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An economics analysis of contract farming of organically produced, natural colour cotton in Karnataka

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ABSTRACT

The present study, conducted in 2005-06, was based on a data from a purposive sample of 80 farmers contracted for organically cultivating naturally coloured cotton and supervised seed multiplication from Uppinbetageri village of Dharwad taluk. The per hectare variable costs for coloured cotton cultivation was Rs.13,078 and formed 82 per cent of the total costs which was Rs.15,934. About 67.92 human days, 14.70 bullock pairdays and 1.43 tractor hours of labour were required per hectare of cultivation. The yield was 8.53 qtls per hectare and resulted in a net profit of Rs.3398. *Kapas* was purchased by the Khadi Nekar Sahakari Utpadak Sangh Niyamit (KNSUSN), Uppinabetageri under a contract for a market linked price. Area under coloured cotton, seed, manure and manpower would improve returns if their use was increased. There was an increasing returns to scale. However, except for bullock labor, all other inputs could be profitably increased. Maintaining field isolation for genetic purity, lack of more cotton colours, non - availability of a broader market, moisture stress, proper price and yield fluctuations were the major cultivator's problems.

Key words :
Colour cotton, Contract farming, Organic farming

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INTRODUCTION

The importance of the cotton in world consumption can be illustrated by the fact that in spite of the fall in the share of the fibre in world fibre consumption, the demand for it keeps on rising. Area under cotton during 2005-06 in Karnataka was around 5.12 lakh hectares, with the production and productivity of 8.00 lakh bales and 266 kg/ha, respectively. The main cotton growing districts in Karnataka are Dharwad, Haveri, Mysore, Gadag, Bellary, Belgaum, Raichur, and Gulbarga.

Cotton fabrics with artificial dyes have been reported to have adverse effects on the skin and human health and the use of pesticides in their cultivation adds to the cost of production of fabric. Of late organic cultivation of coloured cotton has carved a niche entry in Dhrawad district of Karnataka under the platform of contract farming. As of today, coloured cotton cultures are now available in *Gossypium hirsutum*, *Gossypium arboreum* and *Gossypium herbaceum* in our country.

An almond colour variety DDCC-1 (Dharwad Desi Coloured Cotton-I) was identified and popularized for cultivation under contract farming and seed multiplication on a large scale in Upinabetageri village of Dharwad district.

The present paper investigates the economic viability of cultivation of naturally coloured cotton under the controlled price conditions of contract farming, the hypotheses being that coloured cotton cultivation is a profitably enterprise under the explained arrangement.

METHODOLOGY

Selection of the study area and sampling frame:

Dharwad district and in it, Dharwad taluk were purposively selected for the study, as coloured cotton is grown in Uppinbetageri village of this taluk under contract farming since 2002.

From Uppinbetageri village of Dharwad taluk, all the 80 farmers cultivating naturally coloured cotton under contract farming were interviewed for the study which pertained to the year 2005-06.

The salient features of the contract between farmers of Upinabetageri, the Khadi Nekar Sahakari Utpadak Sangh Niyamit (KNSUSN), Upinabetageri and Agricultural Research Station Dharwad are as follows. Only the seeds of DDCC-1 and technical guidance regarding its cultivation is supplied by the University to be cultivated at an isolation distance of 50 mts from other *Desi* cottons. The seed cotton is ginned under supervision; the lint is purchased by the Sangh, at prevailing market price of DDCC-1 coloured cotton on

the day of purchase. An additional 25 per cent more of the cost of coloured cotton kapas is given as incentive to the farmers; the lint is utilized by the Sangh for preparing fabrics while the entire seed material of DDCC-1 will be purchased by the Research Station.

Nature and sources of the data:

The primary data related to the farm disposition and cost of cultivation of naturally coloured cotton, constraints faced etc. were collected directly from the selected farmers.

The data were analyzed using statistical techniques like averages, percentages and the Cobb Douglas Production Function to examine the resource use efficiency.

Functional analysis:

The form of Cobb-Douglas production function used in the present study is as follows:

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}X_7^{b7}e^{n} \qquad (1)$$

where,

Y = Gross output in rupees

a = Intercept (efficiency) term

X_1 = Farm size (ha)

X_2 = Quantity of seeds in kgs

X_3 = Quantity of FYM in tonnes

X_4 = Human labour in mandays

X_5 = Bullock labour in pair days

X_6 = Quantity of biopesticides in litres

X_7= Quantity Trichocard in numbers

u = Random error term

bi's = Output elasticities of respective factor inputs, i = 1, 2….7 and

The Cobb-Douglas production function was converted into log linear form and parameters (coefficients) were estimated by employing Ordinary Least Square Technique (OLS) as given below:

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + u \qquad (2)$$

The regression coefficients (b_i's) were tested for their significance using 't' test at five per cent and one per cent probability levels.

$$t = \frac{b_i}{\text{Standard error of } b_i} \qquad (3)$$

In order to know the goodness of fit, the adjusted co-efficient of multiple determination $\bar{R}^2$ which was calculated by using the formula:

$$\bar{R}^2 = 1-(1-R^2)\frac{(n-1)}{(n-p)} \qquad (4)$$

where,

$\bar{R}^2$ = The adjusted coefficient of multiple determination (adjusted for the size of the sample)

R^2 = The coefficient of multiple determination which is given by

$$R^2 = \frac{\text{Regression sum of squares}}{\text{Total sum of squares}}$$

n = Number of observations in the sample

P = Number of parameters in the function

RESULTS AND DISCUSSION

The results obtained from the present study as well as relevant discussion are presented below:

Labour utilization pattern in naturally coloured cotton cultivation:

It is evident from Table 1 that harvesting/picking and weeding were the main operations consuming as much as two-thirds of the total human labour. Labour on plant protection was minimal and considerable for FYM application as the cultivation was organic. Preparatory tillage and intercultivation accounted for most of the bullock labour consumption.

Input use pattern and output obtained in naturally coloured cotton cultivation:

Table 2 indicates that the average quantity of farmyard manure application was considerable (7.02 tonnes per hectare) to compensate for the non application of chemical fertilizers under the organic cultivation. Only bio-pesticides such as Nimbicidin (for 13.91 liters/ ha) was used for plant protection.

Costs in production and marketing of coloured cotton:

Table 3 indicates that variable costs accounted for 82.08 per cent of the total cost. The costs of human labour, farmyard manure, bio-pesticide (nimbicidine), bullock labour and interest on working capital were the main components of variable costs. Since farm yard manure was liberally applied to compensate for the abstinence of chemical fertilizer application and since most of farmers had to purchase additional manure to complement self

Table 1 : Labour utilization in naturally coloured cotton cultivation (per hectare)

Sr. No.	Operations	Unit	Numbers	Percentage
I.	Bullock and tractor labour			
1.	Ploughing	--		
a.	Bullock labour	Pair days	2.28	15.51
b.	Tractor labour	Hours	1.29	90.21
2.	Harrowing	--		
a.	Bullock labour	Pair days	4.63	31.50
3.	Transportation of FYM			
a.	Bullock labour	Pair days	1.37	9.32
b.	Tractor labour	Hours	0.14	9.80
4.	Sowing	--		
a.	Bullock labour	Pair days	2.68	18.23
5.	Inter cultivation	--		
a.	Bullock labour	Pair days	3.74	25.44
	Total bullock labour	Pair days	14.70	100.00
	Total tractor labour	Hour	1.43	100.00
II.	Human labour			
1.	Loading, transportation and spreading of FYM	Mandays	9.71	14.30
2.	Sowing	Mandays	7.42	10.92
3.	Weeding	Mandays	12.10	17.81
4.	Spraying	Mandays	2.60	3.83
5.	Harvesting/picking	Mandays	32.50	47.85
6.	Baling/packing	Mandays	3.59	5.28
	Total human labour	Mandays	67.92	100.00

Table 2 : Input use and output obtained in naturally coloured cotton cultivation (per hectare)

Sr. No.	Particulars	Units	Quantity
1.	Seeds	Kgs	6.25
2.	Human labour	Mandays	67.92
3.	Bullock labour	Pair days	14.70
4.	Tractor labour	Hours	1.43
5.	Farm yard manure	Tonnes	7.02
6.	Biopesticides		
i.	Nimbicidine	Ltrs.	13.91
ii.	NPV	LE	400.00
7.	Trichocard	Nos.	10.00
8.	Average yield		
i.	Main product (Kapas)	Qtls.	8.53
ii.	By-product (stalk)	Qtls.	29.00

produced manure, the cost proportion of manure was higher. Since the coloured cotton cultivation was a sub-enterprise, the share of the fixed cost in total cost of cultivation was only 17.92 per cent. In the marketing cost, packing material and packing cost were the major components. The total cost incurred to produce one quintal of cotton was Rs.1868.02, which comprised of variable cost (Rs.1533.22) and fixed cost (Rs.334.80).

The study conducted by Ramasundaram *et al*. (2005) in the economics of rainfed hybrid cotton production in Central India revealed similar results with respect to total cost of cultivation per hectare (Rs.15,640) and per quintal (Rs.2148).

The gross return per hectare of coloured cotton cultivation was Rs.19,772.50. The benefit-cost ratio obtained was 1.21. Thus, the hypothesis that coloured cotton cultivation was profitable is vindicated.

Mahantesh (2002) in the economics of cotton production in the Belgaum district revealed similar results with respect to net income (Rs.3088.98/ha) and the benefit-cost ratio (1.10).

Resource use efficiency in naturally coloured cotton production:

As depicted in Table 4 the Cobb-Douglas production function estimates revealed that output elasticities of human labour and land were significant at one per cent and that of farm yard manure was significant at five per cent level. Other variables had non-significant elasticities. Since the coloured cotton crop was labour intensive and the operations such as manure application, hand weeding,

Table 3 : Costs and returns in production of naturally coloured cotton

Sr. No.	Particulars	Rs./ha	Rs./q	Percentage
I.	Variable cost			
1.	Human labour	3396	398.12	21.31
2.	Bullock labour	2205	258.50	13.84
3.	Tractor power	429	50.29	2.69
4.	Seeds	625	73.27	3.92
5.	Farm yard manure	2281.5	267.47	14.32
6.	Biopesticides			
	a.Nimbicidine	2267.33	265.81	14.23
	b.NPV	800	93.79	5.02
7.	Trichocard	50	5.86	0.31
8.	Interest on working capital	1024.58	120.11	6.43
	Sub total (I)	13078.41	1533.22	82.08
II.	Fixed cost			
1.	Rental value of land	2500	293.08	15.69
2.	Land revenue	25	2.93	0.16
3.	Depreciation	83.12	9.74	0.52
4.	Interest on fixed capital	247.77	29.05	1.56
	Sub total (II)	2855.89	334.80	17.92
	Total cost of cultivation (I+II)	15934.3	1868.02	100.00
III.	Marketing cost			
1.	Packing material and packing charges	323.22	37.9	
2.	Loading and unloading charges	38.17	4.47	
3.	Transport cost	79.25	9.29	
	Sub total (III)	440.64	51.66	
	Cost of production (Rs./qtl)	1868.02	218.99	
	Gross returns including by-products (Rs./ha)	19772.50	2318.00	
	Yield (Qtls/ha)	8.53	----	
	Farm business income (Profit at cost-A)	9765.97	1144.90	
	Farm labour income (Profit at cost-B)	7018.20	822.77	
	Net income (Profit at cost-C)	3838.20	449.96	
	Net income (Profit at cost-D)	3397.56	398.31	
	B:C ratio	1.21		

spraying of bio-pesticides, harvesting significantly contributed towards increased output and therefore, to the income.

The coefficient of multiple determination (R^2) for naturally coloured cotton production was 0.92 indicating

Table 4 : Estimated cobb-douglas production function coefficients

Sr. No.	Explanatory variables	Unit	Parameters	Coefficients
1.	Intercept		a	-0.1519
2.	Land	Hectare	b_1	0.4942** (0.1265)
3.	Seeds	Kgs	b_2	0.1182 (0.1027)
4.	Farmyard manure	Tonnes	b_3	0.1118* (0.0490)
5.	Human labour	Mandays	b_4	0.4612** (0.0811)
6.	Bullock labour	Pair days	b_5	0.0078 (0.0476)
7.	Biopesticides	Rs	b_6	0.0722 (0.0690)
8.	Trichocards	Nos.	b_7	0.0318 (0.0651)
9.	Coefficient of multiple determination (R^2)			0.921
10.	Returns to scale (Σb_i)			1.2971

Note: Figures in the parentheses indicate their respective standard errors

** - Significant at one per cent probability level

* - Significant at five per cent probability level

a satisfactory fit of the function. The sum of elasticities (Sb_i) was 1.2971, which indicated increasing returns to scale. A simultaneous increase of one per cent increase in all the inputs used in the production would increase output by nearly 1.30 per cent. In general, there was scope to increase the intensity of input application in the study area.

Allocative efficiency in naturally coloured cotton production:

The Marginal Value Product (MVP) to Marginal Factor Cost (MFC) ratios of resources in the production of naturally coloured cotton has been presented in Table 5.

The MVP to MFC ratio for land, seeds, manures, human labour, bio-pesticides and Trichocard were more than one indicating that still there is scope for higher application of these inputs profitably. The results obtained in respect of land and labours are in conformity with the results of Mahantesh (2002). Bullock labour showed excessive use and had to be curbed.

Table 5 : MVP to MFC ratios of resources in naturally coloured cotton production

Sr. No.	Explanatory variable	Parameters	MVP: MFG Ratios
1.	Land in hectare	b_1	1.517
2.	Seeds in kgs	b_2	3.091
3.	Farmyard manure in tonnes	b_3	1.164
4.	Human labour in mandays	b_4	3.159
5.	Bullock labour in pair days	B_5	0.089
6.	Biopesticides in Rs.	B_6	1.970
7.	Trichocards in numbers	b_7	10.248

Note: MVP – Marginal value product,
MFC – Marginal factor cost

Problems in naturally coloured cotton production:

Table 6 indicates that the farmers were more worried about contamination of the crop since their fields were sporadically distributed among fields of non-contracted farmers who also grew regular cotton crop during the same season. An isolation distance of 50 mts has to be strictly be maintained for the cultivation of DDCC-1. The farmers were also interested to cultivate cotton seeds of alternate coloured varieties apart from the cultivated variety as they thought this would enlarge their crop horizon. Though they marketed their cotton through a pre-determined contract price, the determination of this price was linked to market price, hence the farmers were also concerned of the market price and were assured of a fixed pre-determined price, the farmers opined that their prospects would be improved if the coloured vartiety they cultivated could be marketed through the open market to a larger buyer base so that the scale of their operations could be improved. Lack of adequate moisture for cotton growth, either from rainfall or through irrigation which could impact the yields negatively was a major concern with the farmers. The farmers were also not sure of yields. They also had very few choice of bio-pesticides apart from the neem-based nimbicidine. Field fertility and inadequate credit were some of the other problems that were common to other crops besides organic coloured cotton.

Table 6 : Problems in the naturally coloured cotton production

Sr. No.	Constraints faced by farmer	Highly acute	Acute	Not acute
1.	Non-availability of seeds/ varieties	80 (100)	0	0
2.	Possibility of contamination	80 (100)	0	0
3.	Non-availability of high yield potential varieties	12 (15.0)	7 (8.75)	61 (76.25)
4.	Non-availability of different colours	80 (100.0)	0	0
5.	Non-availability of bio-control agent	4 (5.01)	11 (13.75)	65 (81.25)
6.	Non-availability of FYM	2 (2.50)	8 (10.0)	70 (87.50)
7.	Non-availability of labour during peak season	10 (12.50)	50 (62.50)	20 (25.0)
8.	Lack of guidance from Dept. officials	3 (3.75)	9 (11.25)	68 (85.0)
9.	Unawareness about IPM	14 (17.5)	17 (21.25)	49 (61.25)
10.	Low fertility status of the soil	13 (16.25)	26 (32.50)	41 (51.25)
11.	Water scarcity	46 (57.50)	23 (28.75)	11 (13.75)
12.	Non-availability quality bio pesticides	12 (15.0)	24 (30.00)	44 (55.00)
13.	Price fluctuations	43 (53.75)	32 (40.00)	5 (6.25)
14.	Yield uncertainty	47 (58.75)	24 (30.00)	9 (11.25)
15.	Rain uncertainty	60 (75.00)	16 (20.00)	4 (5.00)
16.	Credit inadequacy	14 (17.5)	19 (23.75)	47 (58.75)
17.	Non-availability of an open market	80 (100)	0	0

Figures in the parentheses indicate percentage to total

Conclusion:

Organic cultivation of coloured cotton variety DDCC-1, technically guided by the Agricultural Research Station, Dharwad under a contract with the Khadi Nekar Sahakari Utpadak Sangha Niyamit, of Uppinbetageri village proved to be a modestly profitable enterprise for the contracted farmers of Uppinbetageri village. Since the farmers cultivated the crop in their own lands and a considerable proportion of the labour contributed for the crop was from their families, the actual profit was Rs.5897 per hectare which was favourable compared to other dryland crops in the area. The regression analysis of the study indicated that cultivation could be further profitably scaled up. Accordingly, augmentation of all inputs except bullock labour would be profitable as well. Elicitation of problems indicated that there was a need to expand the market at the domestic and international scale for coloured cotton so that its cultivation could be undertaken on a profitable scale and on a larger scale.

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REFERENCES

Mahantesh, N. (2002). Economic and environmental issues related to use of agro chemicals in cotton production in Belguam district. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad.

Ramsundaram, P., Ingle, R., Dhote, S. and Singh, P. (2005). Cost of cultivation of cotton. *Financing Agric.*, **37** (2):22-25.

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