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## ECONOMICS OF HYBRID COTTON (DCH-32) PRODUCTION IN NORTH KARNATAKA \*

### Introduction

Cotton is an important fibre crop of the world. It continues to occupy the premier position in the textile industry inspite of severe competition from synthetics. Among the non-food grain crops in India cotton has figured as an important cash crop. Cotton is the chief fibre that sustains the huge Indian textile industry. The production of cotton has increased rapidly with the advent of irrigation and high yielding hybrid varieties. India ranks first with respect to area and fourth with respect to production. The total area under cotton in the world is 32.3 million hectares. In India, during 1992-93, 138 lakh bales of 170 kg each and 43 lakh tonnes of cotton seed, valued at Rs. 9,400 crores, were raised by seven million farmers over an area of 7.6 million hectares. During the same period, 13 lakh bales were exported to earn Rs. 650 crores of foreign exchange. The cotton seed oil is being extracted from about 4 lakh tonnes of cotton seed valued at Rs. 1200 crores annually. The textile industry has earned Rs. 11,800 crores from exports of yarn, cloth and garments in the financial year 1991-92, accounting for 27 per cent of total export earnings of Rs. 44000 crores (Hindu survey of Indian Agriculture, 1994). During 1994-95 the country is facing acute shortage of cotton to meet the demand of textile and other industries. Government of India has proposed to import 10 lakh bales of cotton in a phased manner. In Karnataka area under cotton was 6.81 lakh hectares which accounts for 7.4 per cent of the cultivated area and production was 9.60 lakh bales (Aug. 1993). It has been observed that the compound annual growth rate in the production of cotton was 12.7 per cent between 1973-74 and 1987-88 in Belgaum district (Rao 1992). Further, the area under cotton in Karnataka as a whole has registered a growth rate of 10.5 per cent between 1975-76 and 1989-90 (Yaledhalli 1991).

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The dam across the Malaprabha river was constructed and irrigation was started in 1974. The Malaprabha irrigation project is in the northern part of Karnataka which comes under the northern dry region-II, zone-3 and covers nine taluks of Belgaum, Dharwad and Bijapur districts. The total command area under Malaprabha irrigation project is 2, 18, 191 hectares. Malaprabha command area is blessed with black cotton soil which is most suitable for cotton cultivation. Cotton is the most predominant crop accounting for 40 per cent of the gross cropped area and grown by 95 per cent of the farmers. With this importance, the present study was undertaken in Malaprabha command area to study how location of canal affects the yield and income levels of farmers. Specifically, the objectives of the study were to examine the resource use pattern of hybrid cotton cultivation and its yield levels at different locations of the canal and estimate the costs and returns of Hybrid cotton (DCH- 32) at different locations of the canal.

### Methodology

The study was conducted in the Malaprabha irrigation command area. Cotton (DCH-32) was an important sole crop cultivated by 95 per cent of the farmers in the command area. Multistage random sampling method was adopted for the selection of farmers. The Malaprabha right bank canal which irrigates maximum area of 83847 hectares was selected. The length of the canal was 92 kilometer. It was divided into three locations, namely reach (upto 30 km), middle reach (30-60km) and tail reach (above 60 km). A similar study was conducted by Amirk S. Saini et.al 1989 in which the total length of (17 km) Giri canal irrigation project (Right bank) in Sirmaur district (HP) was divided into three reaches and studied. In the present study, from each canal reach a cluster of four villages were selected. Ten farmers from each selected village were randomly selected and post classified as small farmers having land holding up to 2 ha and large farmers having land holding above 2 hectare. Thus the total sample size was 120, comprising 40 from head reach, 40 from mid reach and 40 from tail reach of the canal. Only cotton-growing farmers were considered for the study and an average of resource use, costs and returns were worked out. The data pertaining to the year 1991-92 crop season were collected through survey method by interviewing the selected farmers. To compute cost of cultivation, the cost concepts employed in the All India Farm Management Studies, namely cost A, cost B and cost C were adopted.

Cost A: It included the items such as wages of hired human labour, charges of owned and hired bullock labour, cost of seeds used, cost of manures, fertilizers and plant protection chemicals, expenditure on irrigation, depreciation of implements, machinery, farm buildings etc. and hiring charges of implements, land revenue and interest on working capital.

Cost B: It constitutes cost A plus rental value of land and interest on fixed capital

Cost C: This cost includes Cost B plus imputed value of family human labour

### **Results and Discussion**

An attempt was made to assess the resource use pattern and yield of cotton obtained at different locations. The results are discussed below.

#### **Resource Use Pattern**

Table -1 reveals that the per hectare use of human labour was the highest in the mid reach (112.46 mandays) followed by head reach (100.80) and tail reach (100.21 mandays). The use of machine labour was found to be the highest in the mid reach (15.85 hrs). On the contrary, the use of bullock labour was lowest in the mid reach (6.62 pair days), whereas it was about 8 pair days in head and tail reaches. The gap in labour utilization was attributed to the operational differences in the cultivation such as ploughing, harrowing, clod crushing, weeding and intercultivation.

#### **Critical input**

The per hectare use of seed did not vary in the three locations and per hectare seeds used were around 2.5 kg. The location of the canal had not affected the use of FYM but it was highest in tail reach (5.70 tonnes) followed by head reach (5.60 tonnes) and mid reach (4.80 tonnes). Farmers in different reaches had applied different quantities of FYM depending on the availability. The per hectare use of fertilizers in terms of nutrients (NPK) was highest in head reach (199.26 kg) followed by mid reach (188.75 kg) and tail reach (171.93kg). N and K in terms of nutrient were used for top dressing. Farmers in head and mid reach received adequate water in the later stage of crop growth which facilitated higher application of fertilizers. On

Table 1: Utilization of inputs and output obtained in cotton (units/ha)

Sl. No.	Items	Regionwise			Size groupwise		Overall farms
		Head reach	Mid reach	Tail reach	Large farms	Small farms	
1.	Human labour (man days)	100.80	112.46	100.21	110.92	105.65	108.28
2.	Bullock labour (Pair days)	8.23	6.62	8.02	7.53	7.65	7.59
3.	Machine labour (hour)	13.00	15.85	11.53	14.24	10.30	12.27
4.	Seeds (kgs)	2.58	2.65	2.52	2.61	2.53	2.57
5.	FYM (Tonnes)	5.64	4.80	5.70	5.10	4.80	4.90
6.	Fertilizers (kg)						
	i) Nitrogen (N)	79.58	72.90	63.54	71.70	70.08	70.89
	ii) Phosphorus (P)	59.84	63.20	60.90	70.41	66.40	68.40
	iii) Potash (K)	59.84	52.65	47.49	50.93	48.58	49.75
	Total	199.26	188.75	171.93	193.04	185.06	189.04
7.	Plant protection chemicals						
	i) Liquids (litres)	7.40	7.50	5.35	6.89	6.25	6.57
	ii) Dusts (kg)	0.75	0.18	0.75	0.70	-	0.35
8.	Yield (quintals)	14.41	17.26	11.86	14.55	14.32	14.43

the contrary, farmers in the tail reach applied lower doses of fertilizers due to inadequate water availability.

Plant protection chemicals used per hectare were around 7.5 litres in head and mid reach and 5.35 litres in the tail reach. Higher use of plant protection chemicals in head and mid reach than in the tail reach could be attributed to better plant growth due to higher fertilizer use and irrigation. Another reason is severe infestation of insects, pests and diseases due to heavy moisture and humidity in the head and mid reaches.

### **Yield levels**

Farmers located in the middle reach of the canal attained highest yield (17.26 quintals/ha) followed by head reach farmers (14.41 quintals/ha) and tail order (11.86 quintals/ha). Low yield in the head reach area in comparison to the mid reach might be due to excessive irrigation. Low yield in the tail reach could be attributed to inadequate water availability and lesser application of fertilizers.

From the point of view of size group of farmers, the large farmers had used machine labour and other inputs slightly more than the small farmers. The reason for this could be attributed to easy access of large farmers to resources than the small farmers. However, the yield did not vary between the groups which was about 14.5 quintals/ha. Kamdar et al (1991) found similarly that there was no correlation between farm size and physical productivity.

### **Resource use efficiency**

Cobb-Douglas type of production function was fitted to the input-output data to estimate the resource use efficiency. All the variables were taken in value terms except land (in ha).

Table 2 reveals that the elasticity coefficient of seed in mid reach (0.4359), tail reach (0.5132) and, of manures and fertilizers (0.1947) were significant. To estimate their efficiency marginal value product (MVP) and marginal factor cost (MFC) were compared and found that there was under utilization of land, human labour, bullock labour, seeds and, manures and fertilizers in head reach, seeds, plant protection chemicals, manures and fertilizers in mid reach and, human labour, seeds, plant protection chemicals, manures and fertilizers in tail reach. There was over utilization of plant

Table 2 : Regression coefficient and ratios of MVP to MFC of cotton

Location	n	Intercept	Land area (ha)	Human labour (Rs)	Bullock labour (Rs)	Cost of seed (Rs)	Value of manures and fertilizers (Rs)	Cost of PPC (Rs)	R <sup>2</sup>
		a	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	
Head reach	36	1.7316 (0.1816)	0.1424 (0.6968)	0.6399 (0.4963)	0.0921 (0.2681)	0.4580 (0.7121)	0.3021 (0.3336)	-0.5614 (0.4135)	0.8493
MV: MFC	-	-	1.4155	16.5587	8.8856	39.8297	6.3589	-15.0203	
Mid reach	35	1.1585 (0.1828)	-0.1840 (0.1359)	0.0389 (0.3425)	0.0068 (0.1747)	0.4359* (0.2444)	0.4596 (0.4214)	0.2293 (0.2165)	0.8488
MVP: MFC	-	-	-2.0624	1.1280	1.1045	46.0145	15.3320	7.6911	
Tail end	38	1.6553 (0.0765)	0.0416 (0.0489)	0.1039 (0.1526)	-0.0382 (0.1739)	0.5132** (0.2065)	0.1947* (0.1133)	0.1691 (0.0998)	0.9627
MV: MFC	-	-	0.2623	1.6209	-2.4619	29.1883	3.2666	3.6382	

Figures in parentheses indicate the respective standard errors

R<sup>2</sup> = Coefficient of multiple determination

MFC = Marginal factor cost

\* = Significant at 10 per cent level

\*\* = Significant at 5 per cent level

protection chemicals in head reach, land in mid reach and, land and bullock labour in tail reach. The coefficient of multiple determination ( $R^2$ ) was 0.84, 0.84 and 0.96 in head, mid and tail reach, respectively.

### Cost and returns

The per hectare cost of cultivation according to the cost concepts for the hybrid cotton is presented in Table 3. The costs A, B and C were higher in mid reach compared to head reach and tail reach. The per hectare total cost of cultivation (Cost C) was highest in mid reach (Rs. 12721) followed by head reach (Rs. 11385) and tail reach (Rs. 10782). The per hectare value of cotton was the highest in mid reach (Rs. 40428) followed by head reach (Rs. 37638) and tail reach (Rs. 23885). The farmers in the head reach and mid reach had a much higher net income per hectare, compared to farmers in the tail reach and net income was double than the tail reach. Net income per hectare was also found to be highest in mid reach (Rs. 27707/ha) followed by head reach (Rs. 26252/ha) and tail reach (Rs. 13103/ha). Less net income in the tail reach was due to less yield level on account of inadequacy of water. Benefit cost ratio showed a definite trend and decreased as one moved from head reach (3.30) to tail reach (2.21).

The comparison of the results of the cost of production and returns from the point of view of size group of farmers in the command area, have shown that there was not much difference in the Cost A, Cost B, Cost C and net income. The reason for this might be that hybrid cotton is most important commercial crop which was grown competitively by all the farmers to realise the maximum profit. Another important reason that might be attributed to this was that all the farmers were getting inputs like seeds, fertilizers, plant protection chemicals and credit in time, because of good network of input suppliers in the area. This result was in confirmation with that of Kamdar, Phulpoto and Hussain (1991).

### Summary and Conclusions

A comparison of resource use pattern between the different locations highlighted that the use of human and machine labour was more in mid reach whereas, use of bullock labour was more in head reach and tail reach. There was not much difference in the use of seed. The use of fertilizers in terms of nutrients NPK and plant protection chemicals in tail reach was less than



Table 3: Cost and return structure of cotton (Rupees per hectare)

Items	Regionwise			Size groupwise		Overall farms
	Head reach	Mid reach	Tail reach	Large farms	Small farms	
Cost A	7,012.39	7,336.96	6,284.77	7,007.86	5,592.00	6,299.93
Cost B	11,096.94	12,429.23	10,469.56	11,151.69	9,697.24	10,424.46
Cost C	11,385.83	12,721.26	10,782.34	11,321.54	10,507.53	10,914.53
Value of gross output	37,638.46	40,428.85	23,885.50	30,035.91	27,851.35	28,943.63
Farm business income (Profit at Cost A)	30,626.07	33,091.89	17,600.73	23,028.05	22,259.07	22,643.56
Family labour income (Profit at Cost B)	26,541.52	27,999.62	13,415.94	18,884.22	18,154.11	18,519.16
Net income (Profit at Cost C)	26,252.63	27,707.59	13,103.16	18,714.37	17,343.82	18,029.09
Benefit Cost ratio	3.30	3.17	2.21	2.65	2.65	2.65

head reach and mid reach. This was due to inadequate availability of water which lead to poor plant growth resulting in lesser output and low income. The economic analysis highlighted that the cost A, Cost B and Cost C were more in mid reach than the head and tail reach. The per hectare net income realised was lowest in the tail reach. Low net income in the tail reach was due to low yield because of inadequate availability of water. From the benefit-cost ratio analysis, it was found that returns realised per rupee investment were highest (3.30) in head reach and lowest (2.21) in tail reach. Income of tail reach farmers can be increased by increasing the yield level. To increase the yield levels in the tail reach adequate water should be made available either through water users cooperative societies or a water distribution policy which aims at an optimum production for a given quantity of water under "Warabandi" system should be advocated. Above all, the farmers should be advised to follow the recommended cropping system. The benefit-cost ratio was constant in different size group of farmers (2.65) possibly due to the distribution of size groups uniformly.

The results of the study have established that cotton as a sole crop was more profitable than the other cropping systems. Therefore, farmers should be educated and encouraged to grow cotton in order to exploit the inherent favourable properties of black soils for reaping the potential yields of cotton to the fullest possible extent.

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