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ECONOMIC FEASIBILITY OF NUTMEG CULTIVATION IN KERALA

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Abstract

Nutmeg is a major tree spice of Kerala. The wet tropical weather of the state is ideally suited to its growth. The tree is important for two spices derived from the fruit, nutmeg and mace. Both nutmeg and mace are currently among the most expensive spices, which are in high demand both domestically and internationally. Actually, it is without even meeting the domestic demand to the full that the country exports around 21 per cent of the output. The exports have also increased by 70 per cent in the past decade, due to their high prices prevailing in the international markets. So, increasing the area and production of the crop will definitely serve as means of gaining the much valued foreign exchange earnings and also saving it by reducing imports.

Keywords:nutmeg and mace,foreign exchange ,international markets

Introduction

The Nutmeg tree comes from the seed of the *Myristicafrangans family,* a tall evergreen species abundant in the Western Ghats. It is easily adaptable in Kerala and ecologically helpful to the environment. The twin spices from this tree are internationally acclaimed as they promote international trade. In comparison to other tree spices, cultivation of nutmeg is considered to be eco-friendly, labor friendly and economically viable. Muttaqin H.M. (2019) observed the financial feasibility of nutmeg cultivation in Indonesia with the application of Integrated Pest Management Technology (IPM). In this study, he indicated that the yield of nutmeg was low due to pests and disease. The calculated NPV, Net B/C Ratio, IRR, and Payback Period to assess the financial feasibility with IPM technology. The results of this study showed a Net B/C Ratio of 4.43, IRR of 17.97%, and Payback Period (PP) 12.19. Therefore IPM technology is viable and profitable for nutmeg cultivation.

Ganga Devi and KS Jadav (2018) made a performance study in area, production, productivity and export of spices in India. Their study indicated that the seed spice crops recorded positive and significantly high growth with low instability in production and productivity. These are indeed essential prerequisites for sustainable agricultural performance of any crop. The export performance of spices in terms of value earned also found a positive growth rate in their study. Hence their suggestion was to make efforts to adopt advanced processing technology to improve the quality of spices crops in the country to boost their exports. They recommended the establishment of a spice park to serve this purpose. Such policies of institutionalization will further enhance the competitiveness of Indian seed spices in the international market.

India today accounts for more than 11 percent of the world output in nutmeg. Ninety six per cent of its total production comes from the state of Kerala. The area of nutmeg plantation in India in the year 2020-21 comes to 22512 hectares, which produces 14342 million tonnes with a yield of 637.08 per hectare (Spices Board 2021). By exporting a quantity of 3280 million tonnes of nutmeg and mace, the country could bring in foreign exchange earnings worth US$ 24.82 million, in 2019. The area cultivated got extended to other states of India, especially Tamil Nadu and Karnataka, maybe because of the sudden rise in the price during 1998-99 . In the subsequent years, a gigantic breakthrough in nutmeg cultivation occurred in these states and in Kerala, as the farmers were so attracted to it. However, though the rise in the area of cultivation and production of nutmeg helped increase its export from India, it

was not sufficient to meet the growing demand. Such increased demand for nutmeg and the potential for high export earnings from its production has prompted the nutmeg farmers in India to go for the commercialized production of the crop. Apart from this, they do not have to spend much on the tree. The changing lifestyles and food habits have also boosted the demand for nutmeg in the country.

Materials and Methods

Sample respondents were selected with the help of a multi-stage sampling technique. During the first stage, sample districts were identified from among the fourteen districts of Kerala. The rationale behind the selection of the districts was that they represented high production of nutmeg in the state. The districts selected were Ernakulum, Thrissur, Idukki and Kottayam. Table 1 justifies the selection of these districts.

Table 1

Area and Production of Nutmeg Cultivation in the Districts of Kerala-2016-17

Districts	Area (Hectare)	Percentage	Production (Ton)	Percentage
Thiruvananthapuram	128	0.58	59	0.42
Kollam	79	0.36	29	0.21
Pathanamthitta	529	2.40	269	1.93
Alappuzha	328	1.49	114	0.82
Kottayam	2209	10.01	1250	8.95
Idukki	3440	15.59	1933	13.84
Ernakulam	6575	29.80	4967	35.57
Thrissur	6920	31.35	4149	29.71
Palakkad	354	1.60	173	1.24
Malappuram	425	1.92	177	1.27
Kozhikode	609	2.76	447	3.20
Wayanad	149	0.68	56	0.40
Kannur	164	0.74	152	1.09
Kasaragod	161	0.73	190	1.36
Total	**22070**	**100**	**13965**	**100**

Source: Spices board, (Annual Report 2019)

The average area and production of nutmeg during the year 2016-17 was taken into consideration while selecting the sample districts. Thrissur district was found to be the largest nutmeg growing district in Kerala during the year with 6920 hectare, followed by Ernakulam with 6575 hectare. However the average production of nutmeg during this period is highest in Ernakulam district with 4967 tonnes.

Profile of sample farms

Farmers were identified and enumerated with the help of the officials from the respective Krishibhavans of the block panchayats. Then sixty farmers were selected for detailed enquiry. After collecting data, they were classified into different categories according to their farm size which was fixed mainly on the basis of the number of peak bearing trees in their holdings. The consequent categorisation was as small, medium and large sized farms. Small farms were those who had trees below fifty in number. Farms which had trees between 50 and 100 were classified as medium, and those farms which had trees above 100 were considered as large farms. Thus, from the four districts, primary data was collected from 720 farmers.

For sketching the profile of the selected nutmeg farms, they were classified on the basis of the number of trees in these farms. The farms were thus categorized into three groups, viz., small, medium and large, based on the number of peak bearing nutmeg trees in them. Percentage distribution of the farms according to the farm size is given in table 2. The small farms were those having trees below 50, medium farms had trees in between 50 and 100 and the large farms had more than 100 trees.

Table 2

Percentage distribution of sample nutmeg farms by size.

Farm size	Ernakulam	Thrissur	Idukki	Kottayam	Total
Small(below 50)	118 (66%)	108(60%)	155(86%)	158(87%)	539 (75%)
Medium(50-100)	46 (26%)	45(25%)	18(10%)	10(6%)	119(16%)
Large (100& above	16 (8%)	27(15%)	7(4%)	12(7%)	62(9%)
Total	180(100)	180(100)	180(100)	180(100)	720(100)

Source:Primary data

Nutmeg cultivation has a lot of potential as a gainful and sustainable crop for all farm sizes, be it small, medium or large. Though the crop is sensitive to storage conditions, it is less, compared to most other agricultural crops. They have lower weight-to-value ratios, and if carefully handled, can be stored for comparatively longer periods without a loss in freshness, quality, or value. In addition, raising and drying them can be carried out profitably, even by small farms without capital intensive and high-technology equipment. Still, as it is a perennial crop, there is a waiting period for the first harvest, which can vary from seven to nine years.

The study assesses the potential of this crop to provide sustainable incomes through an economic feasibility analysis. The study describes the challenges and opportunities faced by the smallholder producers in realizing the economic benefits of participating in competitive markets. As three fourth of the farms in our sample were of small size with less than half an acre, the study intends to provide information on how the crop is currently integrated into existing farming systems, and how it can be further developed to improve economic, environmental, and social outcomes in Kerala.

Economic viability measures

The Economic feasibility of the crop specifically looks at how the crop is used for income generation, and enquires into the viability of nutmeg cultivation. The primary data collected from the farms is examined by using various economic viability measures. The measures incorporated in this study are Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-cost Ratio and Payback Period (PBP).

Results and Discussion

Net Present Value method

This is simply the present worth of the cash flow stream. Net present value is the excess of present value of cash inflows over project cash outflows .Under this method, we find the present value of the expected net cash inflows of nutmeg cultivation, discounted at the cost of capital and subtracted from its initial cost outlay.

If the NPV is positive, the crop is economically viable, if not, it is not a viable one .While zero NPV makes the investor indifferent. Net present value of nutmeg cultivation in this study was worked out at 12 per cent discount rate, while the ultimate lending rate is considered for working out the financial feasibility of a proposal by National Bank for Agriculture and Rural Development (NABARD).

NPV is estimated in this study by using the following equation:

$$\text{NPV} = \sum_{t=1}^{n} \frac{R_t - C_t}{(1 + r)^t}$$

Where,

Rt = Returns in period 't'

Ct = Cost in period 't'

r = Discount rate

t = Duration of the crop

The table 6.1 presents the NPV calculations

Table 3

Estimation of NPV of Nutmeg Cultivation per Acre

Crop Duration (calculated at the end of the period)	Cost (In Rs.)	Gross Returns (In Rs.)	Net Income (In Rs.)	Discount Factor at 12%	NPV (In Rs.)
6th year	-151314	0	-151314	0.507	-76660.25
7th year	-20131	22500	2369	0.452	1071.45
8th year	-22145	45000	22855	0.404	9230.95
9th year	-24359	67500	43141	0.361	15557.09
10th year	-26795	90000	63205	0.322	20350.36
11th year	-29474	112500	83026	0.287	23867.89
12th year	-32422	135000	102578	0.257	26329.27
13th year	-35664	157500	121836	0.229	27921.68
14th year	-39230	180000	140770	0.205	28804.26
15th year	-43153	202500	159347	0.183	29112.03
16th year	-47469	217500	170031	0.163	27735.78
17th year	-52216	232500	180284	0.146	26257.40

18th year	-57437	240000	182563	0.130	23740.40
19th year	-63181	255000	191819	0.116	22271.50
20th year	-69499	262500	193001	0.104	20007.79
		NPV (In Rs.)			**225597.6**

Source: Computed from Primary Data

The net present worth per acre for nutmeg was worked out at a 12 per cent discount rate. In Kerala, it was found to be Rs. 225597.60, and the investment in nutmeg cultivation in Kerala is inferred to be economically feasible.

Benefit-cost Ratio

Benefit cost ratio is another measure used to compare the present worth of the cost of cultivating nutmeg with the present worth of benefit in terms of revenue. Absolute value of the benefit cost ratio will change based on the interest rate chosen. The most common procedure for selecting a proposal is going for the one having a benefit-cost ratio more than one, when discounted at the opportunity cost of capital. Finally, the given proposal is opted for implementation, among alternatives based on the highest benefit cost ratio. The following formula depicts the estimation of benefit -cost ratio.

$$\textbf{Benefit-Cost Ratio} = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+r)^n}}{\sum_{t=1}^{n} \frac{C_t}{(1+r)^n}}$$

The table 6.2 presents the Benefit-cost Ratio calculations

Table 4

Estimation of Benefit-cost Ratio (BCR) of Nutmeg Cultivation per Acre

Crop Duration (calculated at the end of the period)	Cost (In Rs.)	Gross Returns (In Rs.)	Discount Factor at 12%	Present value of Cost (In Rs.)	Present value of Gross Returns (In Rs.)
6th year	151314	0	0.507	76660	0
7th year	20131	22500	0.452	9106	10178
8th year	22145	45000	0.404	8944	18175
9th year	24359	67500	0.361	8784	24341
10th year	26795	90000	0.322	8627	28978
11th year	29474	112500	0.287	8473	32341
12th year	32422	135000	0.257	8322	34651
13th year	35664	157500	0.229	8173	36095
14th year	39230	180000	0.205	8027	36832
15th year	43153	202500	0.183	7884	36996
16th year	47469	217500	0.163	7743	35479
17th year	52216	232500	0.146	7605	33862
18th year	57437	240000	0.130	7469	31210
19th year	63181	255000	0.116	7336	29607
20th year	69499	262500	0.104	7205	27213
				190359	**415957**

Source: Computed from Primary Data

Benefit-cost Ratio = $\frac{\text{Present worth of Gross Return}}{\text{Present worth of Cost}}$

= $\frac{415957}{190359}$ = 2.19

As the benefit-cost ratio is more than one, investment in nutmeg cultivation is inferred to be economically feasible.

Internal rate of return

This is yet another method used when the discount rate is not known, but the cash outflows and cash inflows are known. The internal rate of return is defined as the interest rate that equates the present value of expected future cash inflows to the cost of the investment outlay.

In the computation of Internal Rate of Return (IRR), the time value of money is accounted for. The method of working IRR provides the knowledge of actual rate of return from the different investment decisions. Thus IRR is

known as 'marginal efficiency' of capital or yield on the investment. It is the discount rate at which the present values of the net cash flows are just equal to zero, i.e., NPV = zero. The IRR must be found out by trial and error with some approximation.

In the working procedure, an arbitrary discount rate is assumed and its corresponding NPV is arrived at. The positive net present value of the project indicates that IRR is still higher and the next assumed arbitrary IRR value must be comparatively higher than the initial level. This process is continued until NPV becomes negative. Then, by interpolation method, the exact IRR is found out using the following equation. .

IRR = (Lower Discount Rate + Difference between the two discount rates) x

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This procedure is elucidated for nutmeg cultivation in Table 5

Table 5

Estimation of Internal rate of return of Nutmeg Cultivation per Acre

Crop Duration (calculated at the end of the period)	**Cost (In Rs.)**	**Gross Income (In Rs.)**	**Net Income (In Rs.)**	**Discount Factor at 35%**	**Net Present Value (In Rs.)**	**Discount Factor at 40%**	**Net Present Value (In Rs.)**
6th year	151314	0	-151314	0.165	-24996.3	0.133	-20096
7th year	20131	22500	2369	0.122	289.8	0.095	224.7
8th year	22145	45000	22855	0.091	2071.6	0.068	1548.7
9th year	24359	67500	43141	0.067	2896.6	0.048	2088.0
10th year	26795	90000	63205	0.050	3143.5	0.035	2185.1
11th year	29474	112500	83026	0.037	3058.7	0.025	2050.2
12th year	32422	135000	102578	0.027	2799.3	0.018	1809.3
13th year	35664	157500	121836	0.020	2462.8	0.013	1535.0
14th year	39230	180000	140770	0.015	2107.8	0.009	1266.8
15th year	43153	202500	159347	0.011	1767.4	0.006	1024.2
16th year	47469	217500	170031	0.008	1397.0	0.005	780.6
17th year	52216	232500	180284	0.006	1097.1	0.003	591.3
18th year	57437	240000	182563	0.005	823.009	0.002	427.7
19th year	63181	255000	191819	0.003	640.6	0.002	321.0
20th year	69499	262500	193001	0.002	477.4	0.001	230.7
					36.544		**-4012.530**

Source: Computed from Primary Data *NB: The entire lifespan of the Nutmeg tree should be considered for working out IRR. For want of data, we considered here only for 20 years for illustration purposes.

Internal Rate of Return = 35+5 [36.544/36.544+4012.530] = 35.045

Internal rate of return in nutmeg cultivation was 35.0 per cent, which shows the crop as one having a favorable nature in terms of returns, and it is also higher than the present market rate of interest.

Payback Method

The payback method, also known as pay-off period, indicates the time taken for capital recovery and the beginning of cash flow to the farmer. It is defined as the total number of years required by the producer for the stream of cash flows generated by an investment to equal the cost of that investment. In other words, it is the speed with which the costs are recovered. The Payback Period is calculated by using the following formula.

$$\text{Payback Period} = \frac{\text{Cost of project/Investment}}{\text{Annual cash inflows}}$$

Table 6 indicates the estimated payback period of nutmeg farms from the data as reported by the farmers. Since the flowering of nutmeg trees normally begins from the sixth year onwards, for the first six years the payback is negative. The period of return on investment costs can be obtained when the age of the plant reaches 11 years.

Table 6 Estimation of Payback Period (in Rupees)

Year	Cost	Gross Income	Net Income	Cumulative Net Income
1	-75000	0	-75000	-75000
2	-12500	0	-12500	-87500
3	-13750	0	-13750	-101250
4	-15125	0	-15125	-116375
5	-16638	0	-16638	-133013
6	-18301	0	-18301	-151314
7	-20131	22500	2369	-148945
8	-22145	45000	22855	-126090
9	-24359	67500	43141	-82949
10	-26795	90000	63205	-19743
11	**-29474**	**112500**	**83026**	**63282**
12	-32422	135000	102578	165860
13	-35664	157500	121836	287696
14	-39230	180000	140770	428466
15	-43153	202500	159347	587813
16	-47469	217500	170031	757844
17	-52216	232500	180284	938128

18	-57437	240000	182563	1120691
19	-63181	255000	191819	1312510
20	-69499	262500	193001	1505511

Source: Computed from Primary Data

Summarizing the economic feasibility, the study has found the Net Present Value as Rs. 225597.60 per acre, IRR as 35.045 per cent, Benefit - Cost ratio as 2.19, and the Payback Period as 11 years. All these indicate the financial soundness of investment in nutmeg cultivation to be feasible and profitable.

Constraints in nutmeg cultivation

Though nutmeg is an economically viable crop, the farmers are often reluctant to take it up or extend the area of cultivation. So, an attempt was made to identify the problems faced by the farmers in its production, and they are ranked according to Garrett's ranking technique. This technique provides the rank of orders of constraints and advantages into numerical scores. The prime advantage of this technique is that the constraints are arranged based on their severity from the point of view of respondents. Garrett's formula for converting ranks into percent is

Per cent position = 100 x (Rij –0.5) /Nj

Where

Rij = rank given for i^{th} constraint by j^{th} individual;

Nj = number of constraints ranked by j^{th} individual.

The per cent position of each rank will be converted into scores, referring to the table given by Garrett and Woodworth (1969).

For each factor, the scores of respondents will be added together and divided by the total number of the sample respondents for whom scores will be added. These mean scores for all the constraints will be arranged in descending order; the constraints will be then ranked accordingly.

There are so many constraints in cultivation of nutmeg crops, and these constraints vary from individual to individual, depending upon their economic status and size of land holdings. The ten factors identified from the survey and given for ranking to farmers were lack of technical guidance, attack of pests and diseases, climatic variations, lack of regulated market, lack of remunerative price, lack of storage facility, high cost of labor, lack of proper irrigation, high cost of planting material and high cost of inputs. The respondents of the sample farms were asked to rank these ten factors as 1, 2, 3, 4 .....10 in order to know their preference in the selection of constraints. The calculated percentage position for the rank 1, 2, 3 ...10 and their correspondent Garrett table. Then the total score is calculated by multiplying the number of respondents ranking that factor.

The result portrayed in table 5 indicates the various challenges/ constraints experienced by the farmers in the study area. Lack of remunerative price with a mean value of 74.68 gets the first rank in the table. Poor price information systems make it difficult for farmers to find a suitable price for their produce. It is followed by the lack of a regulated market with a mean value 69.03. During the marketing of nutmeg, the farmers faced many exploitative practices from the part of intermediaries. The third rank is for the constraint of high cost labor with mean value 64.13, and lack of storage facility is ranked the fourth major constraint due to which the farmers are compelled to dispose of their produce immediately after harvest. High cost of planting material (56.57) is the least ranked factor among these constraints.

Table 7

Ranking constraint associated to nutmeg production among respondents

Sl No	Factor	Total score	Total mean	Rank
F1	Lack of technical guidance	40790	56.65	9
F2	Attack of pests and diseases	44938	62.41	5
F3	Climatic variation	44204	61.39	7
F4	Lack of regulated market	49700	69.03	2
F5	Lack of remunerative price	53772	74.68	1
F6	Lack of storage facility	45349	62.98	4
F7	High cost of Labour	46172	64.13	3
F8	Lack of proper irrigation	42845	59.51	8
F9	High cost of planting material	40731	56.57	10
F10	High cost of inputs	44380	61.64	6

Source: Computed from Primary Data

Given these findings on the constraints, the study went on to have a review of how active and effective the government agencies are in trying to resolve these issues.

The study has revealed nutmeg as an environmentally suitable and economically profitable spice crop to the farmers in Kerala. The estimated values of all the feasibility parameters have confirmed the economic feasibility of nutmeg cultivation in the study area. By using Garrett's ranking technique, the challenges faced by the growers in cultivation of nutmeg were scrutinized. Lack of remunerative price, unregulated markets and high labor cost were major problems reported by growers in the study area. Though government agencies are undertaking a number of schemes, a vast majority of farmers and exporters still remain outside the coverage of these programmes. They still have a lot of problems like traditional methods of farming, ever rising prices of inputs, fluctuating output due to climatic variations, low yield per hectare, labor shortage, outbreak of diseases, etc. Defective implementation may be the reason that at least some of the farmers in the survey considered their decision to cultivate nutmeg as one taken at a cursed moment.

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