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Financial Profitability and Sensitivity Analysis of Coffee Cultivation in Paderu Division of Andhra Pradesh

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ABSTRACT

The study examined the present conditions of financial and economic aspects of coffee plantation in Visakhapatnam district of Andhra Pradesh. Data collection was done using pre tested questionnaire administrated on 90 coffee producers selected randomly. The costs and returns per ha of coffee garden based on the opinion of sample producers the economic life was considered as 25 years. A spreadsheet model was used to develop and calculate the Net Present Value (NPV), Internal Rate of Return (IRR)and Benefit Cost ratio (BCR). Sensitivity analysis of NPV to the default discount rate (11%) was included. Results indicated that Positive NPV of Rs. 243136.97, IRR at 26.39% and BCR of 2.03 indicates establishing of coffee plantation to be a profitable investment. NPV, BCR and IRR values indicate that coffee is financially feasible and economically viable project under different risk scenario like 10, 20 and 30 per cent increase in cost. The NPV and BCR even at 30 per cent decline in selling price in the coffee, represented positive value more than one. Change in selling price of Fresh Fruit Berry (FFB) is more sensitive to NPV than a change in total cost and total revenue.

Key words: *Coffee, NPV, BCR and IRR.*

Coffee has tremendous significance in the world economy. Today, coffee is a single largest commodity entering the international trade next to petroleum and petroleum products in the world(Tejaswi*et al*. 2006).Coffee has been a major export earning commodity of several coffee growing countries in the world.

In Paderu division of Visakhapatnam district soil conditions are sandy clayey bares with optimum pH levels of 6.0 to 6.5. The terrain in the region is medium to steep slopes. While most factors of the Eastern Ghats are suitable for coffee cultivation, it is the extreme variation in temperature that needed management. Agricultural activity in Paderu division is mostly seasonal, which provide only seasonal employment to labour. The tribes are habituated for shifting cultivation, which is locally ‘,Mownas the ‘Podu cultivation. Podu’ cultivation practiced by the tribal resulted in extensive denudation of forest cover and enormous soil erosion. To check podu’ cultivation and to improve socio-economic status of tribal inhabitants through sustainable farming, coffee cultivation was found to be the best option as it is suitable for cultivation in hilly slopes under the shade of forest cover. It is found that care to protect coffee from extreme conditions, combined with good management practices, and could make this area a promising for coffee cultivation(Indian coffee, 2015).It was identified that net income attained from coffee was thrice than other agricultural crops grown by tribal farmers(Bajracharya 2003), (Srinivas 2009), (Sharma *et al* 2016).

Coffee was globally traded commodity, global demand-supply conditions dictate price formation leading to volatility in prices and market risk, leaving few options for small growers. Thus coffee production is exposed to a highlevel of farm risks (production and market risk). Rising cost of inputs is identified as a major issue as the labour input accounts for about 60 percent of cost of cultivation (Upendranadh and Subbaiah2013). This is one of the factors driving planters to a state of distress as time-bound operations warrant use of labour even at a wage. Simultaneously, most small growers are affected by severe price volatility. They are subject to resilience problems as means of production (in terms of line of credit, labour, technology) are sticky in response toprices and there is always time-lag to adjust to price signals. Local price-discovery and hedging mechanisms did not yet succeed in reaching the minimum liquidity with respect to small growers.With a view of these problems, the present study was focused to examine the financial profitability and sensitivity analysis of coffee.

MATERIAL AND METHODS

The study was conducted in Andhra Pradesh during the year 2016-17. Multistage random sampling design was used for the study. Paderu division was purposively selected as coffee is extensively cultivated in this division. This division occupies first place both in area and production in Visakhapatnam district. Six mandals namely G. k Veedhi, Chintapalli,G.madugula,

Paderu, Hukumpeta and Dumriguda were purposively selected as they occupy the first six positions in area under coffee.Three villages from each mandal were selected based on highest area under coffee plantation. The coffee growing tribal farmers of the selected villages were listed in each village along with their operational holding and arranged in descending order and five coffee growing tribal farmers were randomly selected to make a sample of 90 respondents for the study.

Financial Feasibility Analysis

The life of coffee was assumed to be 40 years. However for computing costs and returns per ha of coffee garden based on the opinion of sample producers economic life was considered as 25 years (Noormahayu*et.al*2009).In this study the financial returns of coffee was estimated by considering the income from coffee and income from inter crop. This did not include any externalities. The cost taken into account was establishment cost, input cost and labour cost. Establishment cost incurred during the first year of planting include cleaning and preparation of land, cost of seedling and cost of planting *i.e.* digging, filling and planting and fencing. The input costs included fertilizer cost, pesticide chemicals cost, *etc*. labour cost incurred on fertilizing, harvesting, *etc.*

Evaluation of investments

Discounted cash flow technique is employed in evaluating long term projects in agriculture. These measures are advocated as tools to evaluate and find out the worthiness of an investment, especially those of long term projects. The measures used in the analysis are Net present value (NPV), Benefit cost ratio (BCR), internal rate of return (IRR) and Sensitivity analysis.

Net present worth

The net present worth is simply the present worth of net benefit of a project discounted at the opportunity cost of capital. The criterion ranks the alternatives. Generally, the higher the net present worth better would be the preference. In computing net present worth, the difference between the present value of cost and benefits was discounted at 11 per cent, as this is the present prevailing bank rate of interest on working capital.

NPW = Present worth of benefits – Present worth of costs

$$NPW=\sum_{t=1}^{n}\frac{B_t-C_t}{(1+i)^t}$$

Where,

B_t = Benefits in each year
C_t = Costs in each year
t = 1, 2, 3…….n (based on year of establishment)
n = Number of years
i = Discount rate

In order to select the project or to consider the worthiness of a project investment, the net present worth should be positive.

Benefit Cost ratio

It is the ratio of discounted cash inflows and cash out flows which must be unity or more for an enterprise to be considered worthwhile. The minimum ratio required is 1:1, which indicates the coverage of costs without any surplus benefits. But, usually the ratio should be more than unity in order to provide some additional returns over the costs for clear decision.

$$BCR=\frac{\sum_{t=1}^{n}\frac{B_t}{(1+i)^t}}{\sum_{t=1}^{n}\frac{C_t}{(1+i)^t}}$$

$$BCR=\frac{\text{present worth of benefits}}{\text{present worth of costs}}$$

Where,

B_t = Benefit in each year
C_t = Costs in each year
t = 1, 2, 3 …….n (based on year of establishment)
n = Number of years
i = Discount rate

Internal rate of return

The internal rate of return is the rate of return which equates the present worth of benefits to present worth of costs, which means the net present worth is zero. This represents the average earning capacity of an investment from the project.

IRR = = 0 or NPW= 0

Where,

B_t = Benefits in each year
Ct = Costs in each year
t = 1, 2, 3 …….n (based on year of establishment)
n = Number of years or life period
i = Discount rate

The internal rate of return is arrived by interpolation technique using different discount rates so as to see that the net present worth is equated to zero. The interpolation formula employed in this study is as follows

$$IRR = \left[\begin{array}{c}\text{lower}\\ \text{discount}\\ \text{rate}\end{array}\right] + \left[\begin{array}{c}\text{difference}\\ \text{between the two discount}\\ \text{rates}\end{array}\right] \times \left[\frac{\text{Net present worth of the cash flow at lower discount rate}}{\text{absolute difference between Net present worth s of the cash flow at the two discount rates}}\right]$$

The internal rate of returns also ranks the different investment proposals for preference in the order of the magnitude. The IRR should be more than the discount rate to be considered for viable investment and financial soundness.

Sensitivity analysis

The financial indicators provide convenient indices for assessing financial performance, but the disadvantage is that all of them are static. In the real world, factors that affect them vary. Particularly when these changes are in the pessimistic direction, the conclusions of the analysis in terms of viability of project will no longer hold. Therefore it is better to calculate the financial indicators using different values in order to explore how robust the financial performance of coffee cultivation is under changing market conditions. This process is known as sensitivity analysis and it enables to estimate the financial risks associated with such developments.

This analysis involves evaluation of the financial indicators assuming defined percentage or absolute changes in the relevant inputs considered (Maheswararao, U.,T. 2015). In this study the analysis is carried out by recalculating NPV, BCR and IRR for various assumed changes in the crucial factors listed above, for example a 10, 20, 30, per cent increase in some or the entire project costs and 10, 20, 30, percent decrease in selling price.Comparing the resulting changes in the values of the financial indicators gives insights into how sensitive the project is to changes in each of the factors.

RESULTS AND DISCUSSION

Economic Feasibility and Financial Viability of Coffee Plantations

The cost and returns are not the perfect measures to assess the profitability from investment made on coffee. These cost and returns are not comparable with the returns from field crops that are grown in the area.

Before making a choice on any enterprise, it becomes necessary to examine the economic feasibility of that enterprise. Several techniques are available for evaluating the economic viability of coffee plantation. NPW, BCR, and IRR were employed to examine the economic feasibility of investment on coffee plantation.

To evaluate the financial performance of coffee plantation, a spread sheet model was constructed to describe the revenue and costs associated with coffee plantation over 25 years(Noormahayu*et.al*2009). It was considered suitable to determine the cash flow. In the present study the cost and returns had been discounted at 11% to estimate the net present value of future returns. The results of NPV, BCR and IRR values calculated per hectare are presented in Table 1

Table 1. Economic viability of coffee plantation

	Particulars	Cost of capital (11%)
1	NPV (Rs./ha)	243136.97
2	BCR	2.03
3	IRR (%)	26.39

It can be observed from the table 1, that the NPV was highly positive with Rs.2,43,136.97 per hectare at 11 per cent discount rate. This indicates that the investment in coffee plantation was economically feasible and financially sound.

Benefit cost ratio of 2.03 at 11 per cent opportunity cost of capital, indicates that the investment on coffee plantation was economically feasible and financially viable.

Internal rate of return (IRR) was 26.39 %, which was two times greater as compared to the present cost of capital. This indicates the investment in coffee plantation was economically feasible and profitable. The payback period was 9 years. These results were similar with the results of Poudel*et al.* (2009).

Sensitivity Analysis

Estimated values of NPV, BCR, and IRR with increase in total variable cost and decrease in selling price at 10, 20 and 30, per cent are presented in Tables 2.and 3,and illustrated in Fig 1 and 2.

The table 2 reveals that the estimated values of NPV, BCR and IRR values indicate that coffee is financially feasible and economically viable project under different risk scenario like 10, 20 and 30 per cent increase in cost.

Table 2. Estimation of NPV, BCR and IRR with changes (increase) in total variable cost

S. No.	Conditions (change in total variable cost)	Expected results		
		NPV (Rs.)	BCR	IRR
1	10% cost increased	219588.3	1.85	24.27
2	20% cost increased	196040.01	1.69	22.37
3	30% cost increased	172492.12	1.56	20.62

Table 3. Estimation of NPV, BCR and IRR with change (decrease) in selling price

S. No.	Conditions (change in selling price)	Expected results		
		NPV (Rs.)	BCR	IRR
1	10% decreased in selling price	195274.68	1.83	24.04
2	20% decreased in selling price	147413.38	1.62	21.49
3	30% decreased in selling price	40141.96	1.42	18.62

Table 4. Summary of financial indicators under sensitivity analysis of coffee

S. No.	Conditions	Expected results			Interpretation
		NPV (Rs.)	BCR	IRR	
1	10% cost increased, 10% decreased in selling price	171726.97	1.66	21.96	Economically profitable
2	10%cost increased, 20% decreased in selling price	123865.68	1.4	19.44	Economically profitable
3	10% cost increased, 30% decreased in selling price	76004.48	1.29	16.59	Economically profitable

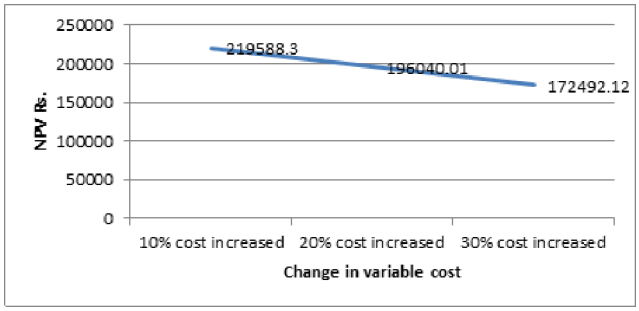

Fig. 1 NPV with increase in total variable cost

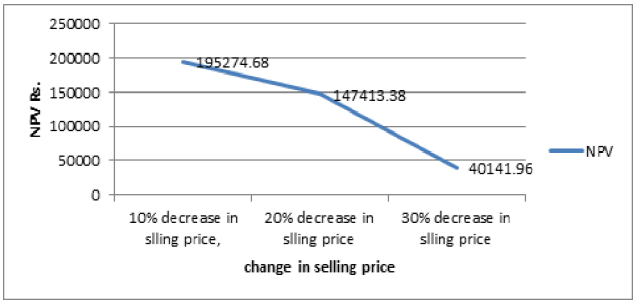

Fig. 2 NPV with decrease in selling price

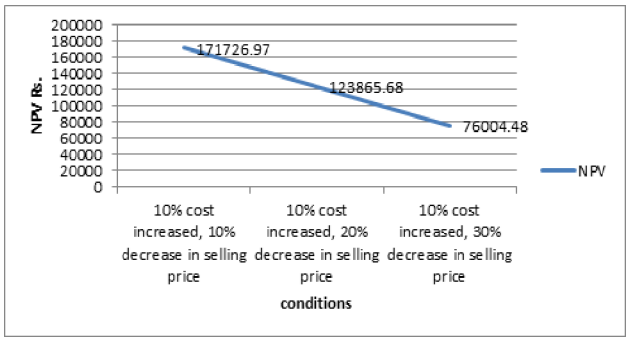

Fig. 3 NPV with increase in total variable cost and decreasing selling price

From the above Table 3, the instabilities in the coffee benefits can be sharpened by the reverse approach of diminishing the foreseen coffee benefits at 10, 20 and 30 percentages. The registered NPV and BCR proportions demonstrate that the coffee cultivation can withstand instabilities. The NPV and BCR even at 30 per cent decline in selling price in the coffee, represented positive value of NPV and BCR of more than one.

The Table 4 reveals that cost increment but with the possibility of price reduction up to 30% will also permit to cultivate coffee in the study area.The sensitivity analysis showed that change in selling price in coffee was more sensitive than change in total cost.

CONCLUSION

The results pointed out that coffee production in Paderu division was suitable enterprise for income generation. The practical part calculates the NPV, BCR and IRR of coffee for 25 years long period with incorporation of 11% discount rate the present value of total cost is Rs. 27,674.22. The NPV of the coffee is positive at Rs. 2,43,136.97 and indicates that this investment is good and profitable, BCR was 2.03, IRR 26.39%. NPV, BCR and IRR values indicate that coffee is financially feasible and economically viable project under different risk scenario like 10, 20 and 30 per cent increase in cost.The sensitivity analysis shows that change in selling price of coffee is more sensitive than change in total cost. Selling price of coffee beans depends on world level production, demand, supply and price behavior of coffee; these factors mainly affect the domestic price behavior.

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