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Estimating Economics of Tissue Culture Banana: A Case of Bharuch District in South Gujarat

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ABSTRACT: Among the various horticulture crops grown in Bharuch District, banana is a staple fruit crop and is an important avenue for generation of skilled employment as well as self-employment opportunities in both rural and urban areas. For the purpose of our investigation, a sample of 120 respondents were selected by multistage random sampling procedure from the study area. The cost of cultivation and returns were estimated using various cost concepts *viz;* cost A, cost B, cost C1 and cost C2. The economic analysis of tissue culture banana production revealed that the per hectare total cost of banana cultivation was found to be ₹ 2,14,192 due to greater use of human labour in various farm operations. The proportionate share of cost-A, cost-B and cost-C1 was 81.28, 88.64 and 90.91 per cent, respectively. The banana growers made a gross return of ₹5, 92, 954 and net profit of ₹3, 78,762 per hectare mainly due to the higher bunch weight and better quality of tissue culture bananas. The benefit cost ratio was worked out to be 1.2.77 indicating profitability of tissue culture banana farming enterprise. The constraint analysis revealed that fluctuations in selling price (1st rank), followed by labour scarcity (2nd rank) and damage due to unfavourable weather conditions (3rd rank) were the top three major problems faced by banana growers in the study area.

Keywords: Tissue culture, cost of cultivation, cost of production, cost concept, returns.

INTRODUCTION

In the past two decades, the horticulture sector of India has gained the reputation of one of the fastest growing agricultural sectors in the country (Idris *et al.*, 2015). Among fruit crops banana leads the scene, with a total production of about 291 lakh tonnes (NHB, 2015). Similarly, with regard to seven districts of South Gujarat, the district of Bharuch the highest area (12286 ha) under banana crop. Moreover, it has the highest production and productivity to the tune of 896878 MT and73.00 MT/ha, respectively (DOH, 2019). Thus, banana is a staple fruit crop and major source of income for farmers in Bharuch district of South Gujarat. There has been a rapid increase in the demand for banana due to population expansion, tremendous nutritive value, higher purchasing power, and development of new markets. The traditional clonal propagation methods, however, are unable to cope up with continuous demand of new planting material. The use of tissue culture technique in banana has numerous advantages like ensuring the availability of pest and disease free planting materials, synchronous growth in plants, uniform fruiting, shorter crop cycle, and better yields (Robinson, 1996). It is due to these reasons that growing of tissue culture banana is becoming very popular in this area. Hence, the following study on the economic analysis of production of tissue culture banana is being proposed with the following specific objectives:

1. To study the cost and returns of tissue culture banana in the study area
2. To elicit the constraints related to tissue culture banana cultivation

MATERIALS AND METHODS

For the present investigation, primary data were collected using multistage random sampling method. Three talukas from Bharuch district *viz.* Bharuch, Zagadiya and Ankleshwartalukas were selected randomly at the first stage. A list of villages was prepared from the selected talukas from the revenue records of the office of Taluka Development Officer. Out of this, six villages were selected randomly from each selected taluka at the second stage. The lists of villages are presented in Table 1.

Table 1: Selection of Farmers from various taluka's of Bharuch district.

Name of Taluka	Name of village	No. of farmers
Bharuch	Nikora	20
	Mangleshwar	20
	Sub Total	**40**
Zagadiya	Sulatanpara	20
	Zagadiya	20
	Sub Total	**40**
Ankleshwar	Andada	20
	Survadi	20
	Sub Total	**40**
	Total	**120**

The lists of respondents were prepared from each village at the third stage. From this list, 20 farmers were selected from each village and finally 120 respondents were selected by random sampling technique. Data were collected using pre-tested and well-structured interview schedule. Tabular and percentage analysis were used to work out the cost concepts for tissue culture banana crop.

RESULTS AND DISCUSSION

With regard to the economics of tissue culture banana cultivation, the increase or decrease in the cost structure depends upon the changes in the use of different resources and substitution of one form of resource for another. The proportion of cash expenditures in the total cost of production of banana crop also increases as in the process of transformation, farm depends more on purchased resources and less on owned or farm produced resources.

The item wise details of per hectare cost of cultivation of tissue culture banana, have been worked out at different cost levels (*i.e.* cost-A, cost-B, cost-C1 and cost-C2 presented in Table 2. It was revealed that the per hectare cost of cultivation for tissue culture banana was worked out to be ₹ 1,74,105, ₹1,89,860, ₹1,94,720 and ₹ 2,14,192 at cost-A, cost-B, cost-C1 and cost-C2. The overall total expenditure on tissue culture banana ₹ 2,14,192 per hectare. The proportionate share of cost-A, cost-B and cost-C1 was 81.28, 88.64 and 90.91 per cent, respectively in case of tissue culture banana crop. The results were in conformity with those reported by Dave (2011); Gaurang *et al.* (2013).

Table 2: Cost of cultivation per hectare of tissue culture banana.

Item	Tissue culture banana		
	Physical unit	Value (₹)	% to total cost
1 Human Labour A. Family (Man days)	24.25	4860	2.27
B. Hired (Man days)	246.50	49411	23.07
2. Bullock labour (Per days)	5.15	3610	1.69
3. Seed (Tissue plant)	3029	45435	21.22
4. Manures (carts)	10.40	10400	4.85
5. Chemical N Fertilizer P (Kg) K	325.10 220.28 249.40	21230	9.91
6. Irrigation	--	12225	5.70
7. Insecticides/ pesticides	--	1530	0.71
8. Miscellaneous Cost	--	11200	5.23
9. Depreciation	--	410	0.19
10. Interest on working capital	--	18654	8.71
11. Rent	--	--	--
12. Rental value of owned land	--	15550	7.27
13. Interest on owned fixed capital	--	205	0.09
14. Managerial charge	--	19472	9.09
15. Cost-A	--	174105	81.28
16. Cost-B	--	189860	88.64
17. Cost-C1	--	194720	90.91
18. Cost-C2	--	214192	100

Field Survey

Note: Figures in parenthesis indicates percentage to total

Table 3: Returns per hectare over different costs of tissue culture banana crop

Yield			Return per hectare over different costs			
Main Yield in quintal	Average Harvest Price per Quintal ₹	Gross Return in ₹	Cost-A	Cost-B	Cost-C1	Cost-C2
790.50	750.10	592954	418849	403094	398234	378762

An attempt has been made here to compare the returns per hectare over different costs in tissue culture banana production. The details in this regard are given in Table 3. It is revealed that per hectare output or yield from tissue culture banana was 790.50 quintals. The per hectare gross value of banana output at prevailing average harvest price of ₹750.10 *i.e*. gross return was ₹5,92,954. The returns per hectare over different cost-A, cost-B, cost-C1 and cost-C2 were worked out to be ₹4, 18,849, ₹4,03,094, ₹3,98,234 and ₹3, 78,762, respectively.

Table 4 depicts the cost of production over different costs obtained by dividing the total cost of cultivation of banana crop by its output. The per quintal cost of production over different costs *i.e.* cost-A, cost-B, cost-C1 and cost-C2were estimated to be ₹220.25, ₹240.18, ₹246.33 and ₹270.96, respectively.

Table 5 shows that the input-output relationship over different cost-A, cost-B, cost-C1 and cost-C2 were 1:3.40, 1: 3.12, 1:3.04 and 1:2.77, respectively for tissue culture banana indicating profitability of banana farming through tissue culture method. The present findings were in line with those reported by Balaganesh *et al.* (2016); Dave *et al.* (2016); Mungalpara (2016).

Table 4: Details of cost of production per quintal over different costs.

Cost of production per quintal over different costs			
Cost-A	**Cost-B**	**Cost-C1**	**Cost-C2**
220.25	240.18	246.33	270.96

Table 5: Details of input-output ratio per hectare over different cost.

Input-output ratio per hectare over different costs			
Cost-A	**Cost-B**	**Cost-C1**	**Cost-C2**
1:3.40	1:3.12	1:3.04	1:2.77

Table 6: Problems faced by tissue culture banana growers (n=120).

Sr. No.	Problems	Number/ percentage	Rank
1.	Fluctuations in selling price	100 (83.33)	I
2.	Labour scarcity	91 (75.83)	II
3.	Damage due to unfavourable weather conditions	86 (71.67)	III
4.	Lack of information on improved package of practices	78 (65.00)	IV
5.	Attack of pests and diseases	64 (53.33)	V
6.	Electricity problems	55 (45.83)	VI
7.	Non-availability of tissue culture plant in time	48 (40.00)	VII

Field survey

The tissue culture banana growers were asked to rank the problems faced by them during their farming operations. The problems were listed and the farmers were asked to rank these problems in their order of priority. The ranks corresponding to each problem are presented in Table 6. The major problem faced by the farmers were fluctuations in selling price(1^{st} rank), followed by labour scarcity (2^{nd} rank), damage due to unfavourable weather conditions (3^{rd} rank), lack of information regarding improved package of practices (4^{th} rank), attack of pests and diseases (5^{th} rank), electricity problems (6^{th} rank) and non-availability of tissue culture plant in time(7^{th} rank). The results were similar to those reported by Gulkari *et al.* (2017).

CONCLUSION

An economic analysis of tissue-cultured banana has been presented through studying their costs and returns. The study suggests that tissue-culture banana is a profitable farming enterprise and can play an important role in doubling farmers' income. The higher yields, bunch weight, better quality, higher prices as well as uniformity in harvesting were the major factors responsible for the higher profitability. Hence, the study suggested that farmers should be encouraged to adopt tissue culture banana to get higher yield and profits.

FUTURE SCOPE

The tissue culture cultivation of banana is the most promising method of mass production of quality, uniform, disease free planting material in a short period of time. Most of the challenges faced by traditionally grown banana using sucker method can be addressed by using tissue cultured banana planting material. Tissue culture adoption among the famers is limited mainly because of the high initial cost of plantlets and lack of awareness of the technology and package of practices. This could be resolved by effective extension services in this direction. The present study proves the economic boons of tissue culture banana and hence it is the need of the hour to disseminate the cultivation practices to wider farming communities to help them uplift their socio-economic levels by building a profitable farming enterprise.

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Conflicts of Interest. None.

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