

## “Assessment of compound growth rate and economic analysis of production of cotton in Bemetara district of Chhattisgarh”

### Abstract

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The study entitled compound growth rate and economic analysis of cotton production in Bemetara district of Chhattisgarh was estimated the growth rate of area, production and productivity of the cotton in Chhattisgarh and Bemetara district was found increasing but non-significantly. The study revealed that average total operational area was 16.68 ha. the average cropping intensity was found to be 198.38 per cent. The total cost of cultivation was ₹ 93562.42, ₹ 96288.20, ₹ 98942.20 and ₹ 102757 per hectare at marginal, small, medium and large farmer respectively. The net profit obtained by cotton growers was ₹ 162154.80, ₹ 176509, ₹ 180445 and ₹ 188226 at marginal, small, medium and large respectively. Benefit-cost ratio was ranging from 1.73 to 1.83 with respect to the farm size.

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**Keywords:** Cotton, Compound growth rate, cost of cultivation

### Introduction

Cotton is the leading plant fiber (white gold) and cash crop. Cotton play important role of in the Indian economy as the country's textile industry is predominately cotton based. Indian is largest producer as well as exporters of cotton yarn. The Indian textile industry contributes about 5% to country's gross domestic product (GDP), 14% to industrial production and 11% total exporter earnings. The industry is second largest employer in the country after agriculture, providing employment to over 51 million people directly and 68 million people indirectly. Maharashtra, Gujarat, Telangana, Andhra Pradesh, Karnataka, Madhya Pradesh, Haryana, Rajasthan and Punjab are the major cotton producing states in India.

Despite the major producing state of India, Bemetara district of Chhattisgarh state has catching the area of cotton and recognized as the major cotton producing districts of Chhattisgarh state, which accounted an area of 2008 hectare and producing 702.8 metric ton (4136 Bales) of cotton the productivity 350 kg/ha of cotton of Bemetara district as, which is commenting of cotton to other cotton producing states of India. As the Chhattisgarh state is well known for paddy cultivation especially Bemetara district also known for paddy cultivation. Farmers of the district and state have diverted to grown other crops through various farmers welfare programs sponsored by the state government the name is

Rajeev Gandhi Nyaya Yojana and others.

In the view of this present study has been conducted

### **Objective:**

1. To find out the compound growth rate of area, production and productivity of cotton in study area.
2. To examine the cost and returns in production of cotton in study area.
3. To find out the major constraint in the production of cotton faced by cotton grower.

### **Material methods**

The study was carried out in the Bemetara district of Chhattisgarh. The state was selected purposively for the study in view of the importance attached to the cotton growing state in India, at the second stage, the state consists of 32 districts out of which Bemetara district have been selected purposively, the district has 4 blocks out of which 2 blocks namely Bemetara and Berla was selected randomly. From the list of cotton growers located in village of both sampled blocks among them 56 cotton growers from 22 villages were selected randomly. The primary data on cost and return of cotton were collected from the cotton grower by personal interviews methods through pre-tested questionnaire and schedule and the secondary data was collected through different government offices such as Department of Agriculture, Directorate of Economics and Statistics, Government of Chhattisgarh and other

to seek to examine the following

relevant sources. Keeping in view the objectives and nature of the study, an extensive schedule was prepared to obtain data from the sample farmers. These selected farmers were personally contacted, interviewed and the required information was collected from them. The multi-stage simple random sampling method was followed for the conducted of the study. In order to select sample farmers, all the cotton growing farmers of the selected sample farmers classified into two categories as irrigated and un-irrigated cotton growers. Further, taking into account the landholdings the cotton growers were reclassified into four groups namely; marginal Farmers (below 1.00 hectares), Small Farmers (1.01 to 2.00 hectares), Medium Farmers (2.01 to 4.00 hectares) and large farmers (Above 4.00 hectares).



Map of Bemetera district

## Analytical

### toolsCompound growth rate

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Annual compound growth rates in the area, production and productivity of cotton. The study area is fitted in an exponential function of the following form.

$$Y = aB^t$$

$$\text{Log } Y = \text{log } a + t \text{ log } B$$

Where,

Y = Area (ha) / production (tonne) / productivity (Kg/ha) A = Constant

B = Regression coefficient t = time in year

Compound growth rate (%) =  $(\text{Antilog } B - 1) \times 100$

### Cost and returns of cotton cultivation

For estimation of costs and returns of cotton, the standard cost concept method given by the commission for Agricultural Costs and Prices (CACP), was used.

- **Cost A1**-Consist of all actual expenses
- **Cost A2**-Cost A1+Rent paid for leased in land
- **Cost B1**-  
Cost A1 or A2+Interest on amount of Owned investment in the business excluding the Land

value

- **Cost B2**-Cost B1+Rental value of owned land-land revenue+rent paid for leased in land
- **Cost C1** -Cost B1+Imputed value of Family labour
- **Cost C2**-Cost B2 +Imputed value of Family Labour
- **Cost C3** – Cost C2 + 10% of cost C2 on account of managerial function performed by the farmers.

### Evaluation of output

Farm produce is evaluated at the actual price received by the farmers. Unsold produce is evaluated at a price fixed by the government of India.

### Measures of comparison

The following measures of comparison have been adopted:

- i) Gross Income = Value of total output
- ii) Family labour income = Gross Income - Cost B2  
Farm business income - Imputed value of the
- iii) Farm investment Income = Family Labour
- iv) Benefit cost ratio = Net returns/Total cost of Cultivation
- v) Cost of production (Rs. /qt.) = Total Cost/Yield
- vi) Net income = Gross income – Total expenses
- vii) Farm business income = Gross income – the cost A1 or cost A2
- viii) Input–output ratio = Total output/Total input

### Constraints in production of cotton

Constraint in the production of cotton in the sampled farms were analyzed and examined using the perception experience of the cotton growing farmers.

Measures of constraints by Garret ranking

**Garret ranking** The Garret ranks were recalculated constraints by using appropriate Garret Ranking formula. The based on the Garret ranks, the Garret value was calculated.

$$\text{Percent position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

#### Where

$R_{ij}$  = Rank given for the  $i$ th variable by  $j$ th respondents

$N_j$  = Number of variable ranked by  $j$ th respondents

## Result and discussion

The results and discussion for compound growth rate and cultivation of cotton with respect to the objectives framed for the study in the Bemetara district of Chhattisgarh state, which specifically represented on CGR, costs and returns of cotton, and constraint in production of cotton, respectively.

**Table 1: General status of sample households**

S. No.	Particulars	Farm size				Overall
		Marginal	Small	Medium	Large	
1.	Total number of sample households	4	8	14	30	56
2.	Average family size	6	5.12	5.28	5.73	5.55
3.	Average holding size (ha.)	0.65	1.58	6.33	25.94	15.39
4.	Irrigated area (ha.)	0.94	1.9	3.45	25.67	14.93
5.	Un-irrigated area (ha.)	0	0	0.5	3.03	1.75
6.	Area irrigated through tube well (ha.)	0.94 (100)	1.4 (73.68)	2.15 (62.31)	17.52 (68.25)	10.3 (68.89)
7.	Area of cotton in Kharif season (ha.)	0.65 (66.33)	1.58 (83.15)	3.25 (82.27)	25.94 (90.38)	14.98 (89.80)
8.	Area of cotton in Rabi Season (ha.)	0.65 (65.33)	1.58 (83.15)	3.25 (82.27)	25.94 (90.38)	14.98 (91.28)
9.	Total cropped area	1.88	3.8	7.9	56.89	33.09
10.	Net cropped area	0.94	1.9	3.95	28.7	16.68
11.	Cropping intensity (%)	200	200	200	198.2	198.38

## Compound growth in area, production and productivity of cotton

The compound growth rate (CGR) of Chhattisgarh the area (79.26%), production (78.61%) and productivity (0.0%) of cotton was increasing non-significant at 95% confidence interval. And the compound growth rate (CGR) of Bemetara district the area (109.22%), production (109.52%) and productivity (0.025%) of cotton was increasing non-significant at 95% confidence interval.

**Table 2. CGR in Area, Production and Productivity of cotton in Bemetara district and Chhattisgarh (2012-13 to 2021-22)**

S. No.	Particulars	items	Area	production	productivity
1.	Chhattisgarh	CGR%	79.26	78.61	0
		P-value	0.00016*** (0.087)	0.00018*** (0.089)	0.1215* (9.81)
2.	Bemetara	CGR%	109.21	109.51	0.28
		P-value	0.0001*** (0.106)	0.0001*** (0.106)	0.025** (0.010)

Note:-\*\*\* indicate significant at 1% and 10% level of significance and parenthesis shows standard error.

**Table:3. Material inputs used for cultivation of cotton (Lit./Kg/ha)**

Material inputs used for cultivation of cotton						
S. No.	Particulars	Farm size				Overall
		Marginal	Small	Medium	Large	
<b>A. Material input use</b>						
1	Seed	1.5	1.5	1.5	1.5	1.5
2	Manure					
	FYM (ton/ha)	10.3	12.5	5.5	4.7	8.25
	Compost	0	150	350	400	225
3	<b>Fertilizer</b>					
	i) Urea	129.68	128.03	128.05	130.65	129.55
	ii) DAP	128.35	129.60	132.56	134.20	131.17
	iii) MOP	122.63	118.95	125.74	126.25	127.10
	iv) Ammonium sulphate	119.37	122.47	122.20	125.06	123.53
4	Herbicide (Lit./ha.)					
	i) 2-4D	1	1	1	1	1
	ii) Other	0.85	0.83	0.75	0.90	0.83
5	Insecticide/ Pesticide					
	i) Thiamethoxam (Spike FS+)	0.10	0.10	0.10	0.10	0.10
	ii) Imidachloropid	0.22	0.22	0.22	0.22	0.22
	iii) Confidor	0.25	0.25	0.25	0.25	0.25
	iv) Safins	1	1	1	1	1
	v) Other	0.35	0.35	0.35	0.35	0.35
<b>B.</b>	<b>Human labour used (day/ha)</b>					

i) owned	102.5	54.37	36	28.8	55.4175
ii) Hired	89.75	131.87	149.21	161.36	133.0475
<b>C. Machine power (hrs./ha)</b>	11.57	11.34	12.44	12.43	11.945

**Table:4.Humanlabourused forcultivationofcotton (Day/ha)**

Human labour used for cultivation of cotton											
S.No.	Particulars	Marginal		Small		Medium		Large		Overall	
		M	F	M	F	M	F	M	F	M	F
1	Field preparation	-	-	-	-	-	-	-	-	-	-
2	sowing	8	16	7	18	5	21	5	20	6.3	18.75
3	Application of manure and fertilizer	8	8	10	11	8	9	-	15	6.5	10.8
4	Irrigation	4		3		4		4		3.8	
5	Weeding	2	8	4	8	0	12		10	1.5	9.5
6	Spraying of insecticide & Herbicide more than three time	18	-	18	-	20	-	22	-	20	-
7	Nipping of tender leaves	-	-	-	-	-	-	-	-	-	-
8	Picking and harvesting on contract (Rs./ha)	-	-	-	-	-	-	-	-	-	-
	i) First harvesting	-	34	-	40	-	40	-	40	-	38.5
	ii) Second harvesting	-	30	-	35	-	38	-	35	-	34.5
	iii) Third harvesting	-	30	-	30	-	42	-	45	-	36.8
	iv) Forth harvesting	-	24	-	10	-	-	-	0	-	8.5
9	<b>Machine power (hrs./ha)</b>	-	-	-	-	-	-	-	-	-	-
10	Bullock	-	-	-	-	-	-	-	-	-	-
	<b>Total</b>	<b>40</b>	<b>150</b>	<b>42</b>	<b>152</b>	<b>38</b>	<b>162</b>	<b>32</b>	<b>160</b>	<b>38</b>	<b>157.35</b>

**Note:- Thewagerateof human labouris150Rs.Perday. (M- Male, F- Female)**

### Costof cultivation

The results of this analysis are presented in the table 5. According to the table, the total costofcultivationincottonwas ₹ 97887.50/haTheVariableCostandFixedCostweredetermined to be ₹ 61005.10/ha and ₹ 36882.40/ha, respectively, representing 62.32 percentand 37.67 percent of the total cost of cultivation. It was also found that the total cost ofcultivationincottonformarginal,small,mediumandlargefarmerswas ₹ 93562.42/ha, ₹ 96288.20/ha, ₹ 98942.20/ha and ₹ 102757/ha, respectively. For marginal, small and mediumand large farmers the variable costs account for 63.50 percent, 61.90 percent, 62.39 percentand 61.59 percent respectively. marginal, small, medium and largefarmers, are, spend 36.50percent,38.10 percent,37.61 percentand 38.41 percentonoverhead costs respectively.

From the table 5, it is clearly demonstrated that hired Human Labour comprises the largestproportion (20.38%) of overall cost among the variable costs, followed by machine

power(12.21%), fertilizers (7.57%), and Insecticides (5.49%). Seeds, owned human labour, bullocklabour, and irrigation expenses are less prominent among operational expenditures. The cost of family labour reduced as farm size increased, but the cost of machine labour increased.

**Table:5. Cost of cultivation in cotton** (₹ /ha)

S. No.	Particulars	Farm Size Group			Overall	
		Marginal	Small	Medium		Large
<b>1. Variable Cost</b>						
A.	<b>Material input Cost</b>					
1	Seed	2025.65 (2.16)	2173.6 (2.25)	2240.64 (2.26)	2318.5 (2.25)	2189.6 (2.23)
2	Manure FYM/Compost	2556.25 (2.17)	2937.5 (3.05)	3378.57 (2.26)	3851.66 (3.74)	3181 (3.24)
3	Fertilizer	<b>7310.25</b> <b>(7.81)</b>	<b>7297.61</b> <b>(7.57)</b>	<b>7397.34</b> <b>7.47)</b>	<b>7660.22</b> <b>(7.45)</b>	<b>7416.36</b> <b>(7.57)</b>
	Urea	700.25 (0.74)	691.37 (0.71)	691.5 (0.69)	705.5 (0.68)	697.155 (0.71)
	DAP	3208.75 (3.42)	3240.62 (3.36)	3314.14 (3.34)	3355.03 (3.26)	3279.64 (3.3)
	MOP	2207.50 (2.35)	2141.25 (2.22)	2263.35 (2.28)	2349.06 (2.28)	2240.29 (2.28)
	Ammonium sulphate	1193.75 (1.27)	1224.37 (1.27)	1128.35 (1.14)	1250.63 (1.21)	1199.28 (1.22)
4	Insecticide/herbicide and pesticide	4883.75 (5.21)	5338.75 (5.54)	5699.92 (5.76)	5612.63 (5.46)	5383.76 (5.49)
5	Irrigation Charge	531.25 (0.54)	584.12 (0.60)	615.35 (0.62)	609.5 (0.59)	585.055 (0.59)
B.	<b>Human Labour (day/Rs./ha)</b>	<b>28837.5</b> <b>(30.82)</b>	<b>27936</b> <b>(29.01)</b>	<b>27781.5</b> <b>(28.07)</b>	<b>28524</b> <b>(27.75)</b>	<b>28269.8</b> <b>(28.87)</b>
1	Owned	15375 (16.43)	8155.5 (8.46)	5400 (5.45)	4320 (4.20)	8312.63 (8.49)
2	Hired	13462.5 (14.38)	19780.5 (20.54)	22381.50 (22.62)	24204 (23.55)	19957.10 (20.38)
C.	Machine power used Charge	11579.25 (12.37)	11349.10 (11.78)	12444.10 (12.57)	12439.10 (12.10)	11952.90 (12.21)
D.	Interest on Working Capital (IOWC)	1693.95 (1.81)	1978.45 (2.05)	2166.30 (2.18)	2267.83 (2.20)	2026.63 (2.07)
	<b>Total Variable Costs</b>	<b>59417.86</b> <b>(63.50)</b>	<b>59595.20</b> <b>(61.90)</b>	<b>61723.80</b> <b>(62.39)</b>	<b>63283.50</b> <b>(61.59)</b>	<b>61005.10</b> <b>(62.33)</b>
<b>B. Fixed Costs</b>						
1	Depreciation	527.51 (0.56)	838.52 (0.87)	1037.27 (1.04)	1439.29 (1.40)	960.648 (0.98)
2	Land Revenue	12.50 (0.00)	12.50 (0.00)	12.50 (0.00)	12.50 (0.00)	12.50 (0.00)
3	Rental Value of Owned Land	30500.50	32506.30	32785.10	34433.30	32556.30

		(32.59)	(33.75)	(33.13)	(33.50)	(33.25)
4	Interest on Fixed Capital (IOFC)	3104.051	3335.73	3383.49	3588.51	3352.95
		(3.31)	(3.46)	(3.14)	(3.49)	(3.42)
	<b>Total Fixed Costs</b>	<b>34144.56</b>	<b>36693</b>	<b>37218.40</b>	<b>39473.60</b>	<b>36882.40</b>
		<b>(36.50)</b>	<b>(38.10)</b>	<b>(37.61)</b>	<b>(38.41)</b>	<b>(37.67)</b>
	<b>Total Costs</b>	<b>93562.42</b>	<b>96288.20</b>	<b>98942.20</b>	<b>102757</b>	<b>97887.50</b>
		<b>(100)</b>	<b>(100)</b>	<b>(100)</b>	<b>(100)</b>	<b>(100)</b>

Mechanization compensated for a reduction in human work on large lands. In addition, small farms used more family workers than large farms. Machine labour increased. Mechanization compensated for a reduction in human work on large lands. In addition, small farms used more family workers than large farms.

### Returns from Cotton Cultivation:

The cotton average gross profits from cotton cultivation at per hectare were computed using the total market price of ₹ 9322.89 per quintal and total gross return from cotton was found to be ₹ 274676. The total farm business earnings, family labour income, and farm investment income were estimated to be ₹ 221010/ha, ₹ 1855101/ha, and ₹ 212697/ha. It is concluded that as farm size increases, so does the net return. The average cotton yield per hectare was 29.46 quintal/hectare.

The table 6., shows the productivity, cost of cultivation and cost of production of cotton for different types of farmers.

<b>Yield and Income</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>	<b>Overall</b>
Cost of cultivation	93562.42	96288.20	98942.20	102757	97887.50
Yield	27.57	29.30	29.96	31.02	29.46
Price	9275.20	9310.50	9325.35	9380.50	9322.89
Gross return	255717.30	272798	279387	290983	274676
Net Return	162154.80	176509	180445	188226	176788
Farm business income	211134.40	220507	222014	230568	221010
Family labour income	177529.90	184665	185845	192546	185101
Farm investment income	195759.40	212351	216614	226248	212697
Cost of production	3393.63	3286.29	3302.48	3312.60	3322.44
B.C. ratio	1.73	1.83	1.82	1.83	1.81
Input - Output ratio	1:2.73	1:2.83	1:2.82	1:2.83	1:2.81

## Constraints in Production of cotton

The calculation of Garret value and ranking of problems faced by cotton farmers are shown below.

**Table 7. Constraints in Production of cotton**

S. No.	Problems reported by the farmers	Respondent	Total	Average	Rank
1	Lack of latest technical knowledge	56	2132	38.07	VIII
2	Non-availability of high yielding var. of seed	56	2292	40.92	VII
3	Lack of resources like Money, equipment	56	2564	45.78	V
4	Deep Ploughing makes the soil more loose and is not economical	56	2827	50.48	III
5	Damaged due to pest and disease	56	4005	71.51	I
6	Timely unavailability of labour	56	3363	60.05	II
7	Timely unavailability of input	56	2747	49.09	IV
8	Less agronomic practices	56	2470	44.10	VI

## Conclusions

The above study to examine, an economic analysis of production and marketing of cotton in Bemetar district of Chhattisgarh. It was observed that the average cropping intensity was 198.37% in the study area. In Chhattisgarh, compound growth rate of area, production and productivity of cotton were 79.26%, 78.61% and 0%, and Bemetara, compound growth rate of area, production and productivity of cotton were 109.22%, 109.52% and 0.25% respectively. The overall total cost per hectare of cotton is found to be ₹ 97887.50/ha. The cost of cultivation for marginal, small, medium and large farm were ₹ 93562.42/ha, ₹ 96288.20/ha, ₹ 98942.20/ha and ₹ 102757/ha respectively. The overall yield of cotton is 29.21 qt/ha. Overall cost of production has been estimated ₹ 3350.88 qt. Overall value of net income of cotton has been estimated ₹ 172536/ha. The overall input-output ratio and B-C ratio were 2.76 and 1.76 respectively.

Overall Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3 of cotton were ₹ 58978.45/ha, ₹ 58978.45/ha, ₹ 623361.40/ha, ₹ 94887.67/ha, ₹ 70644.02/ha,

₹ 103200.52/ha, ₹ 113520.55/ha respectively for the overall sample farms. The major constraints on production of cotton were damage due to pest and disease -I followed by unavailability of labour in time -II, lack of irrigation water-III, unavailability of input in time-IV, lack of resources like money and equipment-V, less agronomic practices-VI, availability of seed high yielding varieties-VII and lack of latest technical knowledge-VIII.

### **Suggestions:**

- Extension services should be improved for the seed sector including the fertilizer provision, pest management and irrigation service etc.
- The use of recommended varieties, fertilizer, and insecticides/fungicides should be encouraged.
- Pest management should be done in an integrated manner. The pest control that is biological might also help to lower input expenses.
- Also, producers must aware themselves that the cotton is a highly demanded product both in the domestic as well as international market and should be motivated themselves to solve production and marketing constraints.
- There should be some facility for crop insurance claim and government subsidy for the cotton cultivator who took the land on lease or rent.
- Lack of cotton mill was seen, so establishment of cotton mill are recommended.
- Fiber crop is quite risky due to the perishable nature of the produce, seasonal production and bulkiness. An awareness of storage of cotton for reduces the losses.

### **References**

Anonymous report

Bemetara District Profile (2018).

Birla H., Meena L. K., Lakra K., Bairwa S. Land Beohar B. B. 2014. Study on marketing of cotton in khargone district of Madhya Pradesh, India: *Journal of recent advances in Agriculture* 2(6): 244-251.

Cotton Corporation of India 2021-22. Cg.nic.in/ revenue 2021.

District Survey Report Bemetara 2019.

Gamanagatti P.

B., Dodamani M. T., Gaddi G. M. and Menasihal 2012. Cost and returns in Bt. cotton cultivation across different farm sizes in northern Transitional Zone, Karnataka: *International Journal of Agricultural Sciences* 8(2), 431-435.

Government of Chhattisgarh 2021-22. Directorate of Agriculture

Government of Chhattisgarh 2021. Indira Gandhi Krishi Vishwavidyalaya Darshika.

Government of India 2010. Department of Agriculture and Cooperation, New Delhi.

Gousiya S.K., Babu G.S.K., Asha R., Shrine S., Lalhminglui 2020. Production and marketing of cotton in Guntur district: Andhra Pradesh, *Journal of plant development science* 12(10): 641-644.

Kambal B.T., Nawadkar D.S. and Hile R.B. 2016. Economics of Production and Marketing of Cotton western Maharashtra Region of Maharashtra State: *Indian Journal of Economics and Development* 12(1), 81-84.

Mayilsami, K. and Selvaraj 2019. Cost and return of cotton cultivation: a study in Krishnagiri district of Tamil Nadu, [www.ijrar.org](http://www.ijrar.org) 5(1): 722-734.

Murthy, C., Kulkarni, V. & Kerur, B.P., 2015. A Study on Economic Analysis of Cotton Production in North Karnataka: *International Research Journal of Agricultural Economics and Statistics* 6(2), 419-425.

Raddy A.R., Blaise D. and Anuradha N. 2018. Cost escalation in cotton cultivation: *New Delhi publishers* 63(4): 833-838.

Sankar A.S. and Naidu V. B. 2017. To study the cost, returns and profitability of cotton production in Andhra Pradesh, India: *International journal of advance education and research* 2(2): 28-32.

Shelke R.D., Bhogaonkar M. M. Chavan R. V. 2016. Cost, returns and profitability of Bt. Cotton production in Beed district: *International journal of commerce and business management*, 9(1): 58-61.

Visawadia H.R., Fadadu A.M. and Tarpara V.D. 2006. A comparative analysis of production and marketing of Bt. Cotton and hybrid cotton in Saurashtra region of Gujarat state, *Agriculture Economics research review* (19): 293-300.