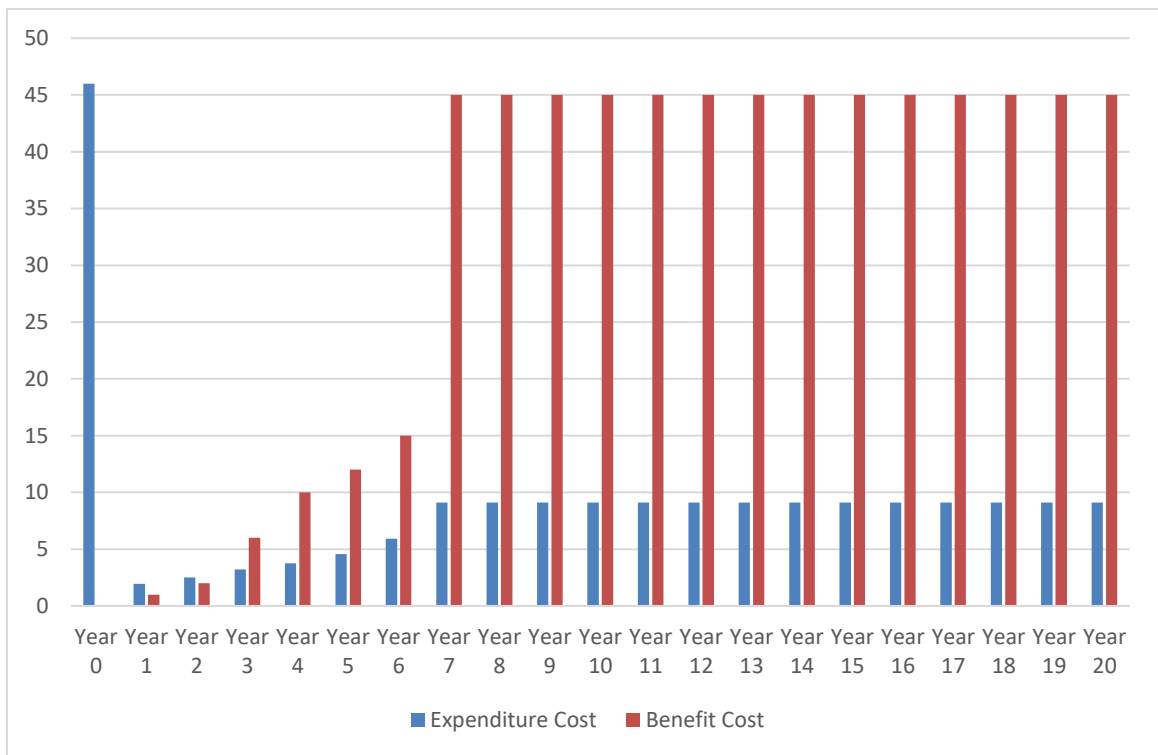
2020).Labour is an important factor in ultra high density apple. One hectore of land needs 400-500 labours in a year. Ultra high density apple farms are an important source of employment also. There are some apple growers who have accepted it as employment.

Table 4: Expenditure and Benefit cost of Ultra High density Apple from Plantation year to Maturity Year in (Lakh) in Indian Rs.

Year	Expenditure Cost in Rs (Lakh)	Benefit Cost per year in Rs (Lakh)
0	46	0
1	1.96	1
2	2.51	2
3	3.21	6
4	3.76	10

5	4.56	12
6	5.91	15
7	9.1	45
8	9.1	45
9	9.1	45
10	9.1	45
11	9.1	45
12	9.1	45
13	9.1	45
14	9.1	45
15	9.1	45
16	9.1	45
17	9.1	45
18	9.1	45
19	9.1	45
20	9.1	45

Comparative Graph of Expenditure Cost and Benefit Cost Ultra High Density Apple Yearly



In district Baramulla and Budgam every grower grows approx.150 plant in one kanal which is

6000 in one hector of land. Establishment cost is 45-50 Lakh per hector in ultra high density in first

year but from 2nd year there are fertilizers, spray and labour cost (weeding, spraying, fertilizers, corning) is very low. Every passing year the maintained cost is very low as compare to production. Some growers harvest fruit from 1st year, some 2nd year and all the growers start from 3rd year. The gestation period of Ultra high density apple is 7 year which is better than old varieties which have 15-20 years. The average productivity of fruit is low (10 mt/ha) in India as compared to other countries (60-70 mt/ha). High Density Variety helps a fruit grower to achieve high productivity, but it needs a lot of investment in the beginning, which is very challenging for the farmer, State Governments as well as Centre Government (Majid, I. et al, 2018).

Calculating the present value of future costs and benefit = $1 / (1+r)^n$ (wallstreetmojo.com).

Here r is the rate of Interest, and n is the number of years.

The formula for calculating present value is:

Present Value of Future Benefits = Future Benefits * Present Value Factor (wallstreetmojo.com).

Present Value of Future Costs = Future Costs * Present Value Factor (wallstreetmojo.com).

AL = Average life span is 20 years for ultra high density apple plant (Kafle.R et al -2021).

r = interest rate taken by Jammu and Kashmir bank annually, which is 12% right know.

n = current year.

Yearly Comparative table of Expenditure Cost and Benefit Cost

Year	Expenditure Cost in Rs (Lakh)	Benefit Cost per year in Rs (Lakh)	Total Benefits	Factor	Value
0	46	0	-46	1	-46
1	1.96	1	-0.96	0.892857	-0.85714
2	2.51	2	-0.51	0.797194	-0.40657
3	3.21	6	2.79	0.711178	1.985867
4	3.76	10	6.24	0.635518	3.965633
5	4.56	12	7.44	0.567427	4.221656
6	5.91	15	9.09	0.506631	4.605277
7	9.1	45	35.9	0.452349	16.23934
8	9.1	45	35.9	0.403883	14.49941
9	9.1	45	35.9	0.36061	12.9459
10	9.1	45	35.9	0.321973	11.55884
11	9.1	45	35.9	0.287476	10.32039
12	9.1	45	35.9	0.256675	9.214636

13	9.1	45	35.9	0.229174	8.227353
14	9.1	45	35.9	0.20462	7.345851
15	9.1	45	35.9	0.182696	6.558796
16	9.1	45	35.9	0.163122	5.856068
17	9.1	45	35.9	0.145644	5.228632
18	9.1	45	35.9	0.13004	4.668421
19	9.1	45	35.9	0.116107	4.168233
20	9.1	45	35.9	0.103667	3.721637
interest				NPV=	88.06822
Rate	12%				
	NPV=	88.06822386			
	IRR=	24%			

Suggestions

1. Establishment of Cold storage in every CD Block.
2. Special market interventions by the Government for the fruit growers.
3. Devising special strategy of transport.
4. Transporting labour during harvesting season from other states.
5. Provide subsidy of 75% during plantation of high density apples.
7. Include apples in minimum support price.
8. Restrict apples of other countries on a certain limit.
9. Indian Government should start a national wide programme just like Prime Minister Agriculture Modernisation Project-Nepal (PMAMP) has been prioritizing high density plant and has been

distributing high density plants at subsidized rates to promote high density apples (Kafle.R. et al., 2021).

10. Interest rate on Kisan credit card will reduce from 8% to 2% annually, so that a large portion of population will take advantage of KCC.

11. Electricity should be provided for all ultra high density apple growers at subsidised prices.

Conclusion

It is clear the Ultra high density apple is beneficial for the fruit grower not only in production and quality but also earning money. It will reduce the unemployment problem in UT of Jammu and Kashmir. There is a big hurdle for fruit growers to adopt it is its huge establishment cost. The COVID-19 pandemic badly affected the horticulture sector of J&K, especially Baramulla and Budgam districts. The pandemic affected transportation of the fruit produce, availability of pesticides and insecticides and marketing of the produce. The unavailability of labors also

affected the horticulture sector. Therefore, this should be an aspect of the sector that has to be kept in mind while designating future strategy for Government Policy for the improvement of Horticulture sector in the State. Establishment of Cold storages at every CD Block, special market interventions by the Government, devising special strategy of transport under these circumstances and transporting labour during harvesting season from other states could counter such situations in future.

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