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Economics of Tur (*Cajanus cajan*) Cultivation in North Karnataka, India

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Authors' contributions

This work was carried out in collaboration between all authors. Author UM designed the study, prepared the interview schedule and supervised the work. Authors UM and MCM collected primary data from the sample respondents and performed the statistical analysis. Author PM managed the analyses of the study. Author UM wrote the first draft of the manuscript. Authors PM and MCM managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Tur is the most important Kharif pulse crop of northern Karnataka. Over the years, the farming community is shifting to cultivation of cash crops due to higher profitability leading to decrease in acreage under pulse crops in general and Tur in particular. The current study was carried out in Vijayapur and Bagalakote districts of north Karnataka to analyze the profitability in Tur cultivation and to document various constraints faced by the Tur growers in the study area. The data pertained to the agricultural year 2014-15. The yield per ha of Tur crop in was 15.08 quintals. The average price received by the sample farmers per quintal of Tur was Rs 5825.50. The total cost of cultivation was Rs 60260.37. The net returns per hectare of Tur cultivation was found to be Rs 27588.17, leading to an undiscounted benefit to cost ratio (Profitability ratio) of 1.45. The sample

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respondents ranked non-availability of labour as the greatest constraint in manual harvesting and mechanical threshing of Tur with a Garrett score of 70.73. The problems ranked as second, third and fourth place were high cost of labour, delay in harvesting and loss of crop due to unexpected pre-monsoon rains, respectively. Efforts should be made to bring more area under Tur crop in the study area. In spite of more yield and higher price of output, the net returns for Tur growers is less due to their higher investment in labour for carrying out various farm operations. To address this problem, mechanization of various operations such as ploughing, harrowing, sowing, harvesting and threshing should be done.

Keywords: Tur; North Karnataka; garrett score.

1. INTRODUCTION

Tur or pigeonpea (*Cajanus cajan* (L) mill.sp.) is one of the major pulse crop of tropics and sub-tropics and owed with several unique characters. It ranks second important pulse crop next to Bengal gram. It finds important place in farming systems adopted by small holding peasants in large number of developing countries.

India is the largest producer, consumer and importer of Tur in the world. In India, pigeonpea is mainly grown in Maharashtra, Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh and Karnataka. It has been estimated that India's population would reach 1.68 billion by 2030 from the present level of 1.27 billion [1]. Accordingly, the projected pulse requirement for the year 2030 is 32 million tons with an anticipated required growth rate of 4.2% as per IIPR Vision 2030 [2]. India has to produce not only enough pulses but also remain competitive to protect the indigenous pulse production.

Tur is the most important Kharif pulse crop of northern Karnataka. It is largely grown especially in Gulbarga, Vijayapur and Bidar districts of the state. The state occupies an area of about 0.77 million ha with a production of 0.36 million tonne, having an average productivity of 556 kg per ha.

Over the years, the farming community is shifting to cultivation of cash crops due higher profitability leading to decrease in acreage under pulse crops in general and Tur in particular. With this backdrop, the current study was carried out in northern Karnataka with the following specific objectives.

- i) To study the socioeconomic profile of the sample farmers
- ii) To analyze the labour and input utilization pattern in Tur cultivation in the study area
- iii) To analyze the profitability in Tur cultivation and
- v) To document various constraints faced by the Tur growers in the study area.

2. MATERIALS AND METHODS

Two major Tur growing districts of north eastern dry zone of Karnataka which are under the jurisdiction of UAS, Dharwad i.e., Vijayapur and Bagalakote were selected for the purpose of study. The data collected was on general characteristics of farmers, land holding, costs, returns, yields, constraints faced in cultivation of Tur etc. The primary data from the sample respondents pertained to the agricultural year 2013-14. Multistage sampling method was used for selection of districts, taluks and villages. Two major Tur growing taluks were selected based on highest area under Tur in each of the selected districts. Hence, Muddebihal and Sindagi taluks of Vijayapur district and Badami and Hunagund taluks of Bagalakote district were selected for the purpose of the study. Based on the highest area under Tur cultivation, three villages from each of the selected taluks were chosen. Thus, a total of twelve villages from four taluks were selected for the study. From each village five farmers growing Tur were randomly selected. Thus, for two districts, sixty Tur growers were selected. Farm budgeting technique was used to estimate the cost and return structure of Tur. The documentation of the constraints in cultivation of tur in the region was done using Garrett's ranking technique. Garrett's formula for converting ranks into % was given by

$$\% \text{ position} = 100 * (R_{ij} - 0.5) / N_j$$

Where, R_{ij} = Rank given for i^{th} factor by j^{th} individual

N_j = Number of factors ranked by j^{th} individual

The % position of each rank then converted into scores referring to the table given by Garret and Woodsworth (1969). For each factor, the scores of individual respondents were added together and divided by the total number of the respondents for whom scores were added. These mean scores for all the factors were

arranged in descending order, ranks were given and most important factors were identified.

3. RESULTS AND DISCUSSION

3.1 General Characteristics of the Sample Respondents

The general characteristics of the Tur growers of the study area are presented in Table 1. The average age of the sample Tur growers was found to be 58 years. Among the respondents, 60% were illiterate, 33.33% received primary education, 6.67% received secondary education and none of them went for post-matriculation studies. About 36.67% of the respondents were having nucleus family and 63.33% were having joint family. The proportion of male members in the family was more than their female counterparts. The average family size of sample Tur growers was found to be 7.30. Only 6.67 % of the sample farmers were associated with social organization *i.e.*, Village Panchayat.

The analysis of the occupational pattern of the sample respondents revealed that, in both the study districts, all the sample farmers practiced agriculture as main occupation. The average

annual income of the sample farmers was found to be Rs 53900. The average area under Tur crop for traditional farmers was 1.75 ha and that for adopters of mechanical harvesting was 3.78 ha due to the reason that the combined harvesters don't work efficiently in scattered and small land holdings. Similar results were obtained by Singh and Verma [3] in Himachal Pradesh stating that the mechanization was badly hampered by small and irregular fields.

The major soil type observed among the sample farmers is the mixture of black and red. Tur crop was grown under rainfed condition. Soil type and rainfall reflect the areas under which the crop can be grown. This is an additional information [4].

3.2 Labour utilization Pattern in Tur Cultivation

The input utilization pattern in Tur cultivation in the study area is presented in Table 2. Ploughing was done by 3.13 man days of man labour, 2.50 pair day of bullock labour and 3.08 hours of machine labour. Harrowing was carried out using 5.03 man days of man labour, 1.93 pair day of bullock labour and 2.50 hours of machine labour.

Table 1. General Characteristics of the sample respondents (n=60)

Sl. no.	Particulars	Unit	Sample respondents
I	Age of the farmers	Years	58
II	Education	Number	
	Illiterate		36 (60.00)
	Primary		20 (33.33)
	Secondary		4 (6.67)
	PUC		-
	Graduation		-
	Total		60 (100.00)
III	Family type	Number	
	Nucleus		22 (36.67)
	Joint		38 (63.33)
	Total		60 (100.00)
IV	Family composition	Number	
	Male		3.80 (52.05)
	Female		3.50 (47.45)
	Average family size		7.30 (100.00)
V	Association with social organization	Number	2 (6.67)
VI	Agriculture as occupation	Number	
	Main		60 (100.00)
	Subsidiary		-
VII	Average annual income	Rupees	
	Main		53900
	Subsidiary		-
	Total		53900
VIII	Average area under Tur	Hectares	1.75

Note: Figures in parentheses indicate percentage to total

Table 2. Labour utilization pattern in Tur production (per Hectare)

Sl. no	Operations	Men labour (man days)	Women labour (days)	Bullock pair (pair days)	Machine labour (hours)
1	Ploughing	3.13	0.00	2.50	3.08
2	Harrowing	5.03	0.00	1.93	2.50
3	Transportation of FYM	5.85	0.00	2.50	0.00
4	Spreading of FYM	5.00	0.00	0.00	2.10
5	Sowing	2.50	7.50	3.75	0.00
6	Inter cultivation	5.65	8.03	4.00	0.00
7	Weeding	2.50	10.55	0.00	0.00
8	Fertilizer application	4.53	0.00	0.00	0.00
9	PPC application	4.00	0.00	0.00	0.00
10	Irrigation	0.50	0.00	0.00	0.00
11	Harvesting	8.13	7.20	0.00	0.00
12	Threshing	6.25	2.60	0.00	6.83
13	Drying/ Winnowing/ Bagging	0.00	2.75	0.00	0.00
	Total	53.05	38.63	14.68	14.50

Transportation of FYM was done by 5.85 man days of man labour and 2.50 pair days of bullock labour. Spreading of FYM was carried out by 5.00 man days of man labour and 2.10 hours of machine labour. Sowing operation was carried out by using 2.50 man day of man labour, 7.50 days of woman labour and 3.75 pair day of bullock labour. Weeding was done by 2.50 man days of man labour and 10.55 days of woman labour. Inter-cultivation was done by 5.65 man days of man labour, 8.03 days of woman labour and 4.00 pair days of bullock labour. Fertilizer and plant protection chemical application were done by 4.53 and 4.00 man days of man labour, respectively. Irrigation operation was done by 0.50 man days of man labour. Harvesting was carried out by 8.13 man days of man labour and 7.20 days of woman labour. Threshing was done by utilizing 6.25 man days of man labour, 2.60 days of woman labour and 6.83 hours of machine labour. Drying and bagging operations were done involving 2.75 days of woman labour.

Thus, a total of 53.05 man days of man labour, 38.63 days of woman labour, 14.68 pair days of bullock labour and 14.50 hours of machine labour were utilized per ha of Tur cultivation.

The number of hours of use of machine is more in case of manual harvesting and mechanical threshing of tur due to the reason that threshers needed more time to thresh unit of output as compared to combined harvesters, which harvest as well as thresh the crop in a comparatively lesser time. Use of both human labour and bullock labour in case of manual harvesting and mechanical threshing is more due to comparatively less use of machines.

3.3 Input Utilization Pattern in Tur Cultivation

The input utilization pattern in Tur cultivation in the study area is presented in Table 3. On an average, 16.03 kg of seeds was used by the sample Tur growers in the study area. The amount of farm yard manure (FYM) used by the Tur growers was 3.68 tonnes. An average of 3.00 bags of urea and 2.83 bags of DAP was used by the sample farmers. Each bag of the fertilizer weighed 50 kilograms. For Tur production, the sample farmers used 3.18 litres plant protection chemicals.

The quantity of inputs used by the adopters of mechanical harvesting is slightly more than that used by the traditional farmers. This might be due to the reason that the adopters of mechanical harvesting have higher net returns enabling them to invest more on various inputs.

3.4 Cost and Returns Structure in Tur Cultivation

The cost and returns structure in Tur cultivation (per ha) is presented in Table 4. The two major components of the total cost incurred in cultivation of a ha of Tur were variable and fixed costs. Of the total cost, the expenditure incurred on male labour utilized for various cultivation operations accounted for about 23.38 per cent of the total cost of cultivation (`14094.00) followed by bullock labour (14.21%) and FYM (8.64%). Input cost of `15039.28 was spent by the sample Tur growers in the study area. The total fixed cost involved in Tur cultivation was `12857.61. Among the fixed costs, the highest share was contributed by rental value of owned land

(16.59%). The total cost of cultivation of Tur in the study area was found to be ` 60260.37.

Yield per hectare of Tur crop in was 15.08 quintals. The average price received by the sample farmers per quintal of Tur was Rs 5825.50. The total cost of cultivation was Rs 60260.37. The net returns per ha of Tur

cultivation was found to be Rs 27588.17, leading to an undiscounted benefit to cost ratio of 1.45.

In spite of more yield and higher price of output, the net returns for traditional Tur growers is less due to their higher investment in labour for carrying out various farm operations.

Table 3. Input utilization pattern in Tur production (per Hectare)

Sl. no.	Particulars	Unit	Quantity
1	Seed	Kg	16.03
2	Manures (FYM)	Ton	3.68
3	Men labour	Days	53.05
4	Women labour	Days	38.63
5	Bullock pair	Pd	14.68
6	Machine hours	Hrs	14.50
7	Fertilizers		
	Urea	Bags	3.00
	DAP	Bags	2.83
	MOP	Bags	0.00
8	Plant protection chemicals	Ltr	3.18

Table 4. Cost and returns structure in Tur cultivation (per Hectare)

Sl. no.	Particulars	Amount (Rs)	Percentage to total
A	Variable costs		
I.	Labour cost		
1	Male (in man days)	14094.00	23.38
2	Female (woman days)	5901.10	9.79
3	Machine (in hours)	3821.80	6.34
4	Bullock (in pairs)	8546.58	14.21
	Sub-Total (I)	32363.48	53.70
II.	Input costs		
1	Seeds (kg)	1064.85	1.76
2	FYM (t)	5207.32	8.64
3	Fertilizers (bags)		
a.	Urea	1092.00	1.81
b.	DAP	3484.17	5.78
c.	Potash	-	-
4	Plant Protection Chemicals (l/kg)	3207.07	5.32
	Interest on working capital @ 7%	983.87	1.63
	Sub-Total (II)	15039.28	24.95
B	Fixed costs		
1	Land revenue (Rs)	25.00	0.004
2	Rental value of owned land (Rs)	10000	16.59
3	Depreciation (Rs)	1353.42	2.24
4	Interest on fixed capital @ 13%	1479.19	2.45
	Sub-total	12857.61	21.33
Returns from Tut cultivation (in Rs/ha)			
1	Yield (quintals/ha)	15.08	
2	Average price received by the sample Tur growers (Rs/quintal)	5825.50	
3	Gross returns (Rs/ha)	87848.54	
4	Total Cost of cultivation (Rs/ha)	60260.37	
5	Net returns (Rs/ha)	27588.17	
6	Undiscounted Benefit Cost Ratio	1.45	

Similar results were obtained by Radha and Choudhry [5] and Santosh [6] in their study on cost of commercial production and seed production of cotton in Kurnool district of Andhra Pradesh.

3.5 Constraints Faced in Tur Cultivation in the Study Area

The constraints faced in cultivation of Tur in the study area are presented in Table 5. The study revealed that the major problems faced in manual harvesting and mechanical threshing of Tur were found as non-availability of labour, high cost of labour, loss of crop due to unexpected pre-monsoon rains and delay in harvesting. The sample respondents ranked non-availability of labour as the greatest constraint in manual harvesting and mechanical threshing of Tur with a Garrett score of 70.73. The problems ranked at second, third and fourth place were high cost of labour, delay in harvesting and loss of crop due to unexpected pre-monsoon rains with Garrett scores of 58.27, 41.16 and 29.83 respectively.

Table 5. Constraints faced by Tur growers in the study area

Sl. no.	Constraints	Garrett score	Rank
1	Non-availability of labour	70.73	I
2	High cost of labour	58.27	II
3	Loss of crop due to unexpected pre-monsoon	29.83	IV
4	Delay in harvesting	41.16	III

High cost of labour is a major problem followed by the Tur growers following manual method of cultivation as it inflates the cost of cultivation of the crop. High cost of labour can be addressed by farm mechanization but it is not feasible in the areas where the machines are not available timely and plentifully.

The above results were supported by the works of Makanga and Singh [7], Mundinamani et al. [8] Ramesh [9] and Gurunath et al. [10].

4. CONCLUSION

Tur cultivation in north Karnataka was found to be economical with a profitability ratio of 1.45. Efforts should be made to bring more area under Tur crop in the study area. In spite of more yield and higher price of output, the net returns for Tur

growers is less than those following mechanized Tur cultivation to the tune of Rs 3000 per ha due to their higher investment in labour for carrying out various farm operations. The study also revealed that the major problems faced in Tur cultivation was non-availability of labour and high cost of labour. Migration of the agricultural work force out of Bijapur and Bagalakote the study area had lead to non-availability of labour during peak season in the study area. To address this problem, mechanization of various operations such as ploughing, harrowing, sowing, harvesting and threshing should be done as suggested by Dange and Thakare [11] and Viswanatha [12]. Efforts should be made by the Department of Agriculture at the district, taluk and village level to popularize the use of machines among the Tur growers through awareness camps and conducting demonstrations. For easy availability of machines during requirement and maintenance of uniform rates, the cooperative model of custom hiring of agricultural machinery implemented in Punjab should be introduced in Tur growing regions of Karnataka.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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