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Cost of cultivation and C:B ratio of chilli in irrigated and unirrigated land in Khargone district of Madhya Pradesh

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Abstract

In present study, multi stage sampling technique was used for drawing the sample. Khargone block in Khargone district was selected purposively due to large area under chilli cultivation. From each block 10 villages were selected randomly and from each villages 90 farmers were selected randomly using proportional allocation i.e. small farmer less than 2 ha, medium farmer (2-4 ha.), large farmers more than 4 ha. The primary data was collected from selected respondents using pre-tested questionnaire, through survey method. Each selected respondents was approached personally for recording relevant data. Appropriate statistical and economic tools were employed to analyze the collected data. Study revealed that, on an average yield was found to be 4.70 quintal per hectare in irrigated condition over unirrigated and also additional net income Rs.21425 per hectare was found in irrigated condition over unirrigated. Although, the return over per rupee investment was higher in irrigated condition but it is very nominal.

Keywords: Cost of cultivation, c:b ratio, chilli, irrigated, unirrigated land, etc.

Introduction

Chilli is considered as one of the commercial spice crops. It is the most widely used universal spice, named as wonder spice in daily life, chillies are integral and the most important ingredient in many different cuisines around the world as it adds pungency, taste, flavour and colour to the dishes. Some varieties are famous for the red colour because of the Capsanthin pigment and others are known for biting pungency attributed to capsaicin. Chilli is used as an essential condiment in foods for its pungency and red colour. Besides these properties chilli is a rich source of Vitamins A, C, E and P and has certain medicinal properties (Saleh *et al.*, 2014) [2]. Chili peppers are rich in many minerals, vitamins and amino acids essential for human health and growth (Pawar *et al.*, 2011) [5]. They also are very high in potassium, magnesium, iron and rich in calcium and phosphorus (Abdul Salam SGS, 2015) [6]. India is the world's largest producer, consumer and exporter of chillies in the world. India is the world leader in chilli production followed by China, Thailand, Ethiopia and Indonesia. Indian chilli is considered to be worlds famous for two important commercial qualities of color and pungency level. Indian chilli is mainly exported to Asian countries like Vietnam, Thailand, Sri Lanka, Bangladesh and U.A.E. Chilli contributes 40-42 per cent of total spices exported from India (Jagtap *et al.*, 2014) [1]. In India, major Chilli producing states are Andhra Pradesh, Telangana, Tamil Nadu, Karnataka and Madhya Pradesh. Telangana is the largest producer of chilli among other states across India contributing about 33 percent to the total chillii production in the country, while Karnataka ranks second followed by Madhya Pradesh ranking third. Kerala contributes 96 percent of the total black pepper production in the country. Karnataka and Kerala alone grow 90 percent of small cardamom (More U, 2019) [3]. The State of Madhya Pradesh is gifted with a wide range of agro-climatic conditions which enables the production of chilli throughout the year for maintaining a continuous supply of fresh demand (Madariya R, 2015) [4]. These off season chilli are in great profitable demand in home market as well as in the city. The farmers can get maximum profit with proper marketing system. If farmers are getting higher productivity with irrigated condition, then there may be also higher marking surplus. Chilli is one of the most important cash crop of Khargone district after cotton. Chilli cultivation area and production are increasing in the district year by year. One of the largest chilli mandi is situated here in Khargone distict at Bediya near Sanawad. The problems of chilli growers are numerous but the main are realizing low productivity with utilization of scares resource condition and low marketing price due to unavailability of proper marketing system. The chilli production profitability in different situation i.e. irrigated and unirrigated and the marketing system in rural areas have not been studied in a systematic way

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even though number of studies have been conducted in the state and country with other objects. Taking above views the present study was therefore, under taken "A Study on Cost of cultivation and C:B ratio of chilli in irrigated and unirrigated land in Khargone district of Madhya Pradesh

Materials and Methods

For the study, a multi stage sampling technique was employed in selection of the block, villages and sample. Khargone block in Khargone district was selected purposively due to large area under chilli cultivation and well known area by researcher which was made convenience in data collection. From this block, ten villages were selected randomly. The sample size for the study was 90 farmers randomly selected from ten villages. The samples were drawn from the list of farmers according to the size of land holding, who having more area under chilli crop to their total cropped area. The chilli producing farmers were categorized as small (<2 ha.), medium (2 to 4 ha.) and large (above 4 ha.), based on land holding size of the farmers. The data on different aspects were collected through pre-tested interview schedule. Each of the selected sample chilli growers was approached personally for recording relevant data. The data were collected using survey method.

Table 1: The detail of farmers' allocation

| S. No. | Size group | Total farmers | No. of selected farmers |
|--------|-------------------------|---------------|-------------------------|
| 1. | Small farmer (< 2 ha.) | 90 | 18 |
| 2. | Medium farmer (2-4 ha.) | 200 | 40 |
| 3. | Large farmers (> 4 ha.) | 160 | 32 |
| 4. | Total | 450 | 90 |

Analytical procedure

Collected data were edited and checked for their adequacy and accuracy. Keeping in view classified and tabulated data were further processed in terms of average and percentage to arrive at conclusive figures for interpretation of data. In present study following statistical and econometrics tools were used.

Cost concepts

The cost of cultivation classified as recommended, —Special expert committee on cost estimates, GOI, New Delhi, was 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 chemical,
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: It includes:

Cost A1 + rent paid for leased in land

Cost B1: It includes:

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

Cost B2: It includes:

Cost B1 + rental value of owned land

Cost C1: It includes:

Cost B1+ imputed value of family labour

Cost C2: It includes:

Cost B2 + imputed value of family labour

Cost C3: Cost C2 + 10 percent of cost C2 to account for managerial input of the farmer.

Result

Cost of cultivation of chilli in irrigated and unirrigated land.

A study of economics of chilli cultivation is important to find out their profitability in order to choose best alternative resources, cultivation practices and scale of production etc. Secondly, it gives an estimate of the amount, (financial requirement) for cultivating with irrigated and without irrigated chilli cultivation. It is well known fact that profitability of crop production depends upon the cost of production, yield and their respective prices at the time of disposal. Hence, these analysis are show paramount importance part of the study.

The detail of cost structure of chilli cultivation on irrigated and unirrigated farm in different size of holding is presented in table 2 and 3

Table 2: Cost of cultivation of chilli crop under irrigated farm in different size of holding. (Rs/ha)

| S. No. | Cost particulars | Size of farm (Irrigated area) | | | |
|--------|--------------------------------|-------------------------------|--------|-------|---------|
| | | Small | Medium | Large | Average |
| 1. | Hired human labour | 0 | 4800 | 5600 | 3467 |
| 2. | Bullock labour | 1500 | 1800 | 2100 | 1800 |
| 3. | Machine power | 2000 | 1500 | 2000 | 1833 |
| 4. | Seed | 5651 | 5701 | 5589 | 5647 |
| 5. | Fertilizer +manure | 3506 | 3511 | 3724 | 3580 |
| 6. | Plant protection | 1958 | 1856 | 2252 | 2022 |
| 7. | Irrigation | 1242 | 1231 | 1038 | 1170 |
| 8. | Interest on working capital | 330 | 425 | 465 | 407 |
| 9. | Depreciation | 2482 | 1389 | 629 | 1500 |
| 10. | Land revenue | 197 | 202 | 216 | 205 |
| | Cost-A ₁ | 18866 | 22415 | 23613 | 21631 |
| 11. | Interest on fixed capital | 248 | 139 | 104 | 164 |
| | Cost-B ₁ | 19114 | 22554 | 23717 | 21795 |
| 12. | Rental value of land | 5000 | 5000 | 5000 | 5000 |
| | Cost-B ₂ | 24114 | 27554 | 28717 | 26795 |
| 13. | Imputed value of family labour | 16800 | 11600 | 11400 | 13267 |
| | Cost-C ₁ | 35914 | 34154 | 35117 | 35062 |
| | Cost-C ₂ | 40914 | 39154 | 40117 | 40062 |
| | Cost-C ₃ | 45005 | 43069 | 44129 | 44068 |

The data on cost of cultivation of chilli under irrigated condition shows that on an average cost of cultivation per hectare of chilli crop was found to Rs. 21631 (Cost A₁) followed by Rs. 21795 (Cost B₁), Rs. 26795 (Cost B₂), Rs. 35062 (Cost C₁), Rs. 40062 (Cost C₂) and Rs. 44068 (Cost C₃) respectively. In this study cost A₂ was not under taken due to that all the Chilli growers were used their own land.

Estimation of operational cost (cost A₁) is important for farmers point of view because this is the cost which is expenses by farmers' own pocket. It is revealed that in

irrigated condition the average operational cost i.e. cost A₁ was higher on large farms being Rs.23613 per hectare and lowest was found with small chilli growers i.e. Rs.18866 per hectare. On the other hand the operational cost on medium chilli growers was accounted to Rs.22415 per hectare. The study depicted that in irrigated condition the cost A₁ was found to increase with increasing size of holding. The higher cost with higher size of holding was due to use of hired human labour on their farm.

The total cost estimates i.e. cost C₁, C₂ and C₃ based on the imputed values would give an unrealistic and even misleading picture of costs. It is attributable to the fact that chilli growers try to minimize only out of pocket expenses of cultivation and that by and large, they make maximum use of resources they own, but it is also not justifiable to take into account only paid out cost. To determine the cost structure in irrigated condition cost C₁, C₂ and C₃ were also analyzed in present study. The maximum cost C₃ in irrigated condition was found Rs.45005 in case of small chilli growers followed by Rs. 44129 on large chilli growers farm and Rs.43069 by medium chilli growers respectively. This shows that medium chilli growers used efficient practices and inputs in production process and small chilli growers used comparatively injudicious inputs in production process.

The detail of cost structure of chilli cultivation on unirrigated farm in different size of holding is presented in table 3.

Table 3: Cost of cultivation of chilli crop under unirrigated farm in different size of holding. (Rs/ha)

| S. No. | Cost particulars | Size of farm (Unirrigated area) | | | |
|--------|--------------------------------|---------------------------------|--------|-------|---------|
| | | Small | Medium | Large | Average |
| 1. | Hired human labour | 0 | 4400 | 4600 | 3000 |
| 2. | Bullock labour | 1200 | 1800 | 2100 | 1700 |
| 3. | Machine power | 1500 | 1500 | 1500 | 1500 |
| 4. | Seed | 5401 | 5695 | 5417 | 5504 |
| 5. | Fertilizer +manure | 2808 | 3327 | 3199 | 3111 |
| 6. | Plant protection | 1668 | 1896 | 2240 | 1935 |
| 7. | Irrigation | 0 | 0 | 0 | 0 |
| 8. | Interest on working capital | 262 | 388 | 397 | 349 |
| 9. | Depreciation | 2539 | 1332 | 621 | 1497 |
| 10. | Land revenue | 97 | 105 | 109 | 104 |
| | Cost-A ₁ | 15475 | 20443 | 20183 | 18700 |
| 11. | Interest on fixed capital | 254 | 133 | 62 | 150 |
| | Cost-B ₁ | 15729 | 20576 | 20245 | 18850 |
| 12. | Rental value of land | 3500 | 3500 | 3500 | 3500 |
| | Cost-B ₂ | 19229 | 24076 | 23745 | 22350 |
| 13. | Imputed value of family labour | 15200 | 10200 | 11200 | 12200 |
| | Cost-C ₁ | 30929 | 30776 | 31445 | 31050 |
| | Cost-C ₂ | 34429 | 34276 | 34945 | 34550 |
| | Cost-C ₃ | 37872 | 37704 | 38440 | 38005 |

The data on cost of cultivation of chilli under unirrigated condition shows that on an average cost of cultivation per hectare of chilli crop was found to Rs. 18700 (Cost A₁) followed by Rs. 18850 (Cost B₁), Rs. 22350 (Cost B₂), Rs. 31050 (Cost C₁), Rs. 34550 (Cost C₂) and Rs.38005 (Cost C₃) respectively. In this study cost A₂ was not under taken due to that all the chilli growers were used their own land.

It is revealed that in unirrigated condition the average operational cost i.e. cost A₁ was higher on medium farms being Rs. 20443 per hectare and lowest was found with small chilli growers i.e. Rs. 15475 per hectare. On the other hand

the operational cost on large chilli growers was accounted to Rs. 20183 per hectare. The higher cost A₁ in unirrigated condition with medium size of holding was due to use of proportionally higher number of hired human labour on their farm.

To determine the cost structure in unirrigated condition cost C₁, C₂ and C₃ were also analyzed in present study. The maximum cost C₃ in unirrigated condition was found Rs. 38440 in case of large chilli growers followed by Rs. 37872 on small chilli growers farm and Rs. 37704 by medium chilli growers respectively. This shows that in unirrigated condition medium chilli growers used efficient practices and inputs in production process and small chilli growers used comparatively injudicious inputs in production process.

Productivity of chilli production on irrigated and unirrigated land

Productivity and total production are the main factors of return which farmers want to realize at maximum level. The higher productivity of chilli per unit of area determine the lower in cost per quintal of production, on the other hand the higher total production determine the maximum marketable surplus from which farmers realized profitability of the production. The productivity and production under irrigated and unirrigated condition of chilli cultivation is presented in table 4

Table 4: Productivity of chilli crop under irrigated and unirrigated farm in different size of holding (q/ha)

| S. No. | Cost particulars | Size of farm | | | |
|--------|---|--------------|--------|-------|---------|
| | | Small | Medium | Large | Average |
| 1. | Green chilli yield (q/ha.) Irrigated | 33.89 | 33.02 | 34.93 | 33.95 |
| 2. | Green chilli yield (q/ha.) Unirrigated | 29.79 | 28.78 | 29.18 | 29.25 |

The yield per hectare of chilli found to variation in different situation i.e. irrigated and unirrigated condition. The yield per unit of area also found to variation in different size of farm. The average yield on irrigated condition farm was found to be 33.95 quintal per hectare as a green chilli. On the other hand, the average yield on unirrigated condition farm was found to be 29.25 quintal per hectare as a green chilli. The average yield on different size of holding in irrigated condition, data shows it was found to maximum 34.93 quintal per hectare on large size of holding followed by 33.89 quintal per hectare on small size of holding and 33.02 quintal per hectare on medium size of holding. The average yield on different size of holding in unirrigated condition, data shows it was found to maximum 29.79 quintal per hectare on small size of holding followed by 29.18 quintal per hectare on large size of holding and 28.78 quintal per hectare on medium size of holding. The above data shows that the medium farmers realized minimum yield on per unit of area in both the condition and it might be due to uneconomic scale of production.

Profitability of chilli in irrigated and unirrigated land:

Yield in quintals, gross income, net income and C:B. ratio are the tools employed for estimating the economics of production of chilli. For this purpose, the profitability of chilli per hectare at different profitability measures on irrigated farms is presented in table 5

Table 5: Profitability of chilli crop on irrigated farm in different size of group (Rs./ha)

| S. No. | Return particulars | Size of farm (Irrigated area) | | | |
|--------|----------------------|-------------------------------|--------|-------|---------|
| | | Small | Medium | Large | Average |
| 1 | Cost C ₃ | 45005 | 43069 | 44129 | 44068 |
| 2 | Gross income | 83248 | 81643 | 84893 | 83261 |
| 3 | Net income | 38243 | 38574 | 40764 | 39194 |
| 4 | Family labour income | 59134 | 54089 | 56176 | 56466 |
| 5 | Farm business income | 64382 | 59228 | 61280 | 61630 |
| 6 | C:B. Ratio | 1.85 | 1.90 | 1.92 | 1.89 |

Gross income per hectare of chilli production under irrigated condition received variation by different size group. This was due to different quantity of yield per unit of area and market price received on the basis of quality of crop, places of marketing and time of disposal. The overall gross income per hectare of chilli crop in case of irrigated condition was found to Rs.83261 per hectare. The maximum gross return under irrigated chilli cultivation was realized by large chilli growers Rs.84893 per hectare followed by small chilli growers Rs.83248 per hectare and medium chilli growers Rs.81643 per hectare.

The net income is the real income realized by chilli growers and it was found to on an average Rs.39194 per hectare. The maximum net return under irrigated chilli cultivation was realized by large chilli growers Rs.40764 per hectare followed by medium chilli growers Rs.38574 per hectare and small chilli growers Rs.38243 per hectare. The trend of net income revealed that it was increased with increasing size of holding.

The other profitability measures revealed that on an average the chilli growers realized by Rs. 56466 per farm as family labour income and Rs. 61630 per farm as farm business income in irrigated condition.

The C:B. ratio determines return over per rupee investment. Data revealed that in irrigated condition the chilli growers realized on an average 1.89 as C:B. ratio in chilli production. The C:B. ratio was found to variation in different size of holding and it was maximum 1.92 in large size group followed by 1.90 with medium size and 1.85 with small size of chilli growers. This indicated that the C:B. ratio of irrigated chilli cultivation found to increase with increasing size of holding.

The profitability of chilli per hectare at different profitability measures on unirrigated farms are presented in table 6

Table 6: Profitability of chilli crop on unirrigated farm in different size of group (Rs./ha)

| S. No. | Return particulars | Size of farm (Unirrigated area) | | | |
|--------|----------------------|---------------------------------|--------|-------|---------|
| | | Small | Medium | Large | Average |
| 1 | Cost C ₃ | 37872 | 37704 | 38440 | 38005 |
| 2 | Gross income | 69928 | 71266 | 74833 | 72009 |
| 3 | Net income | 32056 | 33562 | 36393 | 34004 |
| 4 | Family labour income | 50699 | 47190 | 51088 | 49659 |
| 5 | Farm business income | 54453 | 50823 | 54650 | 53309 |
| 6 | C:B. Ratio | 1.85 | 1.89 | 1.95 | 1.90 |

Gross income per hectare of chilli production under unirrigated condition received variation by different size group. This was due to different quantity of yield per unit of area and market price received on the basis of quality of crop, places of marketing and time of disposal. The overall gross income per hectare of chilli crop in case of unirrigated condition was found to Rs.72009 per hectare. The maximum

gross return under unirrigated chilli cultivation was realized by large chilli growers Rs. 74833 per hectare followed by medium chilli growers Rs. 71266 per hectare and small chilli growers Rs. 69928 per hectare. The trend of gross return revealed that it was increased with increasing size of holding.

The net income is the real income realized by chilli growers and it was found to on an average Rs. 34004 per hectare. The maximum net return under unirrigated chilli cultivation was realized by large chilli growers Rs. 36393 per hectare followed by medium chilli growers Rs.33562 per hectare and small chilli growers Rs. 32056 per hectare. The trend of net income revealed that it was increased with increasing size of holding.

The other profitability measures revealed that on an average the chilli growers realized by Rs.49659 per farm as family labour income and Rs.53309 per farm as farm business income in unirrigated condition.

The C:B. ratio determines return over per rupee investment. Data revealed that in unirrigated condition the chilli growers realized on an average 1.90 as C:B. ratio in chilli production. The C:B. ratio was found to variation in different size of holding and it was maximum 1.95 in large size group followed by 1.89 with medium size and 1.85 with small size of chilli growers. This indicated that the C:B ratio of unirrigated chilli cultivation found to increase with increasing size of holding.

Conclusion

Study revealed that, on an average chilli growers realized additional yield 4.70 quintal per hectare in irrigated condition over unirrigated. On the other hand, the chilli growers also realized additional net income of Rs.21425 per hectare in irrigated condition over unirrigated. Although, the return over per rupee investment was higher in irrigated condition but it is very nominal. It is concluded on the basis of above discussion, chilli growers in irrigated condition was better than unirrigated chilli growers because of availability of irrigation facilities. Study revealed that, the chilli growers could be realized higher productivity and higher profitability in irrigated condition over unirrigated condition. Hence, the policy makers, development agencies and farmers should manage to increase irrigation facilities in the area to boost-up the yield and economic condition of chilli growers.

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