Original Research Article

"Assessment of compoundgrowthrateandeconomicanalysisofproductionof cottoninBemetaradistrictofChhattisgarh"

Abstract

The study entitled compound growth rate and economic analysis of cotton production inBemetaradistrictofChhattisgarhwasestimated 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 thataveragetotaloperationalareawas16.68ha.theaveragecroppingintensitywasfoundtobe 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, ₹ 180445and ₹ 188226 at marginal,small, medium and large respectively. Benefit-cost ratio wasranging from 1.73 to 1.83 with respect to the farm size.

Keywords: Cotton, Compound growth rate, cost of cultivation

Introduction

Cotton is the leading plant fiber (white gold) and cash crop. Cotton play importancerole of in the Indian economy as the country'stextilesindustryispredominatelycottonb ased.Indian islargestproducersaswell as exporters of cotton yarn. The Indian textileindustry contributes about 5% to country's gross domestic product (GDP), 14% to industrialproduction and 11% total exporter earnings. The industry is second largest employer in thecountry after agriculture, providing employment to over 51 million people directly and 68millionpeopleindirectly.Maharashtra, Gujarat,Telangana,AndhraPradesh,Karnataka,Ma dhya Pradesh, Haryana, Rajasthan and Punjab are the major cotton producing states inIndia. Despite the major producing state of India, Bemetara district of Chhattisgarh state hascatchingtheareaofcottonandrecognizedasthem ajorcottonproducingdistrictsofChhattisgarh state, which accounted an area of 2008hectare and producing 702.8 metric ton(4136 Bales) of cotton the productivity 350 kg/ha of cotton of Bemetara district as, which iscommentating of cotton to other cotton producing states of India. As the Chhattisgarh state iswellknownforpaddycultivationespeciallyBemet aradistrictalsoknownforpaddycultivation.

Farmers of the district and state have diverted to grown other crops throughvarious farmers welfare programs sponsored by the state government the name is

RajeevGandhiNyayaYojanaand others.

Intheviewofthisapresentstudyhasbeenconduc tedseekstoexaminethefollowing

Objective:

1. To find out the compound growth rate of area, production and productivity of cotton instudyarea.
2. Toexaminethe cost and returnsin productionof cottonin studyarea.
3. Tofind outthe majorconstraint in theproductionofcotton faced by cotton grower.

Materialmethods

The study was carried out in the Bemetara district of Chhattisgarh. The state was selected purposively for the study inview 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 selectedpurposively, the district has 4 blocks out of which 2blocksnamelyBemetara and Berla was selected randomly. From the list of cotton growers located in village ofboth sampledblocks amongthen 56 cotton growers from 22villageswereselectedrandomly. Theprimarydataoncostandreturnofcottonwere collectedfromthecottongrowerbypersonalinte rviews methods through pre-tested questionnaire and scheduleandthesecondarydatawascollectedth roughdifferentgovernmentofficessuchasDepa rtmentofAgriculture,DirectorateofEconomics andStatistics,GovernmentofChhattisgarh and other relevant sources. Keeping in view the objectives and nature of thestudy,anextensive schedule waspreparedtoobtaindata fromthe sample farmers. Theselected farmers were personally contacted, interviewed and the required information wascollected from them. The multi-stage simple random sampling method was followedfor theconducted of the study. In order to select sample farmers, all the cottongrowing farmers of the selected sample farmers classified into two categories as irrigated andun-irrigated cotton growers. Further, taking into account the landholdings the cotton growerswereclassifiedinto fourgroupsnamely;marginalFarmers(below1. 00hectares),SmallFarmers (1.01 to 2.00 hectares), Medium Farmers (2.01 to 4.00 hectares) and large farmers(Above4.0 hectares).

Map of Bemetara district

Analytical

toolsCompoundgrowthrate

:

Annualcompoundgrowthratesinthearea,productionandproductivityofcotton.Thestudyareabyfitt inganexponential function ofthe followingform.

$$Y=aB^t$$

$$LogY=loga+t\ logB$$

Where,

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

B = Regression coefficientt=timeinyear

Compound growthrate(%)=(AntilogB-1)100

Costand returnsof cottoncultivation

Forestimationofcostsandreturnsofcotton,thestandardcostconceptmethodgivenbythecommission forAgricultural Costsand Prices(CACP), wasused.

- **CostA1**-Consist ofall actual expenses
- **CostA2**-CostA1+Rentpaidforleasedinland
- **CostB1**-CostA1orA2+InterestonamountofOwnedinvestmentinthebusinessexcludingtheLand

value

- **CostB2-**CostB1+Rentalvalueofownedland-landrevenue+rentpaidforleasedin land
- **CostC1 -**CostB1+ImputedvalueofFamilylabour
- **CostC2-**Cost B2 +Imputed valueofFamilyLabour
- **Cost C3** – Cost C2 + 10% of cost C2 on account of managerial function performed bythefarmers.

Evaluationofoutput

Farmproduceisevaluatedattheactualpricereceivedbythefarmers.Unsoldproduceisevaluatedat a pricefixed bythegovernment ofIndia.

Measuresofcomparison

Thefollowingmeasuresofcomparison havebeenadopted:

i)	GrossIncome	=	Valueoftotaloutput
ii)	Familylabourincome	=	GrossIncome -CostB2
iii)	Farminvestment Income	=	Farm business income - Imputed value of the FamilyLabour
iv)	Benefitcostratio	=	NetreturnsTotalcostofCultivation
v)	Cost ofproduction (Rs. /qt.)=		TotalCost/Yield
vi)	Netincome	=	Grossincome–Totalexpenses
vii)	Farmbusiness income	=	Grossincome–thecostA1orcostA2
viii)	Input–outputratio	=	Totaloutput/Total input

Constraintsinproductionof cotton

Constraintintheproductionofcottoninthesampledfarmswereanalyzedandexaminedusingthe perception experience ofthecottongrowingfarmers.

Measuresofconstraintsbygarretranking

GarretrankingTheGarretrankswerecalculatedconstrainsbyusingappropriateGarretRankingfor mula. Thebased on theGarret ranks, thegarretvaluewas calculated.

$$\text{Percent position} = \frac{100\ (Rij-0.5)}{Nj}$$

Where

Rij = Rank given for the ith variable by jth respondents

Nj=Number ofvariableranked byjth respondents

Resultanddiscussion

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				
		Marginal	**Small**	**Medium**	**Large**	**Overall**
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

Compoundgrowthin area,productionandproductivityofcotton

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%)andproductivity(0.025%)ofcottonwasincreasingnon-significantat95%confidenceinterval.

Table 2. CGR in Area, Production and Productivity of cotton in Bemetara district andChhattisgarh(2012-13 to2021-22)

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 andparenthesisshowsstandard error.

Table:3.Material inputsusedforcultivationof cotton (Lit./Kg/ha)

Material inputs used for cultivation of cotton						
		Farm size				
S.No.	Particulars	Marginal	Small	Medium	Large	Overall
A.	**Material input use**					
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	**Fertilizer**					
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.	**Human labour used (day/ha)**					

i)	owned	102.5	54.37	36	28.8	55.4175
ii)	Hired	89.75	131.87	149.21	161.36	133.0475
C.	**Machine power (hrs./ha)**	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	**Machine power (hrs./ha)**	-	-	-	-	-	-	-	-	-	-
10	Bullock	-	-	-	-	-	-	-	-	-	-
	Total	**40**	**150**	**42**	**152**	**38**	**162**	**32**	**160**	**38**	**157.35**

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 costof family labour reduced as farm size increased, but the cost of machine labour increased.

Table:5.Costofcultivation incotton **(₹ /ha)**

S.No.	Particulars	Farm Size Group				Overall
		Marginal	Small	Medium	Large	
1. Variable Cost						
A.	**Material input Cost**					
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	**7310.25 (7.81)**	**7297.61 (7.57)**	**7397.34 7.47)**	**7660.22 (7.45)**	**7416.36 (7.57)**
	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.	**Human Labour (day/Rs./ha)**	**28837.5 (30.82)**	**27936 (29.01)**	**27781.5 (28.07)**	**28524 (27.75)**	**28269.8 (28.87)**
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)
	Total Variable Costs	**59417.86 (63.50)**	**59595.20 (61.90)**	**61723.80 (62.39)**	**63283.50 (61.59)**	**61005.10 (62.33)**
B. Fixed Costs						
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 (3.31)	3335.73 (3.46)	3383.49 (3.14)	3588.51 (3.49)	3352.95 (3.42)
	Total Fixed Costs	**34144.56 (36.50)**	**36693 (38.10)**	**37218.40 (37.61)**	**39473.60 (38.41)**	**36882.40 (37.67)**
	Total Costs	**93562.42 (100)**	**96288.20 (100)**	**98942.20 (100)**	**102757 (100)**	**97887.50 (100)**

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

ReturnsfromCotton Cultivation:

The cotton average gross profits from cotton cultivation at per hectare were computed usingthe 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 incomewere estimated to be ₹ 221010/ha, ₹ 1855101/ha, and ₹ 212697/ha. It is concluded that asfarm size increases, so does the net return. The average cotton yield per hectare was 29.46quintal/hectare.

The table 6., shows the productivity, cost of cultivation and cost of production of cotton fordifferenttypes offarmers.

Table.6.Yield andIncomefromCottonCultivation **(q/₹ /ha)**

Yield and Income	Marginal	Small	Medium	Large	Overall
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

ConstraintsinProductionof cotton

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

Table7.ConstraintsinProductionof cotton

S.No.	Problemsreportedbythefarmers	Respondent	Total	Average	Rank
1	LackoflatesttechnicalKnowledge	56	2132	38.07	**VIII**
2	Non-availabilityofhighyieldingvar.ofseed	56	2292	40.92	**VII**
3	LackofresourceslikeMoney,equipment	56	2564	45.78	**V**
4	DeepPloughingmakethesoilmore loseandisnoteconomical	56	2827	50.48	**III**
5	Damageduetopestanddisease	56	4005	71.51	**I**
6	Timelyunavailabilityoflabour	56	3363	60.05	**II**
7	Timelyunavailabilityofinput	56	2747	49.09	**IV**
8	Lessagronomicpractices	56	2470	44.10	**VI**

Conclusions

The above study to examine, an economic analysis of production and marketing ofcottoninBemetaradistrictofChhattisgarh.Itwasobservedthattheaveragecropping intensity was198.37% inthe study area.InChhattisgarh,compoundgrowth rate of area, production and productivity of cotton were 79.26%, 78.61%and 0%, and Bemetara, compound growth rate of area, production and productivityof cotton were 109.22%,109.52% and0.25% respectively.The overall total costper hectare of cotton is found to be ₹ 97887.50/ha. The cost of cultivation formarginal, 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 29.21qt/ha. Overall cost of production has been estimated ₹ 3350.88 qt. Overall value ofnetincome of cottonhasbeen estimated₹ 172536/ha. The overallinput-outputratioand B-C ratio were2.76 and 1.76 respectively.

Overall CostA1, CostA2, Cost B1, Cost B2, CostC1, CostC2 and CostC3 of cottonwere₹ 58978.45/ha,₹ 58978.45/ha,₹ 623361.40/ha,₹ 94887.67/ha,₹ 70644.02/ha,₹ 10320

0.52/ha, ₹ 113520.55/harespectivelyforthe overall samplefarms.Themajorconstraintsonproductionofcottonweredamage duetopestanddisease-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 andlackof latest technical knowledge-VIII.

Suggestions:

- Extensionserviceshouldbeimprovedfortheseedsectorincludingthefertilizerprovision,pest managementand irrigationserviceetc.
- Theuseofrecommendedvarieties,fertilizer,andinsecticides/fungicidesshouldbeencouraged.
- Pest management should be done in an integrated manner. The pest controlthatis biological might also helpto lower input expenses.
- Also, producers must aware themselves that the cotton is a highly demandedproduct both in the domestically as well as international market andshouldbemotive themselvesto solve productionand marketingconstraints.
- Thereshouldbesomefacility forcropinsuranceclaimandgovernmentsubsidyforthecotton cultivator who took thelandon leasein or rant.
- Lackofcottonmillwasseen,soestablishmentofcottonmillarerecommended.
- Fiber crop is quite risky due to the perishable nature of the produce, seasonalproduction and bulkiness. An awareness of storage of cotton for reduces thelosses.

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