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A Study on Business Viability of Dragon Fruit Cultivation in Telangana

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A B S T R A C T

The study on business viability of dragon fruit aimed to bring more area under cultivation and to help the policy makers to formulate policies. The present study was conducted in Sanga Reddy and Nalgonda districts of Telangana with the following objectives; to analyze the business viability of the dragon fruit cultivation in Telangana and to identify the constraints in production and marketing of dragon fruit in Telangana. To fulfil the objective of the study, data was collected through personal interviews from the selected dragon fruit growers with the help of structured questionnaire/schedule. The data collected was subjected to various analytical tools like project appraisal techniques (NPV, B:C ratio and IRR) and garret ranking technique. The study revealed that total cost of establishment for 1ha of dragon fruit cultivation is Rs. 9.05 lakh. The total annual cost for production of dragon fruit is Rs. 2.02 lakh with the net returns of 15.58 lakhs. The NPV of 1 ha area under cultivation at 10.25 per cent discount rate is 84.53 lakhs, Benefit cost ration is 4.26 and Internal Rate of Return is 53.53 per cent this indicates investment on dragon fruit cultivation is financially feasible. The major production constraints affecting the returns to the producers were high installation cost and unavailability of quality planting material. The major marketing constraints associated with the producers were lack of marketing information and new markets availability.

***Key words*:** Business viability, Dragon fruit, Telangana, Constraints, Financial feasibility

Dragon fruit is an herbaceous perennial climbing cactus with the life span of 20-25 years. Dragon fruit belongs to the family *Cactaceae* and genus *Hylocereus*. It is native of Central America, Southern Mexico, Guatemala and Costa Rica. Its cultivation is well suited in the agro-climatic regions that are dry and frost-free. Good drainage is necessary for the plant growth [1]. It is fast returning fruit crop and economic yield can be obtained after third year. The harvesting is usually taken during the period from June to September [2].

The global dragon fruit production was more than 2.1 million tonnes over an area of 0.112 million ha in 2017-18. India contributes 0.2 per cent share in global dragon fruit production with an area of 400 ha and production of 4200 metric tonnes with the productivity of 8-10.5 MT/ha/year [2]. In Telangana State, farmers are undertaking dragon fruit cultivation mainly in Nalgonda, Rangareddy, Sangareddy and Warangal districts. The current area under cultivation in Telangana is 125.19 hectares. In the districts of Nalgonda, Rangareddy, Sangareddy and Warangal, dragon fruit is cultivated in 16.35, 11.87, 16.32 and 10.55 hectares respectively, during the year 2020 [3]. Many studies were reported in the countries like Thailand, Vietnam, Indonesia etc., on financial feasibility, supply chain management and constraints in the production and marketing of the dragon fruit. As the fruit is new to the state the farmers may face problems in the production and marketing of it. In this study an attempt was made to know about financial feasibility and constraints in production and marketing of dragon fruit. Therefore, the present research study critically examines and analyses the business viability and constraints in production and marketing of dragon fruit in Telangana state. The study enables the growers in making decisions to overcome the problems at various stages of cultivation by efficient utilization of Government policies and initiatives.

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MATERIALS AND METHODS

Sanga Reddy and Nalgonda districts of Telangana are emerging as the potential centres for growing dragon fruit. There has been a steep rise in the number of growers in these districts. Therefore, looking at the growth potential, Sanga Reddy and Nalgonda districts are chosen for study purposively. Hence, 10 growers from each district were selected for the analysis of business viability.

Well-structured and pre-tested questionnaire was used for primary data collection. Both open ended question and close ended questions were framed in questionnaire. The data relating to general information about the respondents, family type, family size, age, education, occupation and land holding were obtained from them by personal interview. The information regarding various inputs used, annual cost of cultivation and yields and returns of the dragon fruit orchard were obtained from the farmers and it was ensured that the data made available by the respondents were relevant, comprehensive and reasonably correct and precise. For the purpose of evaluating the objectives of the study, based on the nature and extent of data, the analytical tools like tabular analysis, financial feasibility analysis and Garret ranking technique were employed for analyzing the data to draw meaningful results and conclusions.

Financial feasibility analysis

Assumptions were made for carrying out business analysis of dragon fruit cultivation. The life of dragon fruit farm or duration of crop is considered 20 years. The techniques of project evaluation such as Net Present Value, Benefit-Cost ratio and internal rate of return were employed to assess the financial feasibility of cultivation. For analyzing the investment feasibility, the establishment cost, working costs and gross returns from dragon fruit cultivation were discounted at 10.25 per cent discount rate, since it represents the opportunity cost of the capital.

Net present value (NPV): Net present value is the present worth of the net benefits or cash flow stream. Mathematically, the net present value is estimated as follows:

$$\text{NPV (Net present value)} = \sum_{t=1}^{n} \frac{Bt-Ct}{(1+i)^t}$$

Where;
Bt =benefit (Cash inflow) in year t,
Ct = cost (Cash outflow) in year t,
n = investment lifespan,
i = interest rate
t = time measured in years

If the calculated NPV is positive it implies the investment is viable and where the NPV is equal to zero implies that the investment breaks even.

$$\text{IRR (Internal rate of return)} = \frac{\text{LDR + NPV at LDR}}{\text{(NPV at HDR – NPV at LDR)}} \times \text{(HDR–LDR)}$$

Where;
LDR = Lower discount rate
HDR = Higher discount rate.

To accept the project the calculated IRR should be more than opportunity cost.

Benefit-cost ratio

The BCR is used for analyzing returns on one rupee investment

$$\text{B:C ratio} = \frac{\sum_{t=1}^{n} \text{Bt}/(1+r)^n}{\sum_{t=1}^{n} \text{Ct}/(1+r)^n}$$

Where;
Bt = denotes benefit (Cash inflow) in year t
Ct = denotes cost (Cash outflow) in year t
n = Economic life of the project
t = Number of years
r = Discount rate

Garett's ranking technique

Garett's ranking technique was used to quantify the constraints faced by growers in production and marketing of dragon fruit. The individual rank is converted into percent position by using the formula given below:

$$\text{Percent position} = \frac{100 \times (R_{ij} - 0.5)}{N_j}$$

Where;
R_{ij} = Ranking given to the i^{th} attribute by the j^{th} individual
N_j = Number of attributes ranked by the j^{th} individual

The percent position of each rank was obtained by converting into scores by referring to the table given by Garrett and Worth [4]. The respondents were requested to rank the constraints faced by them according to the degree of importance. The ranks given by each of the respondents was converted into scores using Garret table. Then for each reason, the scores of individual respondents were added together and mean score is calculated. These mean scores for all the reasons were arranged in the descending order and ranks were given. These ranks help to identify the major and minor constraints faced by the respondents.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The information regarding socio-economic characteristics of the respondents is collected to know the about the decision making and risk-taking ability of respondents. The results showed majority of the respondents in the study sample completed intermediate (50 per cent), the average size of the family is 4 to 5 members (35 per cent) and most of the farmers are aged between 36 to 45 (55 per cent). Majority (65 per cent) of the farmers are having nuclear families. About 75 per cent of the farmers belong to small and marginal category with less than 2 ha in the study area and 85 per cent of the farmers have chosen agriculture as primary occupation.

Cost of establishment

The cost incurred on establishment of dragon fruit is collected from the respondents with structured questionnaires. The total cost of establishment includes the costs associated with land preparation, supportive structures (cement poles, cement rings, iron rods, tyres, etc.), sprayers, drip irrigation and saplings. The information regarding the cost of establishment of dragon fruit farm for an area of 1 ha has been calculated. The cost of establishment of dragon fruit farm is shown in the following (Table 1).

Table 1 Costs associated with establishment of dragon fruit farm

Particulars	Amount (Rs in Lakhs)	Per cent
Land development	0.39	4.31
Supportive structures	5.13	56.69
Sprayer	0.06	0.66
Drip irrigation	1.15	12.70
Saplings	2.32	25.63
Total cost of establishment	9.05	100
Subsidy received from Govt.	1.03	
Net investment incurred by farmer	8.02	

The total cost of establishment for 1ha of dragon fruit cultivation is Rs. 9.05 lakh, out of which the major cost is for supporting structures accounting to 56.69 per cent (Rs. 5.13 lakh). The cost of sapling is 25.63 per cent (Rs. 2.32 lakh) of total establishment cost, the cost of land preparation worked out to 4.31 per cent (Rs. 0.39 lakh), cost of sprayers was 0.66 per cent (Rs. 6000), and the cost for drip irrigation was about 12.70 per cent (Rs. 1.15 lakh) of total establishment cost. The Government of Telangana has provided a subsidy of Rs.1.03 lakh towards drip irrigation which is 90% of total cost of drip irrigation. So, the amount spent by the farmer for drip irrigation was Rs. 0.11 lakh. Therefore, the net investment towards establishment of dragon fruit for 1 ha is Rs. 8.02 lakh. It can be noticed that around 82.32 per cent of the total cost goes towards supporting structures and saplings.

Cost of cultivation of dragon fruit

The cost of cultivation of dragon fruit is presented in the table.2. The cost of production per annum for cultivation of dragon fruit is Rs. 2.02 lakh which included both the fixed cost and variable cost incurred on the crop. Out of the total cost, fixed cost accounted for 64.98% (Rs. 1.31 lakh) and the rest was variable cost, which accounts to 35.02% (Rs. 0.70 lakh) of the total cost.

The fixed costs included rental value of land contributing to 18.79 per cent (Rs. 0.38 lakh) of the total cost and the interest on fixed capital accounted for 46.04 per cent (Rs. 0.93 lakh) and the least cost was for depreciation on sprayer which is about 0.15 per cent (Rs. 0.003 lakh) which is highly negligible compared to other costs.

The variable cost accounted for about 35.02 per cent in which the major cost was that of fertilizers and manures accounting for 12.38 per cent (Rs. 0.25 lakh) of the annual cost followed by marketing cost accounting for 9.90 per cent (Rs. 0.2 lakh) of total cost. Labor cost worked out to about 8.41 per cent (Rs. 0.17 lakhs followed by interest on working capital which was about 3.46 per cent (Rs. 0.07 lakhs) and the least cost was operational maintenance cost which is about 0.99 per cent of the total cost (Rs. 0.02 lakh). Hence, the total cost for dragon fruit cultivation worked out to Rs. 2.02 lakh.

Table 2 Total annual cost associated with the cultivation of dragon fruit

Particulars	Amount (Rs in Lakhs)	Per cent
Fixed costs		
Land rent	0.38	18.79
Depreciation on Sprayers @5%	0.003	0.15
Interest on fixed capital @ 10.25 per cent / annum	0.93	46.04
Total fixed cost	1.31	64.98
Variable costs		
Labour cost	0.17	8.41
Operational maintenance cost	0.02	0.99
Fertilizers and manure	0.25	12.38
Marketing cost	0.20	9.90
Interest on working capital @ 10.25 per cent	0.07	3.46
Total variable cost	0.70	35.02
Total annual cost	2.02	100

Yield and returns from dragon fruit cultivation

Total yield and returns from dragon fruit cultivation for an area of 1 ha is shown in the (Table 3). The economic yield of dragon fruit starts after 3 years, so an average yield is considered for calculation which is of 11 MT per hectare with twenty years life span. The fruits were sold at the selling price of Rs. 1.6 lakh per one MT. The gross return was Rs. 17.6 lakh and net returns worked out to Rs. 15.58 lakh. The net returns obtained are almost 88 per cent of the total gross return.

Table 3 Yield and returns of dragon fruit cultivation

Particulars	
Average yield / year (Metric Ton)	11
Sales price per MT (in lakhs)	1.60
Gross returns (in lakhs)	17.6
Cost of cultivation (in lakhs)	2.02
Net returns (in lakhs)	15.58

Financial feasibility of dragon fruit cultivation

Assumptions were made for carrying out business analysis of dragon fruit cultivation. The life of dragon fruit farm or duration of crop is considered 20 years. The techniques of project evaluation such as Net Present Value, Benefit-Cost ratio and internal rate of return were employed to assess the financial feasibility of cultivation without considering drip irrigation subsidy. For analyzing the financial feasibility, the establishment cost, working costs and gross returns from dragon fruit cultivation were discounted at 10.25 per cent discount rate. The economic yield of dragon fruit starts after three years, so initial three years the yield is considered as 1.7 MT, after three years 11MT is considered for calculation.

The Net Present Value of 1 ha area under cultivation at 10.25 per cent discount rate is 84.53 lakhs. The selection criterion of NPV is to accept all the projects that are with positive values. The obtained NPV is positive in this study, so it clearly indicated financial feasibility of investment.

Benefit- cost (B:C) ratio is the tool to know the returns on one rupee investment by using total cash inflows and total cash outflows. The criteria for accepting B:C ratio is to select the projects where the ratio is more than one. The B:C ratio obtained at 10.25 per cent discount rate is 4.26, the obtained value is more than one hence, the dragon fruit cultivation in the study area is financially feasible (Table 4).

Internal Rate of Return (IRR) is the important tool to know feasibility of the project. The IRR is the rate at which the NPV is equal to zero or the discounted inflows and outflows costs are equal. The selection criterion of IRR is to accept the projects with IRR more than opportunity cost of capital. The Internal Rate of Return obtained was 53.53 per cent which is higher than the opportunity cost of capital. Hence, the dragon fruit cultivation in the study area is financially feasible (Table 4).

Table 4 Estimates of investment analysis parameter in dragon fruit cultivation

Particulars	Unit	Value
Net present value	Lakhs	80.97
Benefit cost ratio (BCR)		4.12
Internal rate of return (IRR)	Per cent	47.46

The present study has been compared to Indonesia which is one of the leading dragon fruits producers in the world. The study conducted in Lenyek village of Kecamatan Luwuk Utara Kabupaten proud of central Sulawesi, Indonesia showed the results of Net Present Value which is Rs. 213.88 million (INR 10,06,446) (The exchange rate has been considered as on end of the year 2018), Internal rate of return of 30.6 per cent and Benefit Cost ratio of 1.86 [5]. The present study showed much better results of financial feasibility analysis compared to Indonesia study.

Constraints faced by farmers in production and marketing of dragon fruit

An attempt has been made to analyze the problems faced by farmers in the production and marketing of dragon fruit in the study area. The farmers were asked to rank the problems faced by them and the results are presented below. The constraints faced by the farmers are classified into two categories i.e., production and marketing constraints.

The problems faced by farmers in the production were high installation cost, unavailability of credit, unavailability of quality planting material, high cost of planting material, pest and disease attack, lack of institutional support, unavailability of skilful labour, change in climate, perishability of produce, high labour charges and high cost of pesticide and fertilizer. The problems faced by farmers in the marketing were lack of market information and new markets, perishability of produce, fluctuation in prices/ seasonal demand, high package cost, high transportation cost, unavailability of space in transportation, lack of transportation facility, exploitation by middlemen and lack of awareness among consumers.

Constraints faced by the farmers in production

The details of production constraints faced by the farmers are presented in (Table 5). The constraints are analyzed based on the opinions of the farmers by using preferential ranking.

Table 5 Production constraints faced by farmers

Constraints	Total score	Average score	Rank
High installation cost	1704	85.2	1
Unavailability of quality planting material	1571	78.55	2
Lack of institutional support	1465	73.25	3
Change in climate	1362	68.1	4
Unavailability of skilful labour	1318	65.9	5
Perishability of produce	1219	60.95	6
High labour charges	1201	60.05	7
Pest and disease attack	1120	56	8
High cost of planting material	1062	53.1	9
Unavailability of credit	1038	51.9	10
High cost of pesticide and fertilizer	980	49	11

Out of all the production constraints faced by the farmers, the major constraint faced by them was the high installation cost with the maximum garret score of about 85.2, and it was given first rank. Unavailability of quality planting material with a garret score of 78.55 was ranked as the second major constraint, followed by the lack of institutional participation with the garret score of 73.25, change in climate with the garret score 68.1, unavailability of skilful labours with garret score 65.9 and perishability of produce with a score of 60.95 received third, fourth, fifth and sixth ranks. Other constraints like high labour charges, pest and disease attack, high cost of planting material, unavailability of credit and high cost for pesticides and fertilizers were ranked as moderate or minor constraints by the farmers. Hence, it can be noticed that the major problems for the farmers is high installation cost as well as unavailability of quality planting material. Unavailability of credit and high cost of pesticides and fertilizers were considered minor problems.

Marketing constraints faced by farmers

The marketing constraints faced by the farmers are presented in (Table 6). The constraints were analyzed based on the opinions of the farmers by using preferential ranking.

Marketing constraints faced by the farmers include lack of marketing information and new markets with a maximum garret score of 87, followed by lack of awareness among consumers about dragon fruit with a garret score of 78. High transportation cost with a garret score of 71.75 was ranked as the third most important constraint followed by high packing costs with a garret score of 69.25. Fluctuation in prices/ seasonal demand was given fifth rank with a garret score of 65. Other constraints like perishability of produce, exploitation by middlemen, unavailability of space in

transportation and lack of transportation facility were ranked as moderate or minor constraints by the farmers.

The constraints reported by the study in production and marketing of dragon fruit were non-availability of quality saplings, lack of awareness among consumers about ideal plantation practices, high initial investment, lack of skilled labours, prevalence of insects and pests, stunted growth and sun burning injuries, reduction in fruit size and yield, lack of pre-cooling, packaging and transportation facility, lack of controlled storage facility, poor marketing infrastructure, lack of knowledge on value addition and lack of research and policy guidelines [6].

Table 6 Marketing constraints faced by farmers

Constraints	Total score	Average score	Rank
Lack of market information and new markets	1740	87.00	1
Lack of awareness among consumers	1560	78.00	2
High transportation cost	1435	71.75	3
High package cost	1385	69.25	4
Fluctuation in prices/ seasonal demand	1300	65.00	5
Perishability of produce	1240	62.00	6
Exploitation by middlemen	1165	58.25	7
Unavailability of space in transportation	1133	56.65	8
Lack of transportation facility	1080	54.00	9

CONCLUSION

It can be concluded from the study that there is an immense scope for production of dragon fruit in the study area. Though the cost of cultivation is high, the returns are also high as the business viability study showed the financial feasibility. The efforts have been started by some of the private agencies to promote dragon fruit as a commercial crop for enhancing income for farmers in the state. The state government can support famers initially by providing rebate on establishment costs and assure quality saplings at lower prices for increasing the area on dragon fruit cultivation and to protect the interest of the farmers. The constraints perceived by the farmers about dragon fruit farming should be taken into account while formulating and implementing the developmental programmes or schemes. Overall, it can be concluded that, dragon fruit cultivation acted as turning point for many farmers to get high income.

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