



Changing scenario of production and cost profitability trends in Indian cotton

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Abstract : The cotton sector has grown into a multi-billion-dollar industry and continues to play a key role in supporting the textile sector. Looking to the national and international importance of this crop which is grown in major eleven cotton growing states in India; the study was taken up to analyse the dynamics of production and cost profitability trends in cotton over the years after the advent of *Bt* cotton in India. The scenario of cotton production in the country is that there has been a growth in area and production but yield decrease over years which is of prime concern for the Indian cotton economy. Over the period of time, there were drastic changes in input use, especially for field operations in cotton fields. The increase in MSP during the same period was higher (7.01 %) as compared to increase in implicit prices showing government price policy support works as an incentive for enhancing the cotton production in the country. The break even yield of cotton in India with the given cost and price structure shows that the farmers are operating cotton production business above the break even point in most of the cotton growing States.

Keywords: Break even yield, cost structure, productivity, profitability

Cotton, a natural fibre, to this day, remains the most consumed natural fibre, representing almost a quarter of all fibres processed by the global textile sector. The cotton sector has grown into a multi billion dollar industry and continues to play a key role in supporting the textile sector. The processing of raw cotton products (cotton seed, cotton lint, and cotton linter) was reported to have a global retail market value of more than USD 18 billion in 2021 and is projected to exceed USD 22 billion by 2027 at a compound annual growth rate (CAGR) of 3.58 per cent. Cotton farming is essential to the global textile sector, employing around 25 million people- as about half of all textiles are made of cotton. Global cotton supply and demand have fluctuated over the last five years but have remained fairly even. Although China and the United States continue to trade large quantities of cotton, other countries, such as Brazil and India, have become close cotton trade partners with China since 2018, further changing the

global market dynamics. Volatile market prices, rising production costs (particularly on inputs such as pesticides and fertilizers), decreasing yields, and increasing household costs add pressure to the already unstable and inadequate incomes of many cotton farmers who are at the end of a long and complex value chain, often receiving the lowest prices while bearing high production costs. Indeed, many farmers depend on local ginneries or traders who buy their raw cotton, often for less than the cost of production. The average production costs of raw cotton vary widely across countries; however, according to ICAC (2016), the average global cost of production of a kilogram of seed or raw cotton was USD 0.46 in 2016, not including land rent and seed value. Fertilizers and harvesting/picking are the most expensive inputs, accounting for 24 and 13 per cent of the total costs, respectively. The same year, the market price hovered around USD 0.65/kg, meaning that most farmers in the world were

struggling to reach the breakeven point or the price needed to cover production costs (ICAC, 2016). Looking to the national and international importance of this crop which is grown in major eleven cotton growing States in India; the study was taken up to analyse the dynamics of production and cost profitability trends in cotton over the years after the advent of *Bt* cotton in India.

Nature and analysis of data

The present study is an attempt to examine the pattern of growth, variability and the changes in cost and profitability in production of cotton. The time series data for the period of 2007-2008 to 2020-2021 (14 years) regarding production, area and yield of cotton has been used to compute compound growth rates and variability across the major cotton growing States comprising Punjab, Haryana and Rajasthan from north zone, Gujarat, Maharashtra, Madhya Pradesh and Odisha from central zone and Andhra Pradesh, Karnataka, Tamil Nadu and Telengana from south zone. The study on cotton production trend and changes in cost profitability structure was undertaken considering 14 years long time series data on cost of cultivation of cotton published in reports of Commission on Agricultural Cost and Prices of years under study.

Statewise dynamics of cotton production

The area under cotton is cultivated in eleven states of north, central and south zone of India dominated by Maharashtra (33 %, Gujarat (25 %) and Andhra Pradesh (14 % along with Telengana) over the years from 2007 to 2021 as given in Table I. Though there has been shift in area in some States, overall there has been an area increase to the tune of 32 per cent (from 97 to 129 lakh ha during the TE 2008-2009 and TE 2020-2021). 75 per cent of production is also contributed by these three States during the same period. The average productivity of the country decreased from 527 to 468 kg/ha over

the decade from 2007 to 2021. Cotton productivity was dominated by Tamil Nadu during TE 2008-2009 with 761 kg/ha but declined to 614 kg/ha during TE 2020-2021 which is a matter of concern. The highest increase in productivity was recorded in Rajasthan to the tune of 55 per cent from 432 to 669 kg/ha and lowest in AP (25%) from 654 to 460 kg/ha during the same period.

Statewise variability and growth in cotton production

For empirical analysis, all major cotton producing states were considered to get reliable estimates of variability (CV%) and growth (GR %) in area, production and productivity under four periods, 2007-2008 to 2010-2011, 2011-2012 to 2015-2016, 2016-2017 to 2020-2021 and 2007-2008 to 2020-2021, respectively. Area under cotton did not show variability significantly during the period under study (Table 2). For the country as a whole, production showed decreased variability between the years but in case of yield, variability was in an increasing trend from 4.22 to 9.06 per cent depicting significance in changes in both area and production of cotton. The cotton growing states of central zone showed negative growth rate in both production and yield. The variability in area, production and productivity of cotton during all the periods were lower as compared to India as a whole and for most of the States. This is possibly due to development of high yielding disease resistant varieties, matching production and protection technologies and better rainfall distribution in majority of cotton growing areas. Minimum support price of cotton has increased almost to 114 per cent over the past 12 years from Rs. 2750/q in 2010-2011 to Rs. 5875/q in 2021-2022. Thus, the government intervention in the form of support prices has apparently been one of the important motivating factors for the expansion in cotton area and output over the years.

Changes in cost profitability structure

Changes in use of critical inputs

The seed and fertilizers are considered as the critical inputs for cotton production along with supporting operational and managerial input, human labour and therefore, the information on use of these critical inputs in physical form over the years is given in Table 3. Seed rate was reduced in almost all the cotton growing states except in AP and Punjab with growth rate of 5.94 and 2.29 per cent, respectively, maybe the advent of *Bt* cotton hybrids. At all India level, the growth rate was negatively significant at 3.97 per cent depicting less seed rate and no overuse of seed input excepting the states mentioned above which is further explained by the absolute change 1.42 and 0.7 kg and relative change around 80 and 29 per cent, respectively. In case of nutrient use per hectare, there has been a general increase in the fertiliser use from 136 kg during 2007-2008 to

195 kg with growth rate of 1.04 per cent at national level. Significant growth rates were registered in the States of Maharashtra and MP to the tune of 6.9 and 4.25 per cent, respectively significant at 5 per cent probability level. This shows that there is a tremendous scope of increasing the productivity of cotton through use of balanced plant nutrients with irrigation facilities. The significant decreasing trend in use of human labour at All India level (-0.61 %), in absolute terms of man hour -91 man hr and in relative terms -10.74 per cent, revealed that the human labour component was substituted by mechanised power over the years due to time, management and availability constraint. Among the States, the growth rate of human labour in MP was positively significant at 4.47 per cent with absolute change from 680 to 790 man hours and relative change of 16.37 per cent. In total, over the period of time there were changes in its input use, especially for field operations in cotton fields.

Table 1. State wise shift in area, production and yield of cotton in India

States	TE 2009-2010			TE 2020-2021			Per cent change		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Pun	5.47 [5.64]	16.83 [5.60]	520 [98.67]	3.94 [3.06]	11 [3.08]	516 [110.27]	-28.01	-34.65	-0.76
Har	4.82 [4.96]	14.75 [4.91]	520 [98.73]	7.1 [5.52]	24.83 [6.94]	584 [124.76]	47.3	68.36	12.21
Raj	3.72 [3.83]	9.5 [3.16]	432 [81.97]	6.45 [5.01]	27.83 [7.78]	669 [143.02]	73.45	192.98	54.94
Guj	24.67 [25.41]	99.33 [33.04]	686 [130.11]	25.47 [19.81]	89.83 [25.12]	601 [128.41]	3.23	-9.56	-12.35
Mah	32.8 [33.78]	63.25 [21.04]	328 [62.24]	41.98 [32.65]	83 [23.21]	328 [70.12]	27.99	31.23	0.04
MP	6.22 [6.41]	17.75 [5.90]	485 [91.97]	6.39 [4.97]	21.33 [5.96]	581 [124.10]	2.79	20.19	19.83
AP	13.36 [13.76]	51.17 [17.02]	654 [124.10]	11.76 [9.15]	17 [4.75]	487 [104.06]	-11.95	-66.78	-25.54
Kar	4.22 [4.35]	9.75 [3.24]	390 [74.00]	6.46 [5.02]	18.67 [5.22]	462 [98.62]	53.08	91.45	18.34
TN	1.04 [1.07]	4.67 [1.55]	761 [144.47]	1.4 [1.09]	5.67 [1.58]	614 [131.27]	34.62	21.43	-19.3
Odi	0.71 [0.73]	1.33 [0.44]	315 [59.71]	1.25 [0.97]	4.33 [1.21]	446 [95.40]	75.7	224.75	41.88
Total	97.1 [100]	-300.67 [100.00]	527 [100]	128.56 [100.00]	357.67 [100.00]	468 [100.08]	32.4	18.96	-11.12

(Area in 000' ha, Production in 000' tons and yield in kg/ha) Figures in parentheses shows percentage to all India level

Changes in cost structure

As shown in Table 4, the total operational cost showed a gradual increase from 65 to 72 per cent of the total cost with significant growth rate of 3.95 per cent from 2007-2008 to 2020-2021. Excepting seed, fertilisers and manures, the escalation of other input costs like human (GR 4.65 %), machine labour (7.31%), irrigation (3.46%) and insecticides (3.61%) have contributed to increased variable cost over the years. On the contrary, fixed cost decreased from 35 to 28 per cent of the total cost during the same period with growth rate of 1.36 per cent. Over the period of time, the expenditure on input use in cotton production increased significantly. The overall total cost of production in real terms increased from Rs. 29503.36/ha in 2007-2008 to Rs. 44048.35/ha in 2020-2021 with significant growth rate of 3.15 per cent and the proportion of operational and fixed cost changed from 65:35 to 72.:28 between 2007-2008 and

2020-2021.

The major components of operational and managerial inputs are human labour, bullock labour, machine power and interest on working capital, while productive and protective inputs cover items like seed, fertilizer, manure, irrigation and insecticides. The information on its proportionate change over the period of time is given in Table 5. The proportionate expenditure on operational and managerial inputs was 66.61 per cent during 2007-2008 which increased to 72.64 per cent in the year 2020-2021. In contrary to this, the percentage expenditure on productive and protective inputs decreased from 33.39 per cent to 27.36 per cent during the same period which reveals less technological intensification in cotton production in India which is revealed in the stagnant productivity at around 15 to 16 q/ha. Still, Punjab, Rajasthan, Karnataka and Tamil Nadu show promising trend in increased productivity in spite of the

Table 2. State wise variability and Growth rate in area, production and yield of cotton in India

Year	Area				Production				Yield			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Pun	-4.14 (7.65)	-10.75 (18.04)	17.83- (29.10)	4.31 (25.20)	-5.17 (17.47)	-22.29 (-38.04)	3.69 (12.96)	-5.40 (33.22)	-1.12 (13.40)	-12.92 (29.21)	-12.01 (-26.64)	-1.00 (23.78)
Har	1.63 (4.42)	-0.68 (7.32)	9.16 (14.47)	3.12 (15.89)	4.72 (8.15)	-12.52 (20.89)	6.78 (11.28)	3.55 (22.46)	3.01 (6.34)	-11.93 (22.59)	-2.10 (9.49)	0.29 (15.90)
Raj	0.96 (16.78)	-0.17 (7.88)	11.62 (21.65)	5.15 (26.38)	8.50 (19.63)	-3.58 (10.14)	10.87 (17.73)	9.74 (39.96)	7.47 (9.920)	-3.43 (5.58)	-0.68 (2.38)	3.71 (16.75)
Guj	3.66 (5.66)	-0.66 (7.14)	-0.97 (7.40)	0.01 (7.17)	-0.20 (8.81)	-3.65 (13.65)	-2.48 (6.55)	-1.08 (11.62)	-3.71 (8.95)	-2.99 (13.86)	-1.53 (9.71)	-1.12 (11.19)
Mah	7.59 (10.54)	-1.38 (3.74)	2.35 (4.50)	1.83 (9.74)	11.64 (17.84)	-0.64 (4.70)	-0.26 (5.99)	2.09 (11.86)	3.73 (7.74)	0.75 (3.66)	-2.48 (10.26)	0.05 (7.48)
MP	0.71 (2.57)	-5.97 (13.00)	-0.26 (8.11)	-0.28 (9.05)	-5.18 (10.98)	-0.54 (2.98)	-1.01 (5.41)	1.69 (10.61)	-5.88 (10.17)	5.78 (13.04)	-3.16 (9.45)	1.96 (13.35)
AP	15.20 (18.50)	5.97 (11.08)	-30.99 (60.21)	-2.63 (38.30)	8.33 (10.47)	-5.21 (35.93)	-24.27 (78.46)	-9.13 (50.98)	-7.43 (10.19)	1.04 (4.02)	-3.71 (17.55)	-1.84 (12.67)
Kar	10.68 (14.54)	8.94 (23.00)	10.91 (16.37)	3.32 (22.86)	13.78 (19.19)	12.66 (30.32)	0.46 (11.16)	6.51 (35.86)	2.83 (14.54)	3.42 (11.13)	-9.39 (26.77)	2.66 (24.24)
TN	5.97 (9.11)	5.23 (15.79)	-0.52 (9.84)	2.61 (17.44)	19.28 (25.50)	-6.83 (12.86)	-2.74 (7.85)	0.82 (14.78)	12.54 (16.14)	-11.44 (24.79)	-5.86 (20.94)	-3.29 (23.42)
Odi	-5.08 (17.71)	4.83 (8.51)	-7.20 (38.07)	4.43 (35.09)	15.72 (39.15)	-3.04 (12.09)	11.73 (18.34)	10.01 (38.49)	21.88 (30.41)	-7.49 (13.27)	3.26 (10.09)	2.01 (22.73)
Total	6.16 (8.27)	0.18 (3.15)	5.05 (8.95)	2.14 (10.93)	3.55 (6.66)	-1.37 (5.90)	0.98 (4.06)	1.32 (9.01)	-2.68 (4.22)	-1.52 (5.90)	-3.76-0.87 (9.06)	-0.87 (6.74)

I - 2007-08 to 2010-11; II - 2011-12 to 2015-16; III - 2016-17 to 2020-21; IV - 2007-08 to 2020-21

(Figures in parentheses show growth rate)

Table 3. Critical input use pattern in cotton production in India

Seed	AP	Guj	Har	Kar	MP	Mah	Odi	Pun	Raj	TN	All India
2007-2008	1.76	3.02	3.91	3.00	1.38	2.66	1.30	2.51	13.91	8.70	4.54
2012-2013	1.87	1.77	2.05	2.01	1.14	1.81	1.50	3.20	4.24	3.97	2.36
2020-2021	3.18	1.90	2.60	2.33	1.20	2.09	1.50	3.23	3.06	4.27	2.54
Abs Change	1.42	-1.12	-1.31	-0.67	-0.18	-0.57	0.20	0.72	-10.85	-4.43	-2.00
Rel Change	80.68	-37.09	-33.50	-22.33	-13.04	-21.43	13.33	28.69	-78.00	-50.92	-44.05
GR	5.94*	-0.58	-1.63	-2.09	-0.54	0.36	0.25	2.29**	-13.73*	-2.35	-3.76**
Fertilizer											
2007-2008	191.06	149.48	108.23	97.93	157.48	123.43	193.96	152.66	91.06	154.30	136.18
2012-2013	255.44	158.10	127.56	121.28	87.81	237.26	179.71	203.15	120.92	192.51	194.06
2020-2021	212.39	200.05	137.11	127.97	254.79	287.91	194.72	193.60	116.25	222.81	194.76
Abs Change	21.33	50.57	28.88	30.04	97.31	164.48	0.76	40.94	25.19	68.51	58.58
Rel Change	11.16	33.83	26.68	30.67	61.79	133.26	0.42	26.82	27.66	44.40	43.02
GR	-1.77	1.21	-0.24	1.21	6.90**	4.25**	1.02	0.12	0.50	-1.42	1.04
H labour											
2007-2008	656.17	991.45	801.91	715.12	680.12	869.10	1327.32	803.30	682.39	967.25	849.41
2012-2013	761.38	900.84	652.29	651.50	484.24	1003.12	1282.48	731.21	796.32	1015.43	827.88
2020-2021	499.43	959.17	500.92	671.94	791.47	764.39	1080.00	548.11	712.57	1053.78	758.18
Abs Change	-156.74	-32.28	-300.99	-43.18	111.35	-104.71	-247.32	-255.19	30.18	86.53	-91.24
Rel Change	-23.89	-3.26	-37.53	-6.04	16.37	-12.05	-19.28	-31.77	4.42	8.95	-10.74
GR	-2.42	-1.81**	-4.18*	0.26	4.47*	-0.59	-1.96**	-2.42*	-0.01	0.50	-0.61**

** & * indicates significant at 1 and 5 per cent level, respectively

constraints. Thus, there is further scope of increasing the productivity of cotton through minimizing the proportionate expenditure on operational and managerial inputs and enhancing the proportionate expenditure on productive and protective inputs through reallocation of inputs at optimum level.

Productivity and profitability

The data on productivity and profitability of cotton cultivation over the period of time is presented in Table 6 estimated on the basis of cost items given in Tables 4 and 5 and data on the yield and prices received by the farmers were taken from the same source. The data revealed that the gain in productivity was negligible over the period of 14 years from 2007 to 2021 though the production potential of available varieties/hybrids is 20 to 25q/ha. Central zone productivity, though rainfed, shows a slight increase, northern zone slight decrease and in south zone, a stable scenario. The growth rate of productivity was hardly 0.07 which was

nonsignificant. The implicit prices of cotton during the period under consideration have increased at the growth rate of 5.18 per cent which is significant at one per cent probability level. The increase in MSP during the same period was higher (7.01%) as compared to increase in implicit prices showing government price policy support works as an incentive for enhancing the cotton production in the country. The growth rate of operational cost (5.95%) was significant and surpassed growth rate of gross income that was merely at the rate of 0.29 per cent resulting in decline of net income at operational cost (-6 %). At All India level, the input output ratio exhibited declining trend from 1.94 in 2007-2008 to 1.35 in 2020-2021 revealing that return to investment of one rupee at operational cost declined marginally on account of proportionality higher increase in operational cost during the period. The same trend was noticed in case of net income at total cost wherein the input output ratio at total cost declined from 1.23 to 0.95. The growth rate of

Table 4. Changes in cost structure of cotton in India (Rs./ha)

Cost items	2007-2008	2010-2011	2014-2015	2020-2021	GR (%)
Human labour	9057.49[30.70]	14389.53[33.21]	18272.93[38.87]	18801.99(42.68)	4.65**
Bullock labour	1709.36[5.79]	2523.81[5.83]	3628.94[7.72]	1283.19(2.91)	-2.34
Machine labour	1527.59[5.18]	1501.33[3.47]	2144.03[4.56]	3939.93(8.94)	7.31**
Seed	1931.77[6.55]	2463.77[5.69]	2797.19[5.95]	1904.97(4.32)	-0.87
Fertilizers	136.18[0.46]	2555.5[5.90]	3352.91[7.13]	3172.44(7.20)	3.36
Manures	602.13[2.04]	688.53[1.59]	1311.63[2.79]	738.08(1.68)	3.05
Insecticides	1303.3[4.42]	1561.47[3.60]	1895.78[4.03]	1915.46(4.35)	3.61**
Irrigation	690.4[2.34]	858.3[1.98]	1179.23[2.51]	946.12(2.15)	3.46**
Interest on working capital	445.3[1.51]	608.96[1.41]	746.28[1.59]	737.95(1.68)	4.15**
Total operational cost	19102.83[64.75]	26659.78[61.53]	34011.24[72.34]	31716.84(72.00)	3.95**
Rental value of owned land	8234.75[27.91]	14259.71[32.91]	9355.75[19.90]	9182.53(20.85)	0.43
Land revenue	22.36[0.08]	13.26[0.03]	8.18[0.02]	3.77(0.01)	-18.27**
Depreciation on farm assets	396[1.34]	378.14[0.87]	336.18[0.72]	318.69(0.72)	0.88
Interest on fixed cost	1338.76[4.54]	1906.89[4.40]	2696.48[5.74]	2238.89(5.08)	5.18*
Total fixed cost	10400.53[35.25]	16666.19[38.47]	13001.86[27.66]	12331.5(28.00)	1.36
Total cost	29503.36[100.00]	43325.97[100.00]	47013.1[100.00]	44048.35(100.00)	3.15**

fixed cost was not significant over the period under study though it showed an increase of 1.36 per cent. The above data clearly indicated that cotton cultivation with given productivity level and cost prices structure is not that profitable even at total cost. And this crop enterprise can be made more profitable through reduction in cost and enhancing productivity per unit of area. Since this is rainfed -partially irrigated crop, the water use efficiency can be further enhanced along with labour reducing technologies, wherever necessary. The cost of production, profitability (per quintal) and break even analysis were carried out to know the potential profitability of expenditure for cotton production

in the market based economy and data on the same are presented in Table VII.

The operational cost/average variable cost per quintal was Rs. 1229.30 during 2007-2008 which rose to Rs. 3967.37 during 2020-2021. The net income at operational cost per quintal was Rs. 1081.02 which increased to just 1199.60 showing an increase of 10.97 per cent during the same period. Break even analysis is carried out using cost and revenue data as presented in the Table 7. Break even analysis is a type of cost volume profit analysis and break-even point for a product is the point where total revenue received equals the total costs associated with the sale of that product. The

Table 5. Statewise proportionate expenditure on basic inputs and productivity of cotton in India

Cost items	Year	AP	Guj	Har	Kar	MP	Mah	Odi	Pun	Raj	TN	India
Operational and managerial inputs	2007-2008	62.63	61.57	69.85	62.73	59.58	72.34	-	66.04	70.56	74.17	66.61
	2012-2013	67.85	63.21	71.55	66.19	63.65	65.73	70.59	67.2	67.37	75.03	67.84
	2020-2021	69.96	72.23	72.36	75.01	71.59	70.79	75.03	68.57	74.83	76.03	72.64
Productive and protective inputs	2007-2008	37.37	38.43	30.15	37.27	40.42	27.66	-	33.96	29.44	25.83	33.39
	2012-2013	32.15	36.79	28.45	33.81	36.35	34.27	29.41	32.8	32.63	24.97	32.16
	2020-2021	30.04	27.77	27.64	24.99	28.41	29.21	24.97	31.43	25.17	23.97	27.36
Yield ((q/ha)	2007-2008	23.55	16.68	18.09	10.77	13.44	11.82	-	21.08	16.51	11.89	15.98
	2012-2013	17.27	12.37	16.87	12.19	14.95	16.91	11.56	18.59	20.31	16.19	15.72
	2020-2021	16.13	17.4	11.92	12.15	14.4	13.63	11.36	21.51	19.29	17.15	15.49

(Operational inputs include human labour, bullock labour, machine power & interest on working capital. Productive & protective inputs include seed, fertilizer, manure, irrigation, insecticides)

Table 6. State wise productivity and profitability of cotton in India (Rs./ha)

Year	Yield	Implicit price (RS./q)	Gross income	Operational cost (OC)	Net income at OC	Input output Ratio at OC	Fixed cost (FC)	Total cost (TC)	Net income at TC	Input output Ratio at TC
North Zone (Punjab, Haryana, Rajasthan)										
2007-2008	18.56	2230.17	41672.31	20150.13	21522.18	2.09	12996.67	33146.80	8525.51	1.29
2012-2013	18.59	4199.72	80190.49	41990.34	38200.15	1.92	24096.62	66086.95	14103.53	1.24
2020-2021	17.57	5367.72	94082.01	57921.95	36160.06	1.63	30647.93	88569.88	5512.13	1.04
Central Zone (Gujarat, Maharashtra, Madhya Pradesh)										
2007-2008	13.98	2336.58	33232.42	18557.60	14674.82	1.78	8675.84	27233.45	12782.87	1.11
2012-2013	14.74	4068.46	60509.82	39467.20	21042.62	1.67	16293.14	55760.34	18312.46	1.04
2020-2021	15.14	4802.29	73898.28	60733.11	13165.17	1.21	20709.18	81442.29	-7544.01	0.90
South Zone (AP, Karnataka, Tamil Nadu)										
2007-2008	15.40	2175.90	35413.73	18600.76	16812.98	1.94	9529.07	28129.83	7283.90	1.27
2012-2013	15.22	3981.70	61299.95	44941.13	16358.82	1.42	17713.83	62654.97	-1355.01	1.00
2020-2021	15.14	5081.31	80158.54	67831.26	12327.28	1.22	23034.62	90865.88	-10707.34	0.90
All India										
2007-2008	15.98	2247.55	36772.82	19102.83	17669.99	1.94	10400.53	29503.36	9530.76	1.23
2012-2013	16.18	4083.29	67333.42	42132.89	25200.53	1.67	19367.86	61500.75	10353.66	1.09
2020-2021	15.95	5083.78	82712.94	62162.11	20550.84	1.35	24797.24	86959.35	-4246.41	0.95
GR (2007-2021)	0.07	5.18**7.02**(MSP)	0.29	3.95**	-6.00	-	1.36	3.15**	-14.52	-

* indicates significant at 1 per cent level

Table 7. Production cost/quintal profitability and break even analysis of cotton in India (Rs./q)

Zones	Year	Operational cost (OC) at OC	Net income Cost	Av. total at TC	Net income	Av revenue	Total fixed cost	Break even yield (q/ha)	Actual yield (q/ha)	Difference
North Zone	2007-2008	1083.37	1162.79	1768.95	477.21	2246.16	12996.67	11.37	18.56	7.19
	2012-2013	2278.38	2021.74	3590.15	709.98	4300.12	24096.62	12.85	18.59	5.74
	2020-2021	3438.74	1919.84	5205.99	152.59	5358.58	30647.93	16.39	17.57	1.19
Central Zone	2007-2008	1344.54	1009.62	1969.01	385.16	2354.17	8675.84	8.94	13.98	5.04
	2012-2013	2691.37	1433.10	3800.79	323.68	4124.47	16293.14	13.21	14.74	1.53
	2020-2021	4045.07	805.77	5412.16	-561.32	4850.84	20709.18	39.60	15.14	-24.46
South Zone	2007-2008	1259.99	1070.64	1861.33	469.30	2330.63	9529.07	8.98	15.40	6.43
	2012-2013	2913.28	1142.16	4079.27	-23.83	4055.44	17713.83	18.64	15.22	-3.43
	2020-2021	4418.30	873.19	5936.44	-644.94	5291.49	23034.62	62.76	15.14	-47.61
All India	2007-2008	1229.30	1081.02	1866.43	443.89	2310.32	10400.53	9.76	15.98	6.22
	2012-2013	2627.67	1532.33	3823.40	336.61	4160.01	19367.86	14.90	16.18	1.28
	2020-2021	3967.37	1199.60	5518.19	-351.22	5166.97	24797.24	39.58	15.95	-23.63

break even yield of cotton in India with the given cost and price structure shows that the farmers are operating cotton production business above the break even point in north zone and to some extent in central zone. This revealed that they are operating in profit zone in the cotton cultivation. During 2020-2021, central and south zone cotton growing States fared badly to meet out the breakeven yield probably due to cost escalation and reduced yield. As such at all India level, cotton farming has been profitable for most of the years excepting few maybe due to pests and disease outbreak or poor rainfall etc., that might have affected the yield. As such in general, cotton farming is operated in profit zone

CONCLUSIONS

The scenario of cotton production in the country is that there has been a growth in area and production but yield decrease over years which is of prime concern for the Indian cotton economy. Over the period of time, there were drastic changes in input use, especially for field operations in cotton fields. There is further scope to increase the productivity of cotton through minimizing the proportionate expenditure on operational and managerial inputs and enhancing the proportionate expenditure on

productive and protective inputs through reallocation of inputs at optimum level. The break even yield of cotton in India with the given cost and price structure shows that the farmers are operating cotton production business above the break even point in most of the cotton growing States. The profitability from cotton can be further enhanced through enhancing productivity per unit of area and input use.

Policy implications

Over the years, country has achieved significant quantitative increase in cotton production. The yield per hectare which was stagnant at about 300 kg/ha for so many years, jumped to average of 506 to 520 kgs between 2006 to 2012, reached to the highest level of 566 kgs per hectare in the year 2013-2014 and slowly nosedived to 450 kg/ha during 2020-2021. Over the last three years, the yield/hectare of Indian cotton has dropped below 500 kg/hectare despite a rise in the area under the fibre crop. Data show that though India is the largest producer of cotton globally, it ranks 34th in terms of yield, below Vietnam, Pakistan, Ivory Coast, Ethiopia and Myanmar. Though the per hectare yield is still lower against the world average of about 755 kgs/hectare, the fundamental changes that are taking place in the

realm of cotton cultivation in the country, are having the potential to take the current productivity level near to the world average in the near future. International cotton prices are expected to decrease in real terms as world cotton demand remains under pressure from synthetic fibres, notably polyester. Cotton prices were only 5 per cent above polyester staple fibre prices between 1972 and 2009. Since 2010, however, cotton prices have been on average almost 40 per cent above the polyester price. It is implicitly assumed in The Outlook report that the relative competitiveness between these two types of fibre does not change drastically, but that there are slight improvements in favour of cotton. Nonetheless, climate change, with most cotton grown under rainfed conditions, may undermine the yield growth potential. Like other crops, cotton production is sensitive to pests and weather conditions and projections are therefore sensitive to climate change which could lead to increasing frequency of droughts and other adverse weather conditions. To this day, it remains the most consumed natural fibre, representing almost a quarter of all fibres processed by the global textile sector. Despite its importance to our economy, the cotton yield in India is low when compared to other major cotton growers in the world. Though our country accounts for 39 per cent of world area under cotton cultivation, we account only for 23 per cent in production—this issue needs to be seriously looked into and steps taken to increase the yield. The government must establish a proper inputs delivery network by reactivating the farmers supply company, inputs supply agencies, and registered public and private actors. Increased use of smart selective mechanisation, varietal development and pest management practices will have to be geared up to boost productivity of cotton. Greater thrust should be laid on bridging the substantial yield

gaps that still prevail between the potential and attainable yield of cotton, through appropriate production technology dissemination and extension services. Demand driven production should be aimed at identifying the productive cotton zones, timely supply of notified seeds of suitable varieties/hybrids, enhanced irrigation facilities, pest management strategies which would help in combined effect of yield enhancement and escalated gross returns to the cotton farmers thus converting cotton farming a profitable enterprise.

REFERENCES

- Reddy, A. Amarender and Mishra, Devraj 2016.** Growth and Instability in Chickpea Production in India: A State Level Analysis, <https://www.researchgate.net/publication/216308282>.
- Kumar, Pradumanand Mittal, Surabhi 2003.** Crop diversification in India: Analysis by State and farm size group, Agricultural Situation in India, August '2003, 272-281
- Nahatkar, Sunil 2017.** Production Trend and Cost- Profitability Structure of Chickpea in Central India: The Dynamic Scenario, Agricultural Situation in India, January, 2017, 30-39.
- OECD/FAO (2021).** OECD-FAO Agricultural Outlook 2021-2030, OECD Publishing, Paris, <https://doi.org/10.1787/19428846-en>.

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