Cost and Returns of Grapes Cultivation in Tamil Nadu

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ABSTRACT

Agriculture remains a dominating sector for providing employment opportunities to the Indians which records to about 58%. Also, India stands second largest producer of fruits. However, farming activities are facing many crises due to natural and cost problems causing unviable and unprofitable for farmers who cultivate cash crops. Due to the favorable climatic condition, Tamil Nadu plays as an important state leading in the production of grapes, but in recent times it had witnessed a drastic drop in the grapes cultivation. Therefore, a study about the cost and returns of grapes cultivation is most important for facilitating the farmers and policymakers to bring required changes in production, marketing strategy, and policy changes. To examine the cost and returns of grapes cultivation in the study area the BCR, NPV, IRR and payback period is used. The results indicated favorable economic feasibility of production and a good return for all class of farmers.

Keywords: Grapes, Economics Viability, Capital Budgeting.

INTRODUCTION:

India second largest fruits producer in the world (13.6 Percent) showed significant growth over the year's growth rate over 5 percent per annum from 28.63 million tonnes in 1991-92 to 9 crore metric tonnes in 2015-16 on 63 lakhs hector land (Singh, 2018). A large variety of fruits are producing in India at all tropical region comprising Grapes, Citrus, guava, pineapple, apple and highlighting 45 percent in mangoes and 29 percent in bananas and 37 percent in papayas production in the world.

India stands first in productivity of grapes in the world ranking with 21.6 t/ha (Singh, 2018). Grapes cultivation in India has been commercially taken up under a wide range of soil and climate conditions while there are three distinct regions, nearly 94 percent of the cultivated areas fall in the tropical zone (Parate, 2006). Currently, the production of grapes in India is about 1878000 MT forming 2.48 percent of the world.

Tamil Nadu is considered to be the prominent state in production of commercial crops mainly grapes in the country standing next to the state of Maharashtra and Karnataka. The two districts named Theni and Coimbatore focuses mainly on the cultivation of Grapes. The Government and Horticulture department is encouraging the farmers to go far grapes cultivation, and the efforts had yield good output. However, in recent years, the declining trend has been noticed in the area. Unless the reasons such as drop are identified, India cannot sustain being the significant producer of grapes in the world. Therefore, there is a need to analyze the economics of grapes cultivation in Tamil Nadu.

REVIEW OF LITERATURE:

In recent years, the Indian agricultural sector has undergone a significant transition in the inputs, technology and marketing strategy which may increase productivity and thereby reduce the cost of production. The production technology plays a vital role in the economies of the agricultural output. A study was estimated the cost and profitability of muscadine grape variety with two different production technology, i.e., production with single-wire (SW) and Geneva double curtain (GDC) trellis systems with and without a drip irrigation system and concludes as GDC system more profitable than SW system (Carlos E. Carpio, 2008). The agricultural production process the new and high technology is used the cost of production and profitability will be increased (Mickelsen, 2013) hence for the better profitability the farmers have to access the new technology. The technology alone will not provide the profitability on agricultural production process particularly in grapes production, protecting the grapes sapling, applying the right quantity of chemical and proper pest management system may increase the productivity (Krishnamoorthy, 1999). The grapes cultivation in Tamilnadu is more profitable (Ramanan, 2012) but in this study did not classify the farmers as per the size of farming (area under cultivation) which may affect the profitability and cost of the production.

For estimating the cost of cultivation, establishment and maintenance cost for perennial crops like coconut, grapes, and coffee (K.Venkat Reddy, 2017). The establishment cost was computed up to the harvesting period from day one (Singh, 2017). In the same way the components of cost were estimated for grapes cultivation by classifying cost in to four categories as cost A_1, cost A_2, cost B and cost C. Cost A1 include cost of inputs, cost of Labour, hired machinery, bullock labour, depreciation of implements and buildings, irrigation land revenue tax, interest on working capital and other expenses. Cost A2 includes cost A1 plus rent paid for lease in the land; cost B include cost A2 plus the rental value of estate and interest on fixed capital excluding land. Cost C comprises cost B plus the imputed value of family Labour (Shah, 2007). In all these studies the cost of agricultural produces computed based on the data what farmers given to the researchers, and they failed to examine the actual cost incurred with the necessary cost of production for given condition.

The calculation of produces they are not considered the probable cost of inputs required like seed, manure, fertilizer, pesticide, hired and owned Labour cost, machinery required, usage depreciation charges, irrigation cost and etc. Since these costs may vary place to place the cost of producing what they calculated may not generalize further in a study cost of the establishment were allocated over the years of life period of the crop for computing cost incurred to the particular harvesting period (Shah, 2007). But they failed to consider the interest on the establishment cost; furthermore, in return calculation, they do not recognize the post-harvesting loss and price for the product also not in an appropriate way. While calculating the cost of production, none of the studies considered the annual cost of inflation using cost index, except in a study the cost of production of crops were computed using time series data with the cost of inflation calculation (S.K. Srivastava, 2017). In the present study, the researcher calculated the cost of establishment of the vineyard at different age of the grape sapling and maintenance cost included the interest of fixed capital, i.e., establishment cost. Further, the establishment cost apportioned throughout the life period of the crop. For calculating the depreciation cost of the farm implements at the rate of 15 percent and for buildings at the rate of 5 percent (Agarwal, 1981) has applied for the present study. For evaluating the investment profitability/viability of the grapes cultivation, the capital budgeting techniques used namely Benefit-cost Ratio(BCR), Net Present Value(NPV), Internal Rate of Return(IRR) and pay-back period. A study estimated the cost and returned by considering the cultivation practice by adopting a dummy variable regression model (Babu, Reddy, & Umesh, 2016) however in this study does not recognize the practice/techniques of cultivation of grapes since in the cultivation practice is uniform in Tamil Nadu. In a study (J Prince Gittinger, 1985) the ratio between the present worth of cost stream and current worth of benefit stream defined as the cost-benefit ratio. The discounted net present value (NPV) technique measures the difference between the present worth of the benefit stream and the present worth of the cost stream. The internal rate of return denotes the discount rate, which makes the present value of benefit stream equate with the present value of the cost stream.

Research Gap:

The past reviews reveal that no comprehensive study on grape cultivation in Tamil Nadu has been attempted so far. Even though a number of general studies have been made on different aspects of grapes cultivation, none of them has focused adequately on the cost and returned analysis, and the profitability of grapes cultivations by classifying the growers into small, medium and large as cost of production vary with size of cultivation and level of output produced by the growers. Therefore, this study addresses that with proper attention.

Statement of the Problem:

In India, farming activities are facing many crises such as erratic rainfall, un-remunerative prices, an increase in labor, heavy harvesting losses, and cost of other inputs leading to unviable and unprofitable. Still, cultivation of grapes can give good remunerative prices for the farmers as long-term crops and high productivity. But, the viability of Grapes cultivation in the state and the economies of scale still a question that finds no answer. Therefore, this study attempts to comprehensively examine and direct the cost structure and returns in the cultivation of grapes in the state of Tamil Nadu.

Sample Design:

The stratified multistage random sampling method is adopted for the present study taking Tamil Nadu state as the universe, the districts of Tamil Nadu as the primary unit, the block as the secondary unit and the grape growers as the ultimate unit. Tamil Nadu consists of 32 districts; out of which 16 districts produce grapes. Among the grapes producing districts, three districts were selected which is accounting about 90 per cent in total grapes production of the state. From the selected district grapes producing blocks were selected and from each block five villages were selected randomly. The proportionate sampling technique has been used to select the sample respondents from these six blocks. The number of grape farmers in each block of the respective district and the number of respondents chosen for the study is presented in Table 1

Table 1: Sample Size Block-Wise Distribution

District	Block	No. of cultivators in the villages	Sample Size	Percentage to total
I-Coimbatore	Thondaamuthur	87	09	2.5
	Total-I	**87**	**09**	**2.5**
II- Theni	Cumbum	287	29	8.06
	Chinnamanur	968	97	26.94
	Uthamapalayam	1963	196	54.44
	Total-II	**3218**	**322**	**89.44**
III-Dindigul	Nilakaottai	213	21	5.84
	Battalagundu	80	08	2.22
	Total-III	293	29	8.06
	Gross Total(I+II+III)	**3598**	**360**	**100**

The individual sample was chosen from the list of farmers of each block using a Tippet random number table. The data were collected from all these persons through interview schedule. On verification, 24 interview schedules were incomplete, contradictory, and hence rejected. Finally, 336 grape growers formed the sample size. These respondents were further categorized as small (4 acres), medium (5-8 acres) and the large (above 8 acres) based on the size of the land owned by them. The economic life cycle of a grape plant in Tamil Nadu was seen to hover around between 12 to 18 years i.es at the Non-bearing stage (1 year), Increasing production stage (2-6 years), Constant production stage (7-11 years) and Declining production stage (above 12 years).

Collection of Data:

Primary as well as secondary data collected for the study though scheduled interview method. The pilot study data were obtained from the 30 grape growers in the study area on light of their opinion interview schedule were finalized and data were collected using field survey method during the period January- April 2018 and the secondary data were collected from various journals, official websites report.

Tools for Analysis :

The capital budgeting technique tools namely Benefit-Cost Ratio (BCR), Present Net Value (NPV), Internal Rate of Returns (IRR) and Payback period were used for analyzing the data collected through the interview schedule.

FINDINGS:

The creation of basic infrastructure is the key to the cultivation of Grapes which requires a high initial investment (shah, 2015). Therefore the cultivation is limited to the particular class of farmers. As per the area of the study, all types of farmers cultivate grapes, i.e., the medium size and large size farmers, even the small farmers. Table 3 shows the various categories of farmers and their initial establishment cost estimates. The

establishment cost is calculated up to the period of the commercial yield of the grapes. In the study area, the total establishment cost per acre is Rs. 2,92,426.39 (small farmers), Rs. 2,81,116 (medium scale farmers) and Rs. 2,91,298.1 (large scale farmers) respectively. It is noted that medium and large farmers establishment cost low because this cost was incurred over the different period and small farmers incurring high labor cost rather than medium and large farmers comparatively are incurring low labor cost. In the labor cost concern, medium and large farmers using human energy in the right way than the small farmers. In the total establishment cost the variable cost, constitute 94.45 percent, 97.85 percent and 94.6 percent for small, medium and large farmers respectively. On the variable cost components, initial establishment cost constituted the largest share of the total cost followed by labor cost and cost of fertilizer and manure cost.

Operation and Maintenance cost of grapes orchards:
Operation and maintenance cost of grapes orchards cost which is occurring during the period of the commercial yield of orchards. It may vary depends upon the different stages of production such as increasing and constant and decline stage and also a class of farmers. The average operation and maintenance cost of grapes orchards in the study area delineated in table 4. In the study area operations and maintenance cost is Rs. 65,344.74, Rs. 66,070.88 and Rs. 63,334.96 for small, medium and large class farmers respectively. The operational cost is high in the concern of medium and large class farmers, but for small farmers operational cost is low it's because of effective utilization of human energy so that labor cost low compared to other class farmers. At the same time, small farmers are spending more for the plant protection and interest on working capital. Maintenance cost concern medium and large-scale farmers are incurring high.

Cost of Production & Returns:
In general, the average cost of production per acre of the vineyard is Rs. 95186.31, 95232.36 and 92412.8 for small, medium and large-scale farmers respectively. However, cost of production varies according to the stages of yield and class of farmers, estimated the cost of production of small size farming was Rs. 1,02,722.8, Rs. 1,02,303.9 and Rs.1,04,667.5 during increasing, constant and declining stage of production respectively. In the concern of medium and large-scale farmers cost of production is coming down because of their scale of operations, the average cost of production for medium farmers is Rs. 99,496.8 Rs. 98,928.29 and Rs. 99,928.57 during the increasing, constant and decline stage of production. The average cost of production is Rs. 93,837.4, Rs. 96,254.12 and Rs. 97,357.28 for large-scale farmers during increasing, constant and declining stage of production. One important point that can extract from the table 3 is the cost of production is high during production increasing stage, and it is coming down on constant stage and again it increasing during production declining stage further cost of production is varying according to the size of farming activities.

In the study area, average production at all stage is 6139.412, 6575.295 and 6482.909 kg of grapes from an acre in a season. Average production of grapes by the small farmers is 6916.25, 7922.94 and 7392.8 kilograms of grapes from an acre during production increasing, constant and declining stages yield. Medium farmers' average production is 6875.59, 7040.26 and 6716.67 kilograms of grapes during different, yielding stages. The large-scale farmers average production grapes from an acre by 6367.5, 6971.25 and 6880.77 kilograms of grapes in a season. The gross returns to the small farmers are Rs. 1,32,571.4, Rs. 1,50,195.9 and Rs. 1,39,315.12 during different, yielding stages. In the case of medium and large farmers that gross returns are low it is because production volume is low.

Financial Analysis of grape orchards:
The above findings reveal only the cost of establishment, operation, and maintenance cost and also cost production and returns from the grape orchards. However, this does not explain the degree of benefits and cost during vineyard's life cycle. Hence, to derive logical results of the sample, it was appraised by considering various components of costs and return over the life cycle. For the evaluation of the sample, i.e., Farmers, the information of costs incurred in each stage from establishments to production stage were collected. The farm gate price and information on the production of grapes were obtained during each year to evaluate the benefits accruing to the farmers. The cost and returns were renewed on per acre basis, and they were discounted at an annual rate of interest 15 percent (as per NABARD bank guidelines) for each year. The results of the financial analysis are presented in table 5.

Table 10 depicts high returns from grapes orchards, the Present Net Value was estimated at Rs. 1,38,882.4 for small farmer's category, Rs. 1,37,869.9 for medium farmers and Rs. 1, 31,558.3 for large-scale farmers. The Benefit-Cost ratio was estimated at 1.26, 1.27 and 1.24 for small, medium and large farmers respectively. In the

above NPV and B-C estimates clearly shows that in the study area small farmers are doing well compared to other class of farmers. Also, it was found that to recover the cost incurred it took 5-6 years and the payback period also remains the same 5-6 years for various categories of orchardists. This finding signifies that the farmer to recover the total cost incurred by them. The IRR for large farmers as against medium and small farmers seems to yield higher return as it was estimated at 24.48 percent implying that at this rate of interest the discounted benefits become equilibrium to discounted cost and returns. Therefore, financial results show that there is a high component of profit involved in grape cultivation, precisely for the medium class of farmers.

CONCLUSION:

The financial analysis concerning cost and returns for various class of farmers are consistent. The gross returns of production stage are more than the cost of production. The capital budgeting result shows as, that B-C Ratio in grape cultivation as 1.26, 1.27 and 1.24 for various classes of farmers with an average of 1.26. On a comparison note, the various classes of farmers small and medium category farmers not only have the quicker payback period but also with elevated NPV and B-C ratio as compared to large farmers. Therefore, it is evident that large farmers can manage their grape farm more efficiently. However, in general, the cultivation of grapes in the study area is noticed to be a well-paid for all class of farmers. Further, it is also important to note that the local and international competitiveness is highly profitable. Thus, making an effort to boost the export trade of this valuable crop to make a profit can be attained by increasing the volume of production.

Table 2: Average Cost of Establishment of Vineyard Per Acre

S.No	Particulars	Small Farmers		Medium Farmers		Large Farmers	
		Rs	%	Rs	%	Rs	%
Variable Cost							
1	Initial Establishment	82607.84	28.25	81697.66	29.06	85084.09	29.21
2	Preparatory Cultivation	14624.12	5.00	14447.19	5.14	14924.2	5.12
3	Plants	3841.97	1.31	4110.29	1.46	3813.41	1.31
4	Planting	1899.05	0.65	1905.25	0.69	1958.86	0.67
5	Irrigation	10894.67	3.73	10803.24	3.84	10754.55	3.69
6	Fertilizer & Manure	75062.94	25.67	76219.64	27.11	76444.77	26.24
7	Care of Young Plant	8340.33	2.85	8468.85	3.01	8493.86	2.92
8	Labour	78929.66	26.99	77406.54	27.54	74330.23	25.52
Total Variable Cost (1 – 8)		**276200.58**	94.45	275058.7	97.85	**275804**	**94.68**
Fixed Cost							
9	Rental Value of Land	13686.27	4.68	3575.54	1.27	12977.27	4.46
10	Other Fixed Cost	2539.54	0.87	2482.37	0.88	2516.82	0.86
Total Fixed Cost (8-9)		**16225.82**	5.55	6057.91	2.15	15494.09	5.32
Total Establishment Cost		292426.39	100	281116.6	100	291298.1	100

Source: Sample Survey (2018)

Table 3: Average Annual Operation & Maintenance Cost Per Acre of Vineyard

S.No	Particulars	Small		Medium		Large	
		Rs	%	Rs	%	Rs	%
I	**Operational Cost**						
1	Labour	20896.83	31.98	21639.1	32.75	20259.77	31.99
2	Manure	7607.25	11.64	7819.42	11.83	7957.27	12.56
3	Fertilizer	8848.3	13.54	8821.22	13.35	8609.55	13.59
4	Plant Protection	14847.39	22.72	14488.49	21.93	13288.64	20.98
5	Irrigation	3080.84	4.71	3004.32	4.55	3162.68	5
6	Watch & Ward	4474.15	6.85	4548.38	6.89	4545.91	7.18
7	Int.on Working Capital	4780.38	7.32	4825.67	7.3	4625.91	7.3
	Total I	**64535.14**	98.76	**65146.6**	**98.6**	**62449.73**	**98.6**
II	**Maintenance Cost**						

S.No	Particulars	Small		Medium		Large	
		Rs	%	Rs	%	Rs	%
8	Harvesting & Handling Charges	478.82	0.73	600.36	0.91	560.23	0.89
9	Repair & Upkeep of Farm Implements	330.78	0.51	323.92	0.49	325	0.51
	Total II	**809.6**	**1.24**	**924.28**	**1.4**	**885.23**	**1.4**
	Grand Total (I + II)	**65344.74**	**100.00**	**66070.88**	**100**	**63334.96**	**100**

Source: Sample Survey (2018)

Table 4: Average Cost of Production Per Acre of Vineyard

S.No	Particulars	Small		Medium		Large	
		Rs	%	Rs	%	Rs	%
I	**Direct Cost**						
1	Annual Maintenance & Operational Cost	65344.74	68.65	66070.88	69.37	63334.96	68.54
	Total Direct Cost	**65344.74**	**68.65**	**66070.88**	**69.37**	**63334.96**	**68.54**
II	**Indirect Cost**						
1	Annual Share of Establishment Cost	14621.32	15.36	14055.83	14.76	14564.91	15.76
2	Rental Value of Land	13686.27	14.38	13575.54	14.26	12977.27	14.04
3	Other Fixed Cost	1533.98	1.61	1530.11	1.61	1535.66	1.66
	Total Indirect Cost (1 to 3)	**29841.57**	**31.35**	**29161.48**	**30.63**	**29077.84**	**31.46**
	Total Cost of Production (I + II)	**95186.31**	**100**	**95232.36**	**100**	**92412.8**	**100**

Source: Sample Survey (2018).

Table 5: Age-Wise Cost of Production of Grapes

S. No	Cost Item	Small farmers			Medium Farmers			Large Farmers		
		Increasing Stage (2-6)	Constant Stage(7-11)	Declining Stage (12 & Above)	Increasing Stage (2-6)	Constant Stage(7-11)	Declining Stage (12 & Above)	Increasing Stage (2-6)	Constant Stage(7-11)	Declining Stage (12 & Above)
I	**Direct Cost**									
1	Labour	21963.1	23223.7	21947.4	22401.5	21599.3	19651.3	22212	21567.5	20998.5
2	Manure	8547.5	8544.19	8840.4	8642.16	8334.87	9391.67	7265	8950	8713.08
3	Fertilizer	9385	9441.18	9326	9305.88	9590.79	9820.83	8950	9109.38	9524.62
4	Plant Protection	15497.5	14987.5	15316	17191.2	18069.1	19991.7	13470	15075	16023.1
5	Irrigation	3022.75	5098.65	6896	3038.24	2966.45	3100	2880	3312.5	3142.92
6	Watch & Ward	4437.13	5540.29	6216.6	4546.37	4556.91	4502.92	4630	4556.25	4986.15
7	Interest on working Capital	5028.24	5626.83	6283.52	5210.02	4649.39	4308.67	4752.56	4605.65	4891.07
	Total of I (1 to 7)	**67881.25**	**72462.34**	**74825.92**	**70335.32**	**69766.81**	**70767.09**	**64159.56**	**67176.28**	**68279.44**
II	**Indirect Cost**									
1	Annual Share of Establishment Cost	14621.3	14621.3	14621.3	14055.8	14055.8	14055.8	14564.9	14564.9	14564.9
2	Rental Value of Land	13686.3	13686.3	13686.3	13575.5	13575.5	13575.5	12977.3	12977.3	12977.3
3	Other fixed cost	1533.98	1533.98	1533.98	1530.11	1530.11	1530.11	1535.66	1535.66	1535.66
	Total of II (1 to 3)	**29841.57**	**29841.57**	**29841.57**	**29161.48**	**29161.48**	**29161.48**	**29077.84**	**29077.84**	**29077.84**
	Grand Total (I + II)	**102722.8**	**102303.9**	**104667.5**	**99496.8**	**98928.29**	**99928.57**	**93237.4**	**96254.12**	**97357.28**

Source: Primary Data

Table 6: Production and Unit Cost of Production of Grape

Farmer	Total Cost (Rs./acre)	Output (Kg./acre)	Cost of Production (Rs./kg)
Small	95186.31	6139.412	15.50
Medium	95232.36	6575.295	14.48
Large	92412.80	6482.909	14.25

Source: Sample Survey (2018)

Table 7: Age Wise Average Production and Unit Cost of Production of Grapes

Farmers	Age	Total Cost (Rs./acre)	Output (Kg./acre)	Cost of Production (Rs./kg)
Small	Increasing Age	98418.07	6916.25	14.85
	Constant Age	92242.79	7922.94	12.91
	Declining Age	88395.02	7392.8	14.16
Medium	Increasing Age	99496.8	6875.59	14.47
	Constant Age	98928.29	7040.26	14.05
	Declining Age	99928.57	6716.67	14.88
Large	Increasing Age	93237.4	6367.5	14.64
	Constant Age	96254.12	6971.25	13.81
	Declining Age	97357.28	6880.77	14.15

Source: Sample Survey (2018)

Table 8: Statement of Income in Grape Cultivation - Age Wise

S. No	Particulars	Small farmers Increasing Age	Constant Age	Declining Age	Medium Farmers Increasing Age	Constant Age	Declining Age	Large Farmers Increasing Age	Constant Age	Declining Age
1	Gross Sales	138325	158459	147856	137512	140805	134333.4	127350	139425	137615.4
2	Less: Marketing Cost	5753.63	8262.88	8540.88	6275.88	8384.42	8361.25	6942.5	8396.5	8284.23
3	Gross Returns	132571.4	150195.9	139315.12	131235.9	132420.8	125972.15	120407.5	131028.5	129331.17
4	Less: Variable Cost	67881.25	72462.34	74825.92	70335.32	69766.81	70767.09	64159.56	67176.28	68279.44
5	Contribution	64690.12	77733.58	64489.2	60900.6	62653.97	55205.06	56247.94	63852.22	61051.73
6	Less: Fixed Cost	29841.57	29841.57	29841.57	29161.5	29161.5	29161.5	29077.8	29077.8	29077.8
7	Net Profit	34848.55	47892.01	34647.63	31739.1	33492.47	26043.56	27170.14	34774.42	31973.93
	Net profit Ratio	**26.29**	**31.89**	**24.87**	**24.18**	**25.29**	**20.67**	**22.57**	**26.54**	**24.72**

Source: Sample Survey (2018)

Table 9: Capital Productivity Indicators of Various Classes of Farmers

Class of Farmers	Pay-back Period (Years)	Net Present Value (Rs.)	Benefit-Cost Ratio	Internal Rate of Return (%)
Small Farmers	5.48	138882.4	1.26	24.16
Medium Farmers	5.45	137869.9	1.27	24.48
Large Farmers	5.49	131558.3	1.24	24.64

Source: Computed Data

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