

## Scientific Approach Improves Yield and Quality of Apples: A Success Story of Kotkhai in Shimla District of Himachal Pradesh, India

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### Abstract

Amongst the cash fruit crops, apple is leading in Himachal Pradesh. However, the productivity of the apple crop is very low and quality of the produce is also not up to the mark due to dependency on old Delicious standard varieties and non-scientific approaches of orchard operations. The present success story is a case study of a progressive apple orchardist who has not only diversified his apple production by introducing new spur varieties but also increased the production and improved the quality of his produce by adopting scientific approaches for orchard operations. The orchardist was a Navy officer till 2004 and his family was cultivating apples with traditional non-scientific techniques and facing many problems like poor fruit set, low production, poor fruit quality, biennial bearing and low returns but after his involvement in the family enterprise in 2005, the production and income of enterprise has increased many folds. Today, he is harvesting fruits of Super chief, Ace spur, Scarlet Spur I and II, Schlect Spur Delicious and Gale Gala varieties and a proud orchardist with a productivity of 16.0 tons acre<sup>-1</sup> and an annual income of about INR 18 lacs acre<sup>-1</sup>.

### 1. Introduction

Apple is a leading cash crop amongst fruit crops in Himachal Pradesh. It alone accounts for about 50% of total area under fruit crops and more than 85% of the total fruits production of the state. Area under apple and its production has increased from 3025 ha and 12000 MT in 1960-61 to 106440 ha and 738723 MT in 2012-13 (Anon, 2013). In recent years, productivity and quality of fruits has become primary concern of apple growers and research workers in the state. Beside other factors influencing the productivity and fruit quality, planting of pre-cautious and high yielding varieties and management of orchards in scientific manner are important.

Kotkhai is leading apple belt of Shimla district (Himachal Pradesh, India) accounting for about 25% of total apple production of the district. Although some of the growers of the area are progressive and producing quality apples with higher productivity but most of the growers are facing problems of low productivity and poor quality due to cultivation of standard delicious varieties and non scientific approaches for orchard operations and discriminate use of chemicals.

The young apple orchardist owns about 2.0 hectares of land.

Till 2004, he was serving in Indian Navy and his family was cultivating apples with traditional non-scientific techniques facing many problems like poor fruit set, low production, poor fruit quality, biennial bearing and low returns etc. In 2005 after joining his family enterprise, he decided to overcome the problems related to apple production being faced by his family. For this purpose he consulted scientists and progressive orchardists of the area and interacted with them, also gone through the literature available on the internet and elsewhere. He planted spur type varieties at lower spacing and started to adopt scientific techniques for orchard management practices. Today he is proud young progressive orchardist producing quality apples with high productivity by diversifying apple production system with introduction of new spur varieties in his orchards. The story has been written to popularize such kind of apple production models for increasing and sustaining the productivity in the state.

### 2. Methodology

Studies were conducted during 2012-13 to survey the apple orchards in Kotkhai area of Shimla district of Himachal Pradesh to collect the data on orchard management practices



being adopted by the orchardists and productivity status of the orchards in the area. While conducting the survey authors came into contact with Mr. Mohit Dharmaik in village Dhronk, who had managed his apple orchard very well in scientific manner and had a very good crop in his orchard. Authors collected information on land owned by the orchardist, varieties being grown, orchard management practices being adopted, labour and input cost, fruit production and total income from the orchard. On the basis of information collected cost benefit economics of the orchard was calculated and success story has been written.

### **3. Technologies Adopted and Being Used by the Young Progressive Orchardist**

#### *3.1. High density plantation and new spur varieties*

Orchardist has started planting spur type varieties viz., Red Chief, Oregon Spur-II, Super Chief, Ace spur, Scarlet Spur, Scarlet Spur- II and Schelect Spur Delicious in a block after 2005 onward at a spacing of 2.25×2.25 m accommodating 711 trees acre<sup>-1</sup>. Today he has a new block of these varieties in about 2.5 bigha (0.2 hectare) and harvesting about 400 boxes (20 kg each) from this block with a productivity of 40.0 tons ha<sup>-1</sup>. According to him, high density planting and new spur varieties not only increased his productivity but also improved the quality of produce which helped him in fetching higher prices up to INR 3000 box<sup>-1</sup>.

#### *3.2. Pollination management*

Old orchard planted with Royal Delicious variety was lacking in pollinizing varieties. Less than 10% pollinizers of two varieties Golden Delicious and Red Gold were planted in the orchard that too scattered in the orchard without proper planning. They were not putting any bee hives in their orchards and due to lack of pollinizers and pollinators, facing the problems of poor fruit set, higher fruit drop, lower yields and poor quality of harvested fruits.

In new apple block of Spur varieties, he has planted 33% pollinizers viz., Golden Spur, Gale Gala, Honey Crisp, Granny Smith and Red Fuji with a proper planning and layout. In old orchard of Royal Delicious also he increased the number of pollinizing trees by top working 1-2 branch or whole tree of main variety for improving pollination and fruit set. In addition to increasing the number of pollinizers, he regularly keeps bee hives during the flowering season in his both orchards after 2005 onwards.

Before 2005, in old orchard of Royal Delicious his family was harvesting annually about 2000-2200 boxes of apples from 1.8 hectares with a productivity of 22.5 ton ha<sup>-1</sup>. However, after improving the pollinizers and pollinators status, they are harvesting about 2200-2500 boxes annually from 1.5 hectares

with a productivity of 33.5 tons ha<sup>-1</sup>.

#### *3.3. Canopy management practices*

Earlier orchardist was inducing the upright growth in standard trees, which increased the vegetative growth of the trees and made them less fruitful. Other practice being adopted by him were hard pruning during on-year and light pruning during off-year which forced the trees towards biennial bearing. After interacting with the scientist, he adopted spindle bush system and vertical axis methods of training for his new spur varieties and forced his new as well as old trees for horizontal growth with a corrective pruning every year. This helped him harvesting regular crop of quality fruits.

#### *3.4. Rejuvenation and top working*

The orchardist has also rejuvenated his old trees by top working with new spur varieties three years back. He has rejuvenated 60 trees in a block of 2.5 bigha (0.2 hectare) and expecting crop in this block in the coming season of 2014.

#### *3.5. Orchard floor management or Moisture conservation and irrigation practices*

There is a direct relationship between input (fertilizers and water) use efficiency and orchard management practices like balanced fertilization, weed control, irrigation method and moisture conservation practices. The orchardist is adopting sod culture+clean cultivation system of orchard floor management allowing the grasses to grow for cattle's in the alley ways and keeping the basin area free of weeds by hoeing and use of mulching. He is covering the basin area with dry grass mulch for conservation of soil moisture, which also helping him in controlling weeds in basin area. For irrigating the orchard trees he has recently installed a sprinkler irrigation system which not only allows him to complete his orchard operations well in time in spite of drought spells but also improves the efficiency of his orchard inputs like fertilizers, pesticides and water.

#### *3.6. Soil testing, leaf analysis and fertilizer scheduling*

The orchardist is getting his soil and leaf samples analysed every year. He use to apply fertilizers or nutrients on the basis of soil tests and leaf analysis and prescriptions of the scientists on the basis of soil and leaf analysis. This helps him to maintain his soil pH and apply balanced nutrition as per the requirement of the plants. As a result of balanced fertilizers application he is able to maintain balance between vegetative growth and fruiting and harvesting quality crop.

#### *3.7. Proper protection measures against insect pest and diseases or balanced use of pesticides*

Mr. Dharmaik follows the spray schedule of the Department of Horticulture and Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, India with the guide lines of the local scientists for protecting his trees against insect pests and



Table 1: Economics of annual production of Spur type apple varieties of the selected farmer

Sl. No.	Activity	Unit and Cost (Acre <sup>-1</sup> )	Unit and Cost (Acre <sup>-1</sup> )	Cost(INR Hectare <sup>-1</sup> )
1	Labour	160 man days @ 200 per man day	32000	80000
2	Manures and fertilizers	350 quintals FYM @ INR 100 quintal <sup>-1</sup>	35000	87500
		CAN 35 bags @ INR 905 bag <sup>-1</sup>	31675	79187.5
		SSP 28 bags @ INR 495 bag <sup>-1</sup>	13860	34650
		MOP 17 bags @ INR 840 bag <sup>-1</sup>	14280	35700
		Boric acid 2 sprays (0.1%) = 4 kg @ INR 250 kg <sup>-1</sup>	1000	2500
		Micronutrient 1 spray (0.5%) = 10 kg @ INR 150 kg <sup>-1</sup>	1500	3750
		Calcium Chloride 3 sprays (0.5%) = 30 kg @ INR 150 kg <sup>-1</sup>	4500	11250
3	Pesticides and other chemicals	Copper oxychloride 1 spray = 6 kg @ INR 500 kg <sup>-1</sup>	3000	7500
		Chlorpyrifos 1 spray = 4 litre @ INR 500 litre <sup>-1</sup>	2000	5000
		Carbendazim 2 sprays = 2 kg @ INR 500 kg <sup>-1</sup>	1000	2500
		Mancozeb 1 spray = 5 kg @ 200 kg <sup>-1</sup>	1000	2500
		Difenoconazole 1 spray = 300 ml @ INR 1600 litre <sup>-1</sup>	480	1200
		Propineb 1 spray = 6 kg @ INR 370 kg <sup>-1</sup>	2220	5550
		Thiophanate Methyl 1 spray = 1 kg	1000	2500
		Horticultural Mineral Oils 1 spray = 40 litre	4800	12000
4	Packing material cost	800 boxes @ INR 70 box <sup>-1</sup>	56000	140000
5	Transportation charges	800 boxes @ INR 50 box <sup>-1</sup>	40000	100000
6	Total Input cost		245315	613287
7	Total Production	800 boxes (20 kg box <sup>-1</sup> )	1.6 tons	4 tons
8	Total income	800 boxes @ INR 2500 box <sup>-1</sup>	2000000	5000000
9	Input cost in % of total income		12.3	
10	Net income		1754685	4386713

diseases. Earlier they were applying 12-15 sprays in a season for protecting the trees from insect pests and diseases but now they are applying only 6-8 sprays that too using right chemical in right concentration at right time with the prescription of the scientists.

### 3.8. Use of growth regulators

The orchardist is also using some plant growth regulators for improving the quality of his produce especially promalin for improving the length to breadth ratio of the fruit. He is not using ethephone sprays for early development of colour in the fruits in his orchard.

### 3.9. Labour and input utilization per season

According to Mr. Dharmak a total of INR 613287 is incurred as cost of labour and inputs in one hectare. A total of 160 man days are required for different orchard operations viz., preparation of basins, application of fertilizers, pruning, mulching, spraying of various pesticides and other chemicals, harvesting of fruits and their grading as well as packing. This costs him INR 32000 @ rupees 200 per manday. Transportation charges are INR 40000 (INR 50 box<sup>-1</sup>). The cost of manures or fertilizers,

pesticides or chemicals and packaging material costs INR 173315. Thus, total cost of labour and inputs hectare<sup>-1</sup> for one season worked out to be INR 613287. The production from one hectare is 2000 boxes (4.0 tons) and average sale price is INR 2500 box<sup>-1</sup>. Thus, total returns from one hectare is INR 50,00,000. The input cost is about 12.3% of total income and net profit is INR 4386713 ha<sup>-1</sup>.

## 4. Conclusion

Today young proud orchardist is obtaining a productivity of 40.0 tons ha<sup>-1</sup> and earning about INR 40.0-45.0 lacs ha<sup>-1</sup> by diversifying his apple production system in a scientific way. The scientific approach and plantation of right and high yielding varieties as per the agro climatic conditions of the area is the key to success.

## 5. References

Directorate of Horticulture. 2013. Area and production under fruit crops, 2012-13. Directorate of Horticulture, Nav Bahar, Shimla, HP, India

