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ECONOMICAL VIABILITY OF LEMON CULTIVATION IN DINDIGUL DISTRICT

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Abstract
The capital productivity analysis indicated that paypack period is less than 8 years in all size of farms when cut off year is 10, net present value is positive and acceptable in all sizes and Internal Rate of Return is less than 26% where cut off rate is 10% in all cases. Hence, it is inferred that Lemon cultivation is economically viable in Dindigul District of Tamil Nadu, India.

Key Words: Capital Productivity, Payback Period, Net Present Value, Internal Rate of Return.

Introduction

A large variety of fruits are grown in India, and among them mango, banana, citrus, guava, grape, pineapple and apple had been the major ones. Fruits and vegetables are rich sources of vitamins, minerals, proteins and carbohydrates, which are essential for human nutrition. India produced 40 per cent of the tropical fruits, against Asia's production of 90 per cent. The Total production and area of fruits had been estimated at 43.1 Million Tonnes and 4.01 Million Hectares respectively, which had accounted for 10 per cent of the Total world's production of fruits which was Second only to that of Brazil. According to a report of the World Health Organisation (WHO) the low fruit intake had been estimated to cause about 31 per cent of the number of heart diseases and of 11 per cent of stroke in the World. The emphasis on Horticulture was a recognition of the need for attaining nutritional security and for earning a sustainable income. Healthier diets improve the learning capacity of the children and the working capacity of the adults, leading to higher incomes and a reduction in poverty levels. Citrus is the world's leading tree – fruit crop. It is a crop adaptable to wide range of soils, terrain, planting and cultural arrangements, and over 100 nations reported citrus production in the world. The area and production have increased many fold in the past 30 years, particularly in Japan, Brazil, Israel, Turkey and Cuba. Although domestic consumption is the principal market for citrus fruit, the major citrus producing countries, like Spain, USA, Israel, Morocco and South Africa export a sizeable amount of fresh fruits to the world market, in particular to Europen Economic Community, Russia, Canada, Saudi Arabia, Kuwait and Hong kong. Citrus plantations in Israel occupy more than 40,000 hectares and 80 per cent of Israel's agricultural export value lies on citrus. In Cuba the planting is about 1,50,000 hectare, though grapefruit is mainly under cultivation. In Japan, citrus occupies the first place among fruit crops, covering nearly more than 50 per cent of the total areas under fruit crops and 2.8 per cent of the total area under Natsudaidai. Citrus occupies about 9 per cent of the total land under various fruits in India. The most important commercial citrus in India is the mandarin orange followed by the sweet oranges and acid limes

Statement of Problem

India stands first in the production of Lemon. Since the citric acid content in Indian Lemon is high it receives resounding reception in modern cuisine both of indigenous and continental. As the fruit has medicinal and nutritional value it finds a respectable place in many kinds of beverages all over the world. In India, Tamil Nadu occupies sixth place both under area of cultivation and production of Lemon. From the horticultural stand point of view, Dindigul District had numerous special features of which, the first and the foremost one was the prevalence of three distinct climates, namely the temperate, the sub-tropical and the tropical climates. No other districts in the Tamil Nadu State had such unique agro climatic zones. Accordingly, the Dindigul District had been selected as it stood first in the cultivation of lemon with an average area of 1229 Hectares during the year 2009-2010 in Tamil Nadu. Dindigul district has 27.499 hectares of fruit producing area with 380658 tonnes of fruit production. The average productivity in the District is estimated to be 13.84 tonnes per hectares. The district has been famous for Guava, Jack fruit, Pear, Plums and Lemon. Due to the prevalence of red and black soil and moderate climatic conditions the district is known for different varieties of fruits of which lemon is widely grown by number of farmers. The Nilakotai, Ottachandram and Batalgundu fruit markets located in the district drawn hundreds and thousands of wholesale fruit vendors. The farmers are motivated to grow more and more fruits including Lemon. Lemon is a tree fruit which gives substantial revenue to the farmers in addition to providing large scale employment directly and indirectly to the people. Through the fruit is being cultivated in the natural way from time immemorial, the growing awareness among various utilities of lemon fruits and the presence of important fruit markets in the district and the economic factors of production and marketing of lemon create growing enthusiasm among prospective fruit cultivators of the district. As there is no detailed study made so fare on production and marketing of lemon in Dindigul District of Tamil Nadu, the researcher felt that it is pertinent to have on exploratory study of cultivation pattern and marketing practices certainly help the policy makers to frame suitable policies which ultimately will result in the overall economic development of the region, hence the present study.

Review of Literature

Mohan in his study entitled, "Production, Marketing and Price Behaviour of Pepper in Vazhoor Block of Kerala State", had classified cost of production into direct costs and indirect costs. Indirect cost consisted of the annual share of the establishment cost, interest on fixed and working capital and the depreciation in the values of the fixed assets. The Direct costs had included the annual maintenance and operation costs, the repairing charges, the land revenue and such other charges.

Madalia and Kukadia in their study entitled "Costs and Returns in Vegetable Cultivation", had found that the variable costs alone had accounted for 96 per cent and the fixed costs had accounted for only four per cent of the Total costs. Among the various inputs, human labour had accounted for a substantial proportion of the expenditure. They had observed that the plant protection chemicals, fertilizers and the expenses on irrigation had also been the important items in the cost structure.

Ravindran in his study entitled "Export and Domestic Trade of Turmeric in Tamil Nadu", had studied the price spread for Turmeric and had found that the marketing margin of the wholesaler, the secondary wholesaler cum processor and the retailer had been respectively 4.74 per cent, 5.98 per cent and 30.06 per cent of the consumer's price. He had also identified that the market structure of Turmeric had exhibited a sort of group monopoly.

Objectives

The main objective of the study is to analyse the capital productivity in marginal, small and medium size lemon farms.

Methodology

The Dindigul District comprised of 7 taluks. Lemon is mainly cultivated in Ottanchathiram and Natham taluks while in Kodaikanal, Nilakottai and Dindigul taluks Lemon is cultivated here and there and in negligible proportions. In Vedasandhur and Palani taluks Lemon is not at all grown. Hence the selection of the sample villages had been restricted to the two taluks only. According to the reports of NABARD any sample size between 300 and 500 is suitable for studying the issues related to agricultural farming, particularly about the fruit crops. Hence in consultation with the Officials of the Horticultural Department and the experts in the fields of Food and Fruit crops the researcher had decided to select 400 Lemon cultivators; 200 each from the respective two taluks of Oddanchathiram and Natham. The chosen cultivators were then classified into marginal farmers and small farmers based on their land holdings. Accordingly 107 marginal and 92 small farmers from Oddanchatram taluk and103 marginal and 98 small farmers from Natham taluk making a total of 400 Lemon farmers had formed part of the sample size. Primary data were collected from Lemon growers and merchant middle men. The survey was undertaken during the period of July 2013 to March 2014.

Tools for Analysis

In the present study the following capital budgeting techniques[1] are used to measure the economic worth of the investments in Lemon production.

Pay–Back Period

It measures the number of years required to recover the original cash outlay invested in the project. The maximum acceptable pay–back period is fixed by taking into account the reciprocal of the cost of capital. This can be termed as the cut-off point. Generally a project having a pay–back period more than cut–off point is not entertained.

Net Present Value

The Net present value is found by subtracting the present value of costs from the present value of returns. A project whose net present value is greater or equal to zero is considered a worthy investment.

Net present Value = Present Value of Returns – Present Value of Costs.

Symbolically,

$$NPV = \sum_{t-t}^{n} \frac{B_1 - C_1}{(1+i)^t}$$

Where, the symbols used are the same as in the case of the benefit–cost ratio.

Internal Rate of Return

The Internal Rate of Returns is the rate of discount at which NPV is zero. If the IRR exceeds the cut–off rate (opportunity cost of capital) the investment is economically viable.

Symbolically,

$$NPV = \sum_{t-t}^{n} \frac{B_1 - C_1}{(1+i)^t}$$

The National Bank for Agriculture and Rural Development (NABARD) considers an agricultural project which yields a return of 15 per cent and above as economically viable project. But in this study the required rate of return is taken as 10 per cent.

Results and Discussions

Capital Productivity Analysis

Lemon being a perennial crop, the commercial production starts from the sixth year onwards. So, considerable investments are made over several years before the crop starts to yield. Moreover, the benefits are realized as a stream over a long period of time. Therefore, it is necessary to learn the present value of the expected future income to justify the investment made. A sound appraisal technique should be used to measure the economic worth of the investment in Lemon gardens.

To compute the payback period, the net present value, and the internal rate of return for Lemon cultivation and incremental benefits were calculated and the results are presented in Table 1, 2 and 3 for marginal, small and medium farmers respectively.

Table 1: Computation of Incremental Benefits in Lemon Cultivation by the Marginal Farmers

Age (in years)	Cost Rs./acre	Revenue Rs./acre	Rate 15%	Rate 10%	P V Cost Rs./acre	PV Revenue Rs./acre	Incremental Benefit
1	44873.06	0	0.87	0.909	40789.61	0	-44873.06
2	9145.07	0	0.756	0.826	7553.828	0	-9145.07
3	9245.07	0	0.658	0.751	6943.048	0	-9245.07
4	9295.04	7694.4	0.572	0.683	6348.526	5255.2752	-1600.66
5	10323.44	11541.6	0.497	0.621	6410.856	7167.3336	1218.16
6	19495.75	30777.6	0.432	0.565	11015.1	17389.344	11281.85
7	21895.25	50013.6	0.376	0.513	11232.26	25656.9768	28118.35
8	23740.25	57708	0.327	0.467	11086.7	26949.636	33967.75
9	25080.54	61555.2	0.284	0.424	10634.15	26099.4048	36474.66
10	26880.54	730696.8	0.247	0.386	10375.89	28215.3648	46216.26
11	34730.54	73096.8	0.215	0.351	12190.42	25656.9768	38366.26
12	26361.75	69249.6	0.187	0.319	8409.398	22090.6224	42887.85
13	26686.75	65402.4	0.163	0.290	7739.158	18966.696	38715.65
14	26711.75	65402.4	0.141	0.263	7025.19	17200.8312	38690.65
15	28655.57	61552.2	0.123	0.239	6848.681	14711.6928	32899.63
16	27245.57	61555.2	0.107	0.218	5939.534	13419.0336	34309.63
17	27655.57	57708	0.093	0.198	5475.803	11426.184	30052.43
18	27455.67	53860.8	0.081	0.180	4942.021	9694.944	26405.13
19	26155.56	46166.4	0.070	0.164	4289.512	7571.2896	20010.84
20	36805.56	46166.4	0.061	0.149	5484.028	6878.7936	9360.84
25	23655.69	30777.6	0.053	0.135	3193.518	5154.976	7121.91
30	23005.58	26930.4	0.0462	0.123	2829.686	3312.4392	3924.82

Source: Computed data

Table 2: Computation of Incremental Benefits in Lemon Cultivation by the Small Farmers

Age (in years)	Cost Rs./acre	Revenue Rs./acre	Rate 10%	P V Cost Rs./acre	PV Revenue Rs./acre	Incremental Benefit
1	52875.97	0	0.909	48064.26	0	-52875.97
2	7709.28	0	0.826	6367.865	0	-7709.28
3	7909.28	0	0.751	5939.869	0	-7909.28
4	8009.29	7015.68	0.683	5470.345	4791.709	-993.61
5	9042.51	21047.04	0.621	5615.399	13070.21	12004.53
6	30515.75	45601.92	0.565	17241.4	25765.08	15086.17

7	32590.75	63141.12	0.513	16719.05	32391.39	30550.37
8	33590.75	70156.8	0.467	15686.88	32763.23	36566.05
9	34715.75	70156.8	0.424	14719.48	29746.48	35441.05
10	37906.52	77172.48	0.386	14631.92	29788.58	39265.96
11	51706.55	80680.32	0.351	18149	28318.79	28973.77
12	38730.97	84188.16	0.319	12355.18	26856.02	45457.19
13	39280.44	91203.84	0.290	11391.33	26449.11	51923.40
14	39380.44	91203.84	0.263	10357.06	23986.61	51823.40
15	41556.21	98219.52	0.239	9931.934	23474.47	56663.31
16	40755.00	91203.84	0.218	8884.59	19882.44	50448.84
17	40855.00	77172.48	0.198	8089.29	15280.15	36317.48
18	40605.00	70156.8	0.180	7308.9	12628.22	29551.80
19	38405.00	66648.96	0.164	6298.42	10930.43	28243.96
20	50805.56	63141.12	0.149	7570.028	9408.027	12335.56
25	34255.98	42094.08	0.135	4624.557	5682.701	7838.10
30	32455.57	35078.4	0.123	3992.035	4314.643	2622.83

Source**:** Computed data

Table 3: Computation of Incremental Benefits in Lemon Cultivation by the Medium Farmers

Age (in years)	Cost Rs./acre	Revenue Rs./acre	Rate 10%	P V Cost Rs./acre	PV Revenue Rs./acre	Incremental Benefit
1	36865.15	0	0.909	33510.42	0	-36865.15
2	10947.97	0	0.826	9043.023	0	-10947.97
3	11147.85	0	0.751	8372.035	0	-11147.85
4	11447.87	10108.62	0.683	7818.895	6904.187	-1339.25
5	12186.31	26956.32	0.621	7567.699	16739.87	14770.01
6	11780.88	26956.32	0.565	6656.197	15230.32	15175.44
7	12218.56	37064.94	0.513	6268.121	19014.31	24846.38
8	12368.33	40434.48	0.467	5776.01	18882.9	28066.15
9	12769.02	47173.56	0.424	5414.064	20001.59	34404.54
10	14216.66	50543.1	0.386	5487.631	19509.64	36326.44
11	21466.30	57282.18	0.351	7534.671	20106.05	35815.88
12	13855.06	67390.8	0.319	4419.764	21497.67	53535.74
13	14330.82	70760.34	0.290	4155.938	20520.5	56429.52
14	14562.32	70760.34	0.263	3829.89	18609.97	56198.02
15	15523.22	74129.88	0.239	3710.05	17717.04	58606.66
16	14897.46	70760.34	0.218	3247.646	15425.75	55862.88
17	14856.25	67390.8	0.198	2941.538	13343.38	52534.55
18	14856.03	60651.72	0.180	2674.085	10917.31	45795.69
19	14705.97	57282.18	0.164	2411.779	9394.278	42576.21
20	24006.48	47173.56	0.149	3576.966	7028.86	23167.08
25	13705.61	23586.78	0.135	1850.257	3184.215	9881.17
30	12306.03	16847.7	0.123	1513.642	2072.267	4541.67

Source: Computed data

Pay Back Period

The Pay–Back period for Lemon cultivation is furnished in Table 4.

Table 4: Capital Productivity Analysis for Lemon Cultivation Pay Back Period Method

S. No	Type of Farmer	Pay Back Period	Cut-Off Years	Decision
1.	Marginal Farmers	7.71 years	10	Acceptable
2.	Small Farmers	7.32 years	10	Acceptable
3.	Medium Farmers	7.19 years	10	Acceptable

Source: Computed data

The pay–back period computed on the basis of undiscounted cumulative value for the investment made in Lemon cultivation by marginal farmers was 7.71 years indicating that the growers can recover the initial investment made in Lemon gardens in 7.71 years. The cut-off years at 10 per cent cost of capital is 10 years. The calculated pay-back period is less than the cut–off years. Hence it may be concluded that the investment in Lemon cultivation is viable for marginal farmers.

The pay–back period for small farmers was 7.32 years indicating that the growers can recover the initial investment made in Lemon gardens in 7.32 years. The cut-off years at 10 per cent cost of capital is 10 years. The calculated pay-back period is less than the cut–off years. Hence it may be concluded that the investment in Lemon cultivation is viable for small farmers also.

The pay–back period for medium farmers was 7.19 years indicating that the growers can recover the initial investment made in Lemon gardens in 7.19 years. The cut–off years at 10 per cent cost of capital is 10 years. The calculated pay-back period is less than the cut-off years. Hence it may be concluded that the investment in Lemon cultivation is viable for medium farmers too.

Net Present Value

It is the most valid technique of evaluating an investment project. It is generally consistent with the objective of maximizing wealth. The net present value of Lemon production was computed on the basis of estimates and the results are presented in Table 5.

Table 5: Capital Productivity Analysis for Lemon Cultivation Net Present Value Method

S. No	Type of Farmer	Net Present Value	Nature of Net Present Value	Decision
1.	Marginal Farmers	94957.44	Positive	Acceptable
2.	Small Farmers	116106.55	Positive	Acceptable
3.	Medium Farmers	138196.55	Positive	Acceptable

Source: Computed data

As far as the marginal farmers are concerned, it is found from Table 5.15 that the net present value was ₹ 94957.44 at 10 per cent discount rate. Since the net present value is positive and large it is inferred that there is a scope to generate more wealth in case of marginal Lemon farms.

As far as the small farmers are concerned the net present value was ₹ 116106.55 at 10 per cent discount rate. Since the net present value is positive and large it is inferred that there is a scope to generate more wealth in small Lemon farms also.

In case of the medium farmers, it is found from Table 5 that the net present value was ₹ 138196.55. Since the net present value is positive and large it is inferred that there is a scope to generate more wealth in case of medium Lemon farms too. Overall it is concluded that investment in Lemon cultivation is economically beneficial irrespective of size of land holding in the study area.

Internal Rate of Return

The Internal Rate of Return for Lemon cultivation is furnished in Table 6.

Table 6: Capital Productivity Analysis for Lemon Cultivation Internal Rate of Return Method

S. No	Type of Farmer	Internal Rate of Return	Cut- Off Rate	Decision
1.	Marginal Farmers	22 %	10 %	Acceptable
2.	Small Farmers	23 %	10 %	Acceptable
3.	Medium Farmers	26 %	10 %	Acceptable

Source: Computed data.

The computed value of the internal rate of return was 22 per cent for the marginal farmers, 23 per cent for small farmers and 26 per cent for medium farmers when compared to the opportunity cost of the capital (cut-off rate) which was taken as 10 per cent, the rate of return on investment made in Lemon cultivation is very high in all the three types of land holdings. It indicates the economic viability of investment in Lemon cultivation in the study area.

Conclusion

From the capital productivity analysis, paypack period is less than 8 years in all size of farms when cut off year is 10, net present value is positive and acceptable in all sizes and Internal Rate of Return is less than 26% where cut off rate is 10% in all cases. Hence, it is inferred that Lemon cultivation is economically viable in the study area.

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