



Study on Cost of Cultivation and Economic Returns from Chilli Crop Growing Districts of Telangana, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i92391

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

<https://www.sdiarticle5.com/review-history/101855>

Original Research Article

Received: 02/05/2023

Accepted: 05/07/2023

Published: 21/07/2023

ABSTRACT

Study was done to work out the cost of cultivation, returns and benefit cost ratio of chilli crop growing districts of Telangana for Agricultural year 2019-2020. India is one among the world's largest producer, most of the consumption takes place within the country and it is the best exporter of chilli throughout the world. The study is based on primary data and the total number of 120 farmers treated as respondents and had been selected from all four categories of farmers by adopting proportion allocation with simple random sampling without replacement method with the objective of cost of cultivation and economic return from chilli grower B:C ratio of chilli in the study area. In this the study says that the overall average total cost of cultivation is Rs. 328225.25. The study reveals that returns in chilli cultivation increases with the increase of the farm size and the

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overall benefit-cost ratio are 2.41. The average cost, of cultivation per hectare of overall basis, was found to have 147024.50 (costA₁) followed by Rs.150625.25 (costB₁); Rs.29600.2 (costB₂); Rs. 182850.25 (cost C₁); Rs. 328225.25 (costC₂); Rs. 361047.78 (CostC₃) has been noted consequently. The average yield was found to be 72.00 quintals per hectare. The overall gross income per hectare was observed to be Rs. 872250.00 per hectare. Study implies the B.C ratio increases with the increase in the size of the holding.

Keywords: B: C ratio; chilli; cost of cultivation; production; returns.

1. INTRODUCTION

In India Chilli is one of the important commercial crops, almost all the states of India were cultivating the chillies. India is one among the world's largest producer, most of the consumption takes place within the country and it is the best exporter of chilli throughout the world after India China, Thailand, Ethiopia and Indonesia. The chillies of India are world-famous for two main reasons one is for their pungency levels and the second one is quality of fruit colour. Indian chilli is exported to many Asian countries they are Vietnam, Bangladesh, Thailand, Sri Lanka and U.A.E. "Naga Jolokia" is a variety of chilli which is considered as world's Number one hottest chilli with the high level of pungency which is grown in Tezpur district of Assam state in India [1-3].

The Red chillies are well known for its sharp acidic flavours and colour. Crushing of the dried pods of fruit gives chilli powder. The nutritive value of chilli is excellent, contains vitamins A and C [4-8]. Green chillies consist of the high amount of proteins, calcium, magnesium, copper and sulphur. Vitamins like Vitamin C, Riboflavin and Thiamine. Chilli is the main key ingredient in different cuisines across the nations for its pungency, flavour and gives colour to the food [9-12].

Teja chilli is a fine variety of Guntur chilli. It is the one of the popular variety of chilli in the world and most exported one in the country [13,14]. It is widely grown in Khammam, Guntur, and Warangal districts of India. The fruit skin of crushed Teja chilli is bright red and hot. It is mainly grown under irrigated as well as rain-fed conditions. In which 90 per cent of the chilli variety grown in this study region is "TEJA". It is one of the hottest chillies in the country with a fiery red colour. It is commonly exported as dried chilli and powdered form [15,16]. This variety produces massive yields when mature. The study was been confined to Khammam district. In this district Gross area sown was 2, 23,251ha and Area insured 23846 ha (Kharif) 3864.72 Ha

(Agricultural Crops in Rabi) 20484 Trees (Horticultural Crops in Rabi). This investigation was done to work out the cost and returns of chilli cultivation and B:C ratio of chilli in the study area.

2. MATERIALS AND METHODS

In this reaesrch paper the study was been confined to Khammam district. Multistage random sampling method has been used to select samples. At the first stage of sampling Khammam district of Telangana state was selected purposively because it ranks 1st in the production of chilli. Same as B. Raja Madhu Shaker et al [17]. At the second stage of sampling, In Khammam district, there are a total of five agricultural Divisions. They are Palair, Khammam, Madhira, Wyra, Sathupalli. In which Palair division was selected due to the highest area and production under chilli, comparatively more than other four divisions. Palair division has a total of five mandals (Kusumanchi, Mudigonda, Khammam rural, Tirumalayapalem, and Nelakondapally). At the third stage of sampling out of five mandals, Kusumanchi Mandal was selected purposely based on second highest production of chilli and the researcher herself has worked under this Mandal so that the data will be collected more realistic for analysis. At the fourth stage of sampling, from the selected Mandals list of chilli cultivated villages has been prepared. And from this list, five villages were randomly selected with simple random sampling and they are Nelapatla, Loukyathanda, Pocharam, Dharmathanda, Gurvayiagudem. At the last stage of sampling, from the selected five villages a separate list of chilli growers was been prepared, and classified into four categories viz, The total number of 120 farmers treated as respondents and had been selected from all four categories of farmers by adopting proportion allocation with simple random sampling without replacement method. The secondary data has collected the particulars of Area, Production and Productivity of chilli district wise, The data was available from 2008-13 and due to the unavailability of the appropriate district-wise data

from 2013-19 the analysis of compound growth rate was done for the total area, production, and productivity of Telangana. And the source of the data was the Directorate of economics and statistics, Government of Telangana; Indian Agristat. The data was been collected for the Agricultural year 2019-2020.

2.1 Cost Concepts

The cost of cultivation will be used in this study. The cost concepts are given below:

Cost A₁: It includes: -

- Value of hired human labour,
- Value of hired and owned bullock labour,
- Value of hired and owned machinery labour,
- Value of owned and purchased seed,
- Value of fertilizers, manures and chemicals,
- Value of insecticide and pesticides,
- Expenditure on irrigation,
- Land revenue and taxes,
- Interest paid on crop loan if taken,
- Depreciation on farm assets excluding land,
- Interest on working capital,
- Miscellaneous expenses.

Cost A₂: Cost A₁ + rent paid for leased inland

Cost B₁: Cost A₂ + interest on the value of owned fixed capital assets. (excluding land)

Cost B₂: Cost B₁ + rental value of owned land

Cost C₁: Cost B₁ + imputed value of family labour

Cost C₂: Cost B₂ + imputed value of family labour

Cost C₃: Cost C₂ + 10 per cent of cost C₂ as managerial cost.

2.2 Profitability Concepts

These are defined as under: -

Gross income: It is defined as the total value of main product + by product.

Net farm income (NFI) = Gross income – Cost C₃ (total cost)

Family labour income (FLI) = Gross income – Cost B₂

Farm business income (FBI) = Gross income – Cost A₁

B: C ratio (Benefit-cost ratio) = Gross income/ Gross expenses

3. RESULTS AND DISCUSSION

The cost of chilli cultivation was analyzed by primary data collected from the questioner and the data analyzed through the information given by the chilli cultivators the cost and returns must be calculated to identify aspects where farmer investments are more and overall analysis of the cost incurred in the cultivation aspects.

3.1 Land Use Pattern of Chilli Growers

In Table 1 exhibits that the size of land holdings of various farmer groups range with an average of 0.55 to 12.60 ha. On an overall average of 5.40 ha is identified and the total net cultivated area is 95.71 per cent of all the farm groups.

We can also see that the net sown area was observed 98.18 per cent in marginal farmers 95.29 per cent in small farm group; 90.91 per cent in medium farm group and 85.15 per cent in a large group of farmers. And the least observed in large farmers and the highest is marginal farmers are noted respectively.

The net irrigated area was 100 per cent in all categories of farmers this is because this belt has a reservoir in the region and mostly 90 per cent through canal irrigation and 10 per cent through the bore and tube well so by this we can say that the region is completely irrigated.

3.2 Cost of Cultivation of Chilli

We can observe from the Table 2 in labour cost, Family human labour, Hired human labour, Machine power were included. Overall family human labour cost was 11.48 percent and in the four categories of farmers according to size of farm maximum i.e.17.65 percent of family human labour cost was observed in marginal farmers followed by 12.67 percent in small farmers, 6.46 percent in medium farmers and 4.31 percent in large farmers. Overall hired family labour cost was observed 16.55 percent and maximum hired human labour cost was calculated in large farmers i.e.23.17 percent followed by 22.26 percent in medium farmers, 16.63 percent in small farmers and lowest 12.09 percent in marginal farmers. Again in Total labour cost overall machine power was 4.46 percent of total machine power cost and maximum machine power cost was 4.74 percent in marginal farmers followed by 4.70 percent in small farmers, 4.54 percent in medium farmers and 4.31 percent in large farmers.

Table 1. Land use pattern of chilli growers of different size of farm groups

Particulars	Size of farm				Overall
	Marginal	Small	Medium	Large	
Total landholding	0.55 (100)	2.55 (100)	5.91 (100)	12.60 (100)	5.40 (100)
Cultivated land	0.54 (98.18)	2.43 (95.29)	5.61 (94.76)	11.92 (94.6)	5.13 (95.71)
Un-cultivated land	0.01 (1.82)	0.12 (4.71)	0.31 (5.24)	0.68 (5.4)	0.28 (4.29)
Net area is sown	0.53 (98.15)	2.39 (98.35)	5.1 (90.91)	10.15 (85.15)	4.54 (88.63)
Current fellow land	0.01 (1.85)	0.04 (1.65)	0.51 (9.09)	1.77 (14.85)	0.58 (11.37)
Irrigated area	0.43 (100)	2.39 (100)	5.1 (100)	10.15 (100)	4.52 (100)

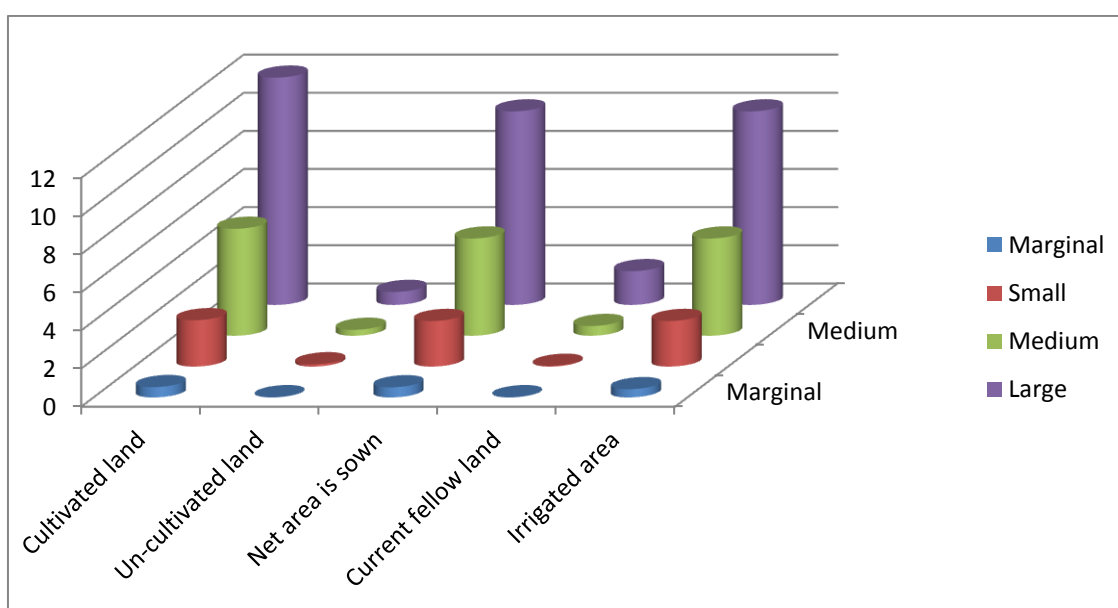


Fig. 1. Bar graph showing land use pattern of chilli growers of different farm size

In material cost, cost of seed, Fertilizer & Manures, Plant protection, Irrigation charges and Interest on working capital (4%) were included. Overall seed cost was 2.19 percent, Fertilizer & Manures was 7.47 percent, Plant protection 5.55 percent, Irrigation charges 0.27 percent and Interest on working capital (4%) was 1.55 percent. It shows in the study area in material cost maximum amount of money spent on Fertilizer & Manures, followed by Plant protection seed cost Interest on working capital (4%) and Irrigation charges.

The figures noted in Table 2 disclose that whatever the farm size of farm groups, the total cost of cultivation of chilli of sample farms have been noted on the overall average basis as Rs. 361047.78 per hectare; the total variable cost

was 53.81% and the share of labour cost was found to be the topmost is 32.49% accompanied by material cost 21.32%; interest on working capital is 1.55% and the fixed cost is 45.39%. The rental value of land is 44.29% and interest on fixed capital 0.63% and the share of machine power is 4.20% respectively.

3.3 The Aggregate Cost of Chilli Production

Table 3 shows The Aggregate Cost of Chilli Production and we can see from table maximum cost A1 was observed in large farmers i.e. 178204 Rs./ha followed by 163310Rs./ha was in medium farmers, 133952 Rs./ha in small farmers and lowest i.e. 112632 Rs./ha in marginal farmers. Cost A1 and A2 were same. The

maximum cost B1 was observed in large farmers i.e. 182166 Rs./ha followed by 167225 Rs./ha was in medium farmers, 137364 Rs./ha in small farmers and lowest i.e. 115746 Rs./ha in marginal farmers. The maximum cost B2 was observed in large farmers i.e. 352674.33 Rs./ha followed by 318475 Rs./ha was in medium farmers, 273064 Rs./ha in small farmers and lowest i.e. 239787.67 Rs./ha in marginal farmers. The maximum cost C1 was observed in large farmers i.e. 198066 Rs./ha followed by 189225 Rs./ha was in medium farmers, 176964 Rs./ha in small farmers and lowest i.e. 167146 Rs./ha in marginal farmers. The maximum cost C2 was observed in large farmers i.e. 291187.67 Rs./ha followed by 312664 Rs./ha was in medium farmers, 340475 Rs./ha in small farmers and

lowest i.e. 368574.33 Rs./ha in marginal farmers. The maximum cost C2 was observed in large farmers i.e. 405431.77Rs./ha followed by 374522.50 Rs./ha was in medium farmers, 343930.40 Rs./ha in small farmers and lowest i.e. 320306.43Rs./ha in marginal farmers.

From Table 3 it has been observed that the cost of cultivation of chilli showed that on an average cost, of cultivation per hectare of overall basis was found to have cost A1 147024.50 followed by Rs.150625.25 (cost B1), Rs.29600.25 (cost B2); Rs.182850.25 (cost C1); Rs. 328225.25 (cost C2); Rs. 361047.78 (Cost C3) has been noted consequently. Study were similar to P.P. Jagtap, U.S. Shingane and K.P. Kulkarni [18].

Table 2. Cost of cultivation of chilli on different size of farm groups (Rs/ha)

Particulars	Size of farm				Overall
	Marginal	Small	Medium	Large	
Labour Cost					
Family human labour	51400 (17.65)	39600 (12.67)	22000 (6.46)	15900 (4.31)	37666.67 (11.48)
Hired human labour	35200 (12.09)	52000 (16.63)	75800 (22.26)	85400 (23.17)	54333.33 (16.55)
Machine power	13800 (4.74)	14700 (4.7)	15450 (4.54)	15900 (4.31)	14650 (4.46)
Total labour cost	100400 (34.48)	106300 (34)	113250 (33.26)	117200 (31.8)	106650 (32.49)
Material cost					
Seed cost	6250 (2.15)	6800 (2.17)	7500 (2.2)	8150 (2.21)	7175 (2.19)
Fertilizer & Manures	22700 (7.8)	23400 (7.48)	25100 (7.37)	26900 (7.3)	24525 (7.47)
Plant protection	17050 (5.86)	17850 (5.71)	18750 (5.51)	19250 (5.22)	18225 (5.55)
Irrigation charges	800 (0.27)	850 (0.27)	925 (0.27)	950 (0.26)	881.25 (0.27)
Interest on working capital (4%)	4332 (1.49)	5152 (1.5)	6185 (1.65)	6854 (1.69)	5630.7 (1.55)
Total material cost	63632 (21.85)	67252 (21.51)	72060 (21.16)	76904 (20.87)	69962 (21.32)
Fixed cost					
Depreciation	1380 (0.47)	1470 (0.47)	1545 (0.45)	1590 (0.43)	1496.25 (0.46)
Land revenue	30 (0.01)	30 (0.01)	30 (0.01)	31 (0.01)	30.25 (0.01)
The Rental value of own land	124041.67 (42.6)	135700 (43.4)	151250 (44.42)	170508.33 (46.26)	145375 (44.29)
Interest on fixed capital	1704 (0.59)	1912 (0.61)	2340 (0.69)	2341 (0.64)	2074.25 (0.63)
Total fixed cost	127155.67 (43.67)	139112 (44.49)	155165 (45.57)	174470.33 (47.34)	148975.75 (45.39)
Total Cost	291187.67 (100)	312664 (100)	340475 (100)	368574.33 (100)	328225.25 (100)

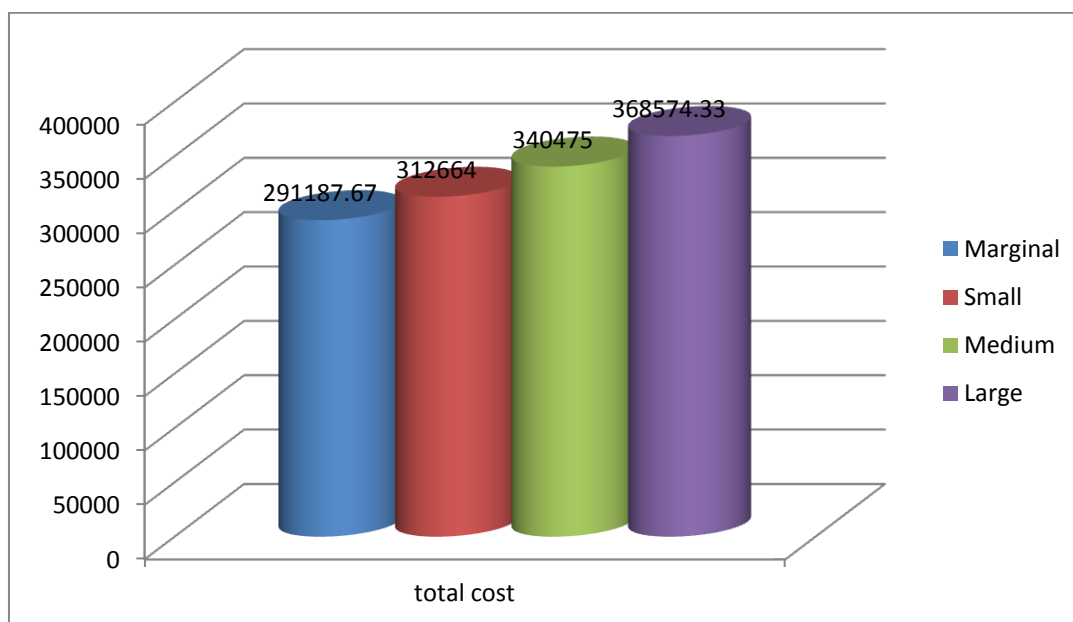


Fig. 2. Bar graph showing cost of cultivation of chilli on different farm size (Rs/ha)

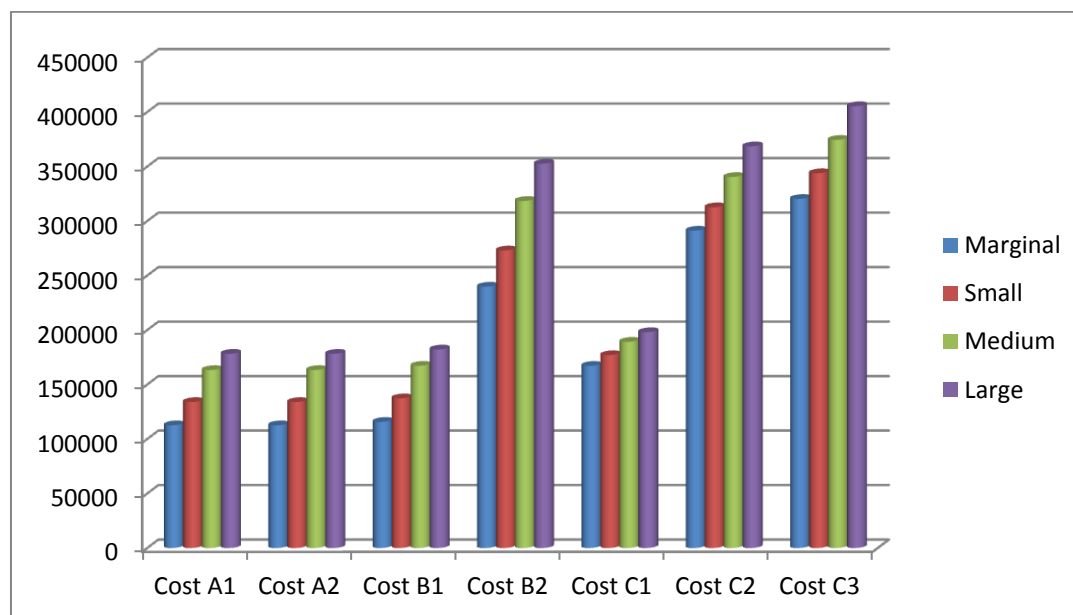


Fig. 3. Bar graph showing aggregate cost of chilli on different farm size (Rs/ha)

Table 3. Aggregate cost of chilli on different size of the farm groups (Rs/ha)

Particulars	Size group				Overall
	Marginal	Small	Medium	Large	
Cost A1	112632.00	133952.00	163310.00	178204.00	147024.50
Cost A2	112632.00	133952.00	163310.00	178204.00	147024.50
Cost B1	115746.00	137364.00	167225.00	182166.00	150625.25
Cost B2	239787.67	273064.00	318475.00	352674.33	296000.25
Cost C1	167146.00	176964.00	189225.00	198066.00	182850.25
Cost C2	291187.67	312664.00	340475.00	368574.33	328225.25
Cost C3	320306.43	343930.40	374522.50	405431.77	361047.78

3.4 The Productivity of Chilli

From Table 4 it has been observed that the average yield was found to be 72.00 quintal per hectare. Data observed that the average yield on different size of holdings was found to be 79.00 quintals per hectare on large size is the highest yield followed by 75.00 quintals per hectare on medium size followed by 69.00 quintals per hectare on small size followed by 65.00 quintals per hectare on the marginal size of land holding.

3.5 The Profitability of Chilli Cultivation

Gross income per hectare of chilli production received dissimilitude in different size group. This was due to different quantity of yield per unit crop area and market price received based on the quality and quantity of crop, place of marketing, grading and drying aspects and the time of distributions.

The overall gross income per hectare was observed to be Rs. 872250.00 per hectare. The highest gross return of chilli cultivation was registered by large growers Rs. 1023050.00 per hectare on large size accompanied by medium growers RS. 907500.00 And then by small growers Rs. 814200.00 and later noticed by marginal growers Rs. 744250.00.

The net income is the real income noted in the chilli growers and it was found to be an average of Rs.511202.23 per hectare. The maximum net return of chilli cultivation was obtained in large group growers Rs. 617618.23 per hectare followed by medium group growers Rs. 532977.50 per hectare accompanied by small group growers Rs.470269.60 per hectare followed by marginal group growers Rs. 423943.57 per hectare.

The tendency of net income in chilli cultivation express that it increases with the increase in the size of the farm group. The other profitability measures considered on an average of the chilli growers obtained Rs.576249.75 as family labour income, Rs. 725225.50 as farm business income. The present findings are also supported by Ruchira [19] who also reported higher return from chilli cultivation.

The B.C ratio dictates the return per rupee investment. Data shows that the chilli growers realized on an average of 2.41 as B.C ratio in chilli production.

The B.C ratio was found to be varied in different size of holding and it was maximum 2.52 in large group size accompanied by 2.42 medium group sizes and then by 2.37 small sizes group next by 2.32 of marginal size group of chilli growers this implies the B.C ratio increases with the increase in the size of the holding.

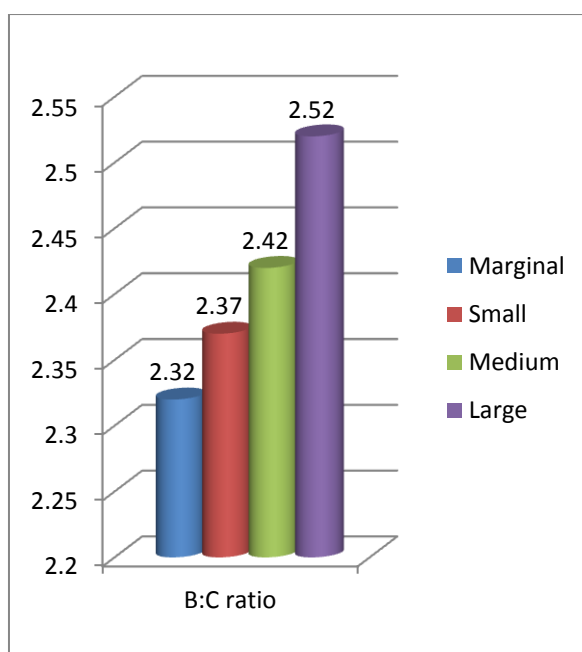


Fig. 4. Bar graph showing productivity of chilli on different farm size A(q/ha)

Table 4. Productivity of chilli on different size of farm groups (q/ha)

Particulars	Size group				
	Marginal	Small	Medium	Large	Overall
The actual main yield(q/ha)	65.00	69.00	75.00	79.00	72.00
Price of the main product (Rs/q)	11450	11800	12100	12950	12075.00
Value of Main Product (Rs)	744250.00	814200.00	907500.00	1023050.00	872250.00

Table 5. Profitability of chilli on different size of holding (Rs/ha.)

Particulars	Size group				
	Marginal	Small	Medium	Large	Overall
Gross income	744250.00	814200.00	907500.00	1023050.00	872250.00
Net farm income	423943.57	470269.60	532977.50	617618.23	511202.23
Family labour income	504462.33	541136.00	589025.00	670375.67	576249.75
Farm business income	631618.00	680248.00	744190.00	844846.00	725225.50
Farm investment income	549689.23	607881.60	686567.50	790467.57	658651.48
Cost of production (Rs./q)	4927.79	4984.50	4993.63	5132.05	5009.49
B.C Ratio	2.32	2.37	2.42	2.52	2.41

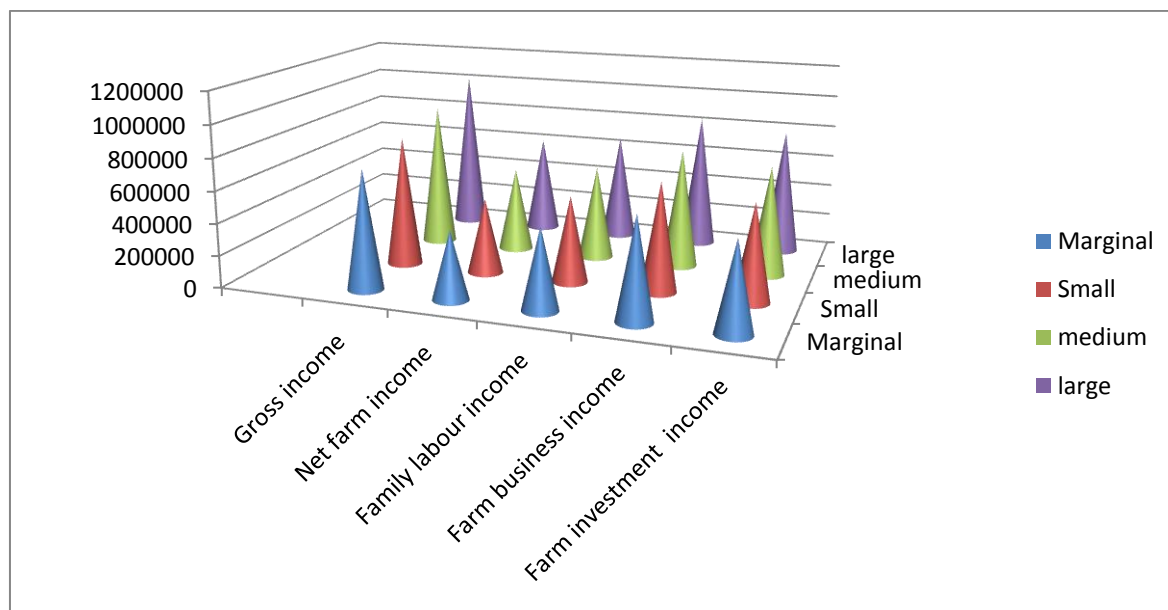


Fig. 5. Bar graph showing Profitability of chilli on different size of holding (Rs/ha.)

This complete study says that the B:C ratio or return per rupee investment of the chilli growers was determined as 2.41. This was also observed in the research of James Tsopoe and Nchumthung Murry [20].

4. CONCLUSION

The study of cost and returns implies nothing but an idea about the amount invested in the cultivation aspects of chilli and this will be using full to identify the areas where farmers have to less their investments and where they can improve their investment so that by they can gain more profits.

In this the study says that the overall average total cost of cultivation is 328225.25 and in which the Total Labour cost was 106650; Total Material Cost was 69962; Total fixed cost was 148975.75 and in which the highest cost is applied to fixed cost and it is to be considered and steps to be taken to reduce the fixed cost.

Similar, Jagtap et al. [18] the overall Aggregate cost of chilli on different size land holdings was Cost A1/A2 147024.50 and cost B1 was 150625.25, cost B2 was 296000.25, cost C1 was 182850.25, cost C2 was 328225.25, cost C3 was 361047.78 was found respectively.

The study reveals that returns in chilli cultivation increases with the increase of the farm size and the overall benefit-cost ratio are 2.41. Similar to the present findings were noted in the Gangaiah (2018), Olayiwola [21].

The total cost of cultivation of chilli of sample farms has been noted on the overall average basis as Rs. 361047.78 per hectare; the total variable cost was 53.81% and the share of labour cost was found to be the topmost is 32.49% accompanied by material cost 21.32% interest on working capital is 1.55% and the fixed cost is 45.39%. The rental value of land is 44.29% and interest on fixed capital 0.63% and the share of machine power is 4.20% respectively.

The average cost, of cultivation per hectare of overall basis, was found to have 147024.50 (costA₁) followed by Rs.150625.25 (costB₁); Rs.29600.25 (costB₂); Rs.182850.25 (cost C₁); Rs. 328225.25 (costC₂); Rs. 361047.78 (CostC₃) has been noted consequently.

The average yield was found to be 72.00 quintals per hectare Data showed that the average yield on different size of holdings was found to be maximum 79.00 quintals per hectare on large size followed by 75.00 quintals per hectare on medium size followed by 69.00 quintals per hectare on small size followed by 65.00 quintals per hectare on marginal size of the holding.

The overall gross income per hectare was observed to be Rs. 872250.00 per hectare. The highest gross return of chilli cultivation was registered by large growers Rs. 1023050.00 per hectare on large size accompanied by medium growers RS. 907500.00 and then by small growers Rs. 814200.00 and later noticed by marginal growers Rs. 7442500.00.

The B.C ratio was found to be varied in different size of holding and it was maximum 2.52 in large group size accompanied by 2.42 medium group sizes and then by 2.37 small group size next by 2.32 of marginal size group of chilli growers on an average of 2.41 as B.C ratio in chilli production. This implies the B.C ratio increases with the increase in the size of the holding.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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