



Economic appraisal of Kinnow production in Sirsa district of Haryana

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ABSTRACT

An economic analysis of kinnow has been presented through studying their costs and returns. The present study was carried out during 2017–18 in Sirsa district of Haryana. A sample of 30 kinnow respondents was taken purposively from various villages in Mandi Dabwali block of Sirsa district of Haryana. The results of the study revealed that average first year establishment costs per hectare for kinnow has been worked out to be ₹127979. Whereas, per hectare per year returns from kinnow orchard have been worked out to be ₹272845. The economic viability of the kinnow fruit, mainly net present value, internal rate of return, benefit-cost ratio and payback period have been computed as ₹783243.67, (26.24%), 1:3.76 and 7 years, respectively. The findings of study revealed that kinnow growing is a step forwards the diversification and commercialization of agriculture in the state and it also helps in doubling the farmers' income. Keeping in view all the facts, there is need to develop early fruit bearing varieties of kinnow, timely supply of necessary inputs to make more profitable kinnow cultivation.

Keywords: Benefit-Cost Ratio, IRR, Kinnow, NPV, PBP, Returns

Fruit cultivation is a diversified agriculture activity significantly generating employment throughout the year enhances farm economy and also earns foreign exchange by enhancing export (Parkash 2000). Fruits are essential for human diet as main source of nutrition, indirect diversity, ecological sustainability and fight against hunger (Kumar *et al.* 2016). Citrus is one of the most relevant fruit crops grown across the globe and has a tremendous social, cultural and economic influence on our society (Vijaya *et al.* 2017). India being the home of many citrus fruits, and their cultivated area is spread more than 0.953 million hectares with the production of 11.66 million tonnes (Vijaya *et al.* 2017). Along with citrus cluster, kinnow fruit occupies a distinctive position in fruit industry of India (Parkash 2000). Kinnow has large globular in shape and orange in color, is a hybrid of two citrus cultivars-kings and yellow leaf, thus, its uniqueness is assortment between mandarin fruit and sweet orange with neither tight nor loose skin (Goyal *et al.* 2012). It was developed by Dr. H.B. Frost in the year 1915 at citrus research centre, university of California, U.S.A. and Prof. Dr. J. C. Bakhshi PAU (Punjab Agricultural, university) brought it into India at Regional Fruits Research Centre, Abohar (Gill and Mahindra 2010). The cultivated area under kinnow fruit

is being stretched from arid and semi-arid regions due to its growing demand in domestic and international consumer markets (Vijaya *et al.* 2017). The commercial values of kinnow fruit in terms of direct consumption, processing and trade have risen continuously in recent years. Now, it is commercially cultivated in Punjab, Haryana, north-western parts of Rajasthan and Uttar Pradesh of India. Haryana is a progressive agricultural state, has only (1.4%) cultivatable geographical areas of India. Haryana has 13th rank in citrus fruit production (Kumar 2011). In the year 2017–18, citrus was grown on 1003 thousand hectare and 19931 hectare area with the production of 12546 thousand MT and 470390 MT in India and Haryana (Anonymous 2017-18).

MATERIALS AND METHODS

The present experiment was conducted during 2017-18 in Sirsa district of Haryana. Multistage stratified sampling technique was adopted to select the ultimate unit of sample. Out of 22 districts of Haryana state, Sirsa district was selected, on the basis of highest production of total citrus. A sample of 30 kinnow respondents was taken purposively from various villages in Mandi Dabwali block of Sirsa District of Haryana. Primary data pertaining to the year 2017-18 were collected from selected respondents by conducting personal interviews with help of specifically designed schedule.

Amortization of fixed cost: The annual amortization of cost was computed from the investment made on establishment of kinnow fruits, assuming the rate of interest 12% per annum and the expected life 25 years for kinnow. Thus, annual amortization was worked out by using the

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compounding cost formula and by adding it to maintenance cost for estimating the annual cost of cultivation of kinnow fruits of respective farmers (Kumar *et al.* 2019).

Economic viability: To examine the economic feasibility of orchard while studying the economics of kinnow cultivation, four indicators were used, viz. net present value (NPV), internal rate of return (IRR), cost benefit ratio and payback period (Kumar *et al.* 2019)

RESULTS AND DISCUSSION

Establishment cost of kinnow orchard: The results indicated that the average total cost of establishment of kinnow orchard in Sirsa district was ₹ 127979 per hectare. The highest cost item of expenditure was incurred on construction of pond which was worked out to be ₹ 46585 per hectare, that constitute (36.40%) followed by drip irrigation ₹ 24683 per hectare, contributing (19.29%), permanent fencing ₹ 11418, which constituted (8.92%), preparation of land and layout which was worked out to be ₹ 7142 per hectare, constituting (5.58%) to total establishment cost, cost of plant ₹ 6875, contributing (5.37%) of total establishment cost. Cost of equipment accounted only (4.73%) of overall average establishments cost. In case of kinnow plantation ₹ 12002 per hectare subsidy was given by government under National Horticulture Mission (NHM) scheme to increase the area under kinnow cultivation in the state.

Operational cost of kinnow orchard: The operations in an orchard do not come to an end at its establishment only but they have to be carried on throughout its life span. The expenses on various operations like manure and fertilizer, plant protection, pruning and cutting, intercultural and hoeing, irrigation, replacement, watch and ward, picking cost and miscellaneous to be incurred every year.

It is obvious from the data that the operating costs per hectare increased over years because of higher expenses incurred on various inputs and rise in picking cost. This increase may be attributed to the Data shows annual operating cost ranges from ₹ 29698 in the first year to ₹ 89076 per hectare in the seventh year (Table 1). The average operational cost goes on increasing up to seventh year of the establishment of an orchard and thereafter it becomes more or less stabilized. The average operational cost from first to seventh years were found to be ₹ 13743.71 on plant protection (22.48%), ₹ 8373.00 on picking (13.70%), ₹ 7470.14 on intercultural and hoeing (12.22%), ₹ 7236.14 on pruning and cutting (11.84%), ₹ 7118.14 on watch and ward (11.65%), ₹ 7049.00 on irrigation (11.53%) and ₹ 5088.71 on manure and fertilizer (8.33%), in kinnow cultivation annually, respectively.

Cost and returns from kinnow orchard: The cost and returns from kinnow orchards depends upon the age of plants. No fruiting till three years of kinnow plantation there after the production of fruits starts increasing steadily from nearly 38 quintals in fourth year to about 318 quintals in seventh year of orchard age (Table 1). However, after the age of seventh year it remains almost static with advance in age of the plants. Hence, the gross returns per hectare

from kinnow orchard increase up to seventh year age of the plants. The gross returns per hectare worked out to be ₹ 453150 in the seventh year that was full bearing stage. This rate of return was expected to be more or less same up to age of 25 years. Taking into account the rental value of land, amortized fixed cost, operational cost, expected depreciation on fixed investment and interest on operational cost, the net returns per hectare have been worked out over time. The net returns from inter cropping ranges from ₹ 29213-18932 per hectare during the first year to fifth year of the kinnow orchard. Even after taking the returns from intercropping in the orchard the orchardist has to bear a loss of ₹ 72924, ₹ 86666, ₹ 99730, ₹ 78036 and ₹ 50371 per hectare in first, second, third, fourth and fifth year, respectively.

These conclusions are in agreement with the observations of Kumar *et al.* (2017) who reported that the average first year establishment costs per hectare for kinnow was ₹ 399466. The overall per hectare per year returns from kinnow orchards was ₹ 125478. During the sixth year the net returns become positive and worked out to be ₹ 95591 per hectare. The net returns increase up to seventh year i.e. ₹ 272845 per hectare and after that it becomes more or less stable up to the age of 25 years. It was indicated from the table that during the first five year the return from kinnow orchard available were found to be negative and the positive returns started from the sixth year and onwards. These conclusions are in agreement with the observations of Kumar *et al.* (2017) who reported that the average first year establishment costs per hectare for kinnow was ₹ 399466. The overall per hectare per year returns from kinnow orchards was ₹ 125478.

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Economic viability of kinnow orchard: To examine the economic feasibility of kinnow orchard, four indicators were used, viz. net present value (NPV) and internal rate of returns (IRR), benefit-cost ratio and payback period which are discussed as below:

Net present value (NPV) of kinnow orchard: Cost and returns data do not serve as true guide for making preference to go for kinnow orchard than any other annual crops. This was mainly because of the fact that costs incurred and returns obtained from kinnow orchard over time was not comparable with annual crops grown in the area. Returns from annual crops can be obtained within same season, while minimum three to four years period must be lapse after planting before any returns can be obtained over operational cost from kinnow orchards. Hence, it dire requires to estimate the net present value of future returns which can be determined by discounting both the costs as well as returns at the prevailing rate of interest. In the present study the prevailing interest

Table 1 Cost and return from kinnow orchard in Sirsa district of Haryana (₹/hectare)

Particular	Years						
	1	2	3	4	5	6	7
Rental value of land	47439	48808	49690	50923	53413	56437	59105
Amortized fixed cost	16317	16317	16317	16317	16317	16317	16317
Operational cost	29698	38943	47783	61414	75263	85701	89076
Expected depreciation on fixed cost investment @4%	5119	5118	5118	5118	5118	5118	5118
Interest on operational cost @12% PA	3564	4673	5734	7370	9032	10284	10689
Total cost (1 to 5)	102137	113859	124642	141142	159143	173857	180305
Production (qtls)	-	-	-	38	80	218	318
Price (₹/qtls)	-	-	-	1027	1123	1236	1425
Gross returns#	-	-	-	39026	89840	269448	453150
Net returns	-102137	-113859	-124642	-102116	-69303	95591	272845
Return from inter cropping	29213	27193	24912	24080	18932	-	-
Total net returns	-72924	-86666	-99730	-78036	-50371	95591	272845

Gross return has been worked out by taking average price (₹1425 per quintal) received by farmers during peak marketing season of the current period in Sirsa market.

rate at (12%) per annum taken as discount rate of the cost and returns to determine NPV of the kinnow orchard. The data shows that net present values (NPVs) for one hectare kinnow orchard came to be ₹ 783243.67 for the entire life (25 years) of the kinnow orchard. The positive NPV of kinnow cultivation indicated that it is a profitable crop enterprise in the Sirsa district of the state.

Internal rate of return (IRR) of kinnow orchard: In estimating the internal rate of return, the investment costs, gross returns from first to seventh year and the life of kinnow orchard have been depicted in Tables 2. The net cash flow was obtained by using these single values which may have negative and positive signs depending on the quantum of costs and benefits or returns in each year. To find out the present value, the discounted rate was estimated by different

discount rate at random until the difference between the sum of discounted streams of positive and negative values was reduced either to zero or to a lowest minimum value. The data indicates a very high internal rate of return of 26.24% per annum. This indicates that investment on kinnow orchards is highly profitable and internal rate of return is more than the present market interest rate i.e. (12%) per annum.

Benefit-Cost ratio of kinnow orchard: At discount rate of (12%), on an average the benefit cost ratio obtained was equal to 1:3.76. It indicates that at the existing rate of interest of (12%) per annum on investment of ₹ 1.00 would fetch a return of ₹ 3.76. Since this ratio was greater than unity, it showed that the investment in kinnow orchard is economically viable. The findings are in collaboration with results reported by Yogi *et al.* (2019).

Table 2 Per hectare net present value and internal rate of return of kinnow orchard in Sirsa district of Haryana

Year	Negative returns (₹)	Positive returns (₹)	Discount coefficient $1/(1+r)^n$	Present value (r=12%)		Internal rate of return (₹/hectare)				
				Negative returns (₹)	Positive returns (₹)	Net cash flow	Present value coefficient $r=26\% (1/(1+r)^n)$	Corresponding present value (₹)	Present value coefficient $r=27\% (1/(1+r)^n)$	Corresponding present value (₹)
1.	-72924	-	0.8929	-65110.64	-	-72924	0.7937	-57876.13	0.8333	-60769.93
2.	-86666	-	0.7972	-69089.73	-	-86666	0.6299	-54589.42	0.6944	-60184.83
3.	-99730	-	0.7118	-70985.82	-	-99730	0.4999	-49855.61	0.5787	-57714.10
4.	-78036	-	0.6355	-49593.09	-	-78036	0.3968	-30960.72	0.4823	-37632.95
5.	-50371	-	0.5674	-28581.61	-	-50371	0.3149	-15860.76	0.4019	-20242.80
6.	-	95591	0.5066	-	48429.31	95591	0.2499	23888.74	0.3349	32013.19
7.(and onward up to 25 years)	-	272845	3.7317	-	1018175.24	272845	0.9493	259011.64	1.6221	442581.68
Total	-387727	368436	-	-283360.88	1066604.55	-	-	73757.75	-	238050.26

Net present value (NPV) = $1066604.55 - 283360.88 = 783243.67$

IRR = $26 + 1 (73757.75) / (73757.75 + 238050.26) = 26 + 0.24 = 26.24\%$

Payback period of kinnow orchard: The net cost incurred during the first five years of the kinnow plantation was ₹ 387727 per hectare. These costs are more than the return of ₹ 368436 per hectare. These costs are fully recovered in seventh year of establishment of kinnow plantation. Thus, the payback period of investment of kinnow orchard is seven years. Similar outcomes were also found by Kumar *et al.* (2017) who elucidated that overall economic viability of the kinnow fruit, mainly net present value, internal rate of return, benefit-cost ratio and payback period were ₹ 261258, (15.57%), 2.19 and 7.6 years, respectively.

In the light of above discussion, it may be said that although the initial investment in kinnow orchard establishment is very high yet it is an economically viable enterprise. Per hectare establishment cost of kinnow orchard was estimated ₹ 127979. The total cost varied from ₹ 102137 per hectare in the first year to ₹ 180305 per hectare in seventh year. Average per year net return for the sample as a whole was ₹ 272845 among the different age groups of kinnow orchard. The economic viability of the kinnow fruit, mainly net present value, internal rate of return, benefit-cost ratio and payback period have been computed as ₹ 783243.67, (26.24%), 1:3.76 and 7 years, respectively. The orchards indicating that kinnow cultivation was a profitable enterprise. It has a vital potential in increasing the income and gainful employment of family community. Kinnow growing is a step towards the diversification and commercialization of agriculture in the Haryana state. Keeping in view the findings of the present study it is suggested that the kinnow fruit growers to make profitable enterprises by taking these steps. The early fruit bearing varieties should be developed to make kinnow fruit profitable. Quality planting material suited to the area should be provided to the farmers. Insurance of kinnow orchard should be encouraged at lower insurance premium to minimize the risk due to natural hazards. The government should make adequate arrangement for timely supply of necessary inputs at reasonable prices to the growers so as to increase per hectare productivity as well as net returns.

REFERENCES

- Anonymous. 2017. Revised area and production of fruit crops of Haryana for the year 2005-06 to 2017-18. *Directorate of Horticulture*, Panchkula, Haryana.
- Gill S M and M K. 2010. Package of practices for cultivation of fruits. *Horticulture officers' workshop report*, Punjab Agricultural University Ludhiana.
- Goyal P, Goyal M and Singh A. 2012. Marketing practices of kinnow framers in Punjab. *International Research Journal of Agriculture Economics and Statistics* 3(2): 249–52.
- Kumar N, Duhan A, Bhatia J and Malik V. 2017. Economic appraisal of kinnow production and its marketing in Sirsa District of Haryana, India. *International Journal of Current Microbiology and Applied Sciences* 6(11): 4045–53.
- Kumar P, Shehrawat P S, Rohila K A, Ghanghas B S and Kumar A. 2016. Constraints faced by farmers of Haryana state in adoption of Masumbi cultivation. *Journal of Applied and Natural Science* 8(2): 785–89.
- Kumar R, Kumar N, Dhillon A, Bishnoi D K, Kavita and Malik A K. 2019. Economic analysis of guava (*Psidium guajava* L.) in Sonapat District of Haryana. *Economic Affairs* 64(4): 747–52.
- Kumar R, Rathee A K, Kumar N and Luhach V P. 2019. Economic appraisal of mango production in Yamunanagar District of Haryana, India. *Journal of Pharmacognosy and Phytochemistry* 8(2): 1298–1302.
- Kumar R. 2011. 'Problems and prospectus of kinnow production under drip irrigation system in Haryana'. *M.Sc. Thesis*, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana.
- Parakash O. 2000. 'Nutritional studies in kinnow mandarin'. *Ph.D. Thesis*, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana.
- Vijaya H M, Godara R K, Shashank S and Sharma N. 2017. Effect of exogenous application of micronutrients on growth and yield of kinnow mandarin under semi-arid zone of Haryana. *Journal of Pharmacognosy and Phytochemistry* 6(4): 733–35.
- Yogi V, Kumar P, Prakash P, Kar A, Singh D R, Singh R, Arya P and Awasthi O P. 2019. An economic evaluation of kinnow cultivation in north western India. *Indian Journal of Agricultural Sciences* 89(10): 1684–87.