"Temporal Changes in Economics of Production of Cotton and Hybrid Jowar Crops in Akola District"

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ABSTRACT: *The present study was conducted in Akola district of Maharashtra. Major crops grown in Akola district are Cotton, Hybrid Jowar. Data on inputs use, cost of each input and the total cost, output and gross return and net return for the selected crops were obtained from Agricultural Price Cell of Dr. PDKV, Akola. To study the temporal changes in the variables under study, the data for two points of time, namely 1990-91 and 2009-10 were collected. Simple, tabular analysis was done to accomplish the objectives of the study.The study on the temporal changes in input-output prices revealed that the process of all the inputs and crops under study increased substantially over the period of time. As regards to inputs, the substantial price rise was recorded for female labour (593.35 percent) and male labour (632.45 percent). The study revealed that Use of key inputs particularly human labour and fertilizers increased over the period of time. Cost of cultivation of the selected crops also increased substantially over the period of time this increase could be due to increase in the level of input use. The input- output prices recorded substantial increase over the period of time. The production of Cotton, Hybrid Jowar, was profitable in both the years under study as indicated by the positive farm business income and output-input ratio greater than unity.*

Key Words: Akola District, Cotton, Economics, Hybrid Jowar, Production, Temporal changes.

Agriculture is a most important sector of Indian Economy. The new technology yielded results in the form of augmented agricultural production in the early seventies and the trend continued to go up. This had been possible by the extension of improved technology among the farmers by supplying the credit and inputs which convinced them to change the recommended technology into agricultural operations. This has resulted in increase in the food grain production to about 200 million tonnes in 1998-99 just from 50 million tonnes in early fifties. Pulses and oilseed production was 14.85 million tonnes and 24.46 million tonnes respectively in 1996-97.

Thus, to increase the agricultural production continuously and constantly in future also, it is necessary to change the cultivator's attitude towards agriculture, so that he should become more responsive and conscious of the changing technology and to decide about the use of limited resources for having maximum returns.

IMPORTANCE OF STUDY

The study of economics of production is helpful to serves as a guideline to the cultivator to select appropriate crop. In deciding what to produce, how to produce and how much to produce, it is necessary to have some knowledge about the economics of production. Data regarding cost of production are also essential for a number of purposes. As farming has become a business, the farmer would like to derive maximum net revenue out of their minimum investment. In doing so, the farmer is interested in determining the quantities of variable inputs which would give him a certain amount of product at minimum cost. The farm cost data help the farmer in arriving at the least cost combination of the inputs.

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The study regarding this conducted over the period of time helps the farmer to know the relative position of various crops in terms of their profitability and changes therein over the period of time. It also helps the policy makers to formulate appropriate policy measures, regarding prices of agricultural commodities. Economics of crop production depends upon various factors. Among these, the important factors are level of input use and the prices of input and output. Study of cost of cultivation and its composition and the changes therein over the period is important in many ways. Such study helps in knowing the relative importance of different crops which in turn helps in formulation appropriate price policy for their inputs. Study of productivity or per hectare yield of crops and changes there in is important in devising policies regarding agricultural production.

An important issue addressed in the context of agricultural development is the share accrued to the various factors of production. It is necessary that the fruits of development are equally shared by all those involved in the production process. This requires study of factor share. The study of factor share is also important to know the relative position of factors of production in the context of the agricultural development. It is important to note whether the benefits of increased production due to technological change have been equally shared by the factors of production. An unequal distribution of benefits of technological change would make some factors better off than before and deteriorate the condition of others who did not share the benefits of technological changes. This can have social implications in the rural area. Study of factor share and changes there in is, therefore important.

The impact of increases in input prices on profitability and production of a farm enterprise depends upon the cost structure under which it is produced. The typical family farms in India use family labour and farm raised produced bullock power, FYM and seed as inputs in producing various farm enterprises.These family farms owned inputs constituted a very large proportion of the total input package in traditional agriculture and therefore, the increase in the input prices had no significant effect on the profitability and production of farm enterprises. However, with the introduction of new improved technology involving use of seeds of high yielding varieties, fertilizers, pesticides and weedicide and fuel, the cost structure in terms of the share of family farm owned and purchased inputs in the total cost of production of farm enterprises has changed in India and continue to change. Also the relative share of the total purchased inputs supplied by agricultural sectors and those supplied by non-agricultural sectors has changed as a result of adoption of the new improved technology. To what extent the share of purchased and farm produced inputs have changed over the period of time is, therefore, a matter which needs consideration.

SCOPE AND LIMITATIONS

Present study mainly covers shift in cropping pattern and input use at two points namely 1990-91 and 2009-10. It is expected that the results of this study will help the farmers of the Akola district to allocate their resources most efficiently. Comparison of share or effect of variable cost on price of 1990-91 and 2009-10. The result of the study would also be much use to the cultivators of the selected area in fixing the level of cash inputs to be added in the field so as to get increasing output.

However, limiting factor of this study is that only two major crops of Akola district are covered due to unavailability of data. The findings of the study are applicable only to the period to which the study pertains. So the results of this study will be applicable to Akola district and that too for selected crops only.

MATERIALS AND METHOD

For the present research work the Primary data would be collected from Agricultural Price Cell of the Department of Agricultural Economics Dr. P.D.K.V., Akola. The data on cost of cultivation for major crops grown in Akola district will be used for the present investigation. Major crops grown in Akola district are Cotton, Soybean, Tur, Hy. Jowar out of that cotton, Hy. Jowar will be selected for the present study. The data on the above items will be collected for two point's time namely 1990-91 and 2009-10 from the records maintained by Agricultural Price Cell (APC).The data collected were subject to the tabular analysis to estimate input use, cost and profitability of the selected crops. The cost concepts usually followed in the cost of cultivation studies, were used to estimate the cost of cultivation and cost of production of the selected crops. Per hectare cost of cultivation covering the various items of cost and per quintal cost of production was estimated at the various cost concepts, namely, Cost A, Cost B and Cost C.

Economic Analysis of Crop

The economic analysis of crop enterprise was carried out by working out the following income measures

1. Estimation of Income Measures

   Farm Business Income = Gross Return – Cost 'A'

   Family labour Income = Gross Return – Cost 'B'

   Net Income = Gross Return – Cost 'C'

2. **Estimation of Output–Input Ratio**

   Output-input ratio at cost 'A' = $\dfrac{\text{Gross Return}}{\text{Cost 'A'}}$

   Output-input ratio at cost 'C' = $\dfrac{\text{Gross Return}}{\text{Cost 'C'}}$

3. **Cost of production of crop**

   Cost of production of the crop per quintal was estimated as:

$$\text{Cost of production per quintal} = \frac{\text{Total cost of cultivation (cost c)} - \text{Value of by produce}}{\text{Yield in quintals}}$$

RESULTS AND DISCUSSION

The cost of cultivation and cost of production of crops change over period of time due to the changes in the level of technology adoption and Input use. This has great implications on the policy for fixing prices of agricultural commodities. The study of change in the input use is important as it indicates the extent to which farmers have accepted the new crop production technology. Results of such study also give a feed-back to the extension agencies to plan their strategies. An attempt was therefore made to estimate the per hectare use of the key inputs for two points of time, namely, 1990-91 and 2009-10 and estimate the changes in the level of inputs used for these periods. Results obtained in this behalf are presented and discussed crop-wise in the following section.

Temporal changes in per hectare input use in Cotton and Hybrid Jowar

Cotton

Input use for cotton is presented in Table 1. As revealed from this table, the use of male labour for cotton in 1990-91 was 20.73 days which increased marginally to 22.48 days in 2009-10. Use of female labour however increased from 72.64 days in 1990-91 to about 97.30 days in 2009-10 showing an increase of 33.95 percent. Increased use of female labour in 2009-10 could be due to the increased per hectare yield of 14.23 quintals in 2009-10 as against 6.08 quintals in 1990-91. Increased cotton yield in 2009-10 might have required more female labour for picking operation. Use of seed decreased in 2009-10 by 63.36 percent. Use of FYM is increased from 16.67 quintals in 1990-

91 to about 27.67 quintals in 2009-10. Use of chemical fertilizers has substantially increased over the period of time. Use of nitrogen increased from 33.67 kg in 1990-91 to about 48.15 kg in 2009-10 (43 percent) while use of phosphorus increased from 15.30 kg in 1990-91 to about 41.60 kg in 2009-10 (171.90 percent). Use of potash increased from 6.93 kg in 1990-91 to about 8.12 kg in 2009-10. Per hectare yield of cotton increased from 6.08 quintals in 1990-91 to 14.23 quintals in 2009-10. This indicates an increase in the yield of about 134.05 percent. The increased yield of cotton is obviously due to the increased use of inputs, particularly the chemical fertilizers.

Table 1
Temporal changes in per hectare input use in Cotton

Sr. No.	Particulars of input use	Units	Per hectare input used		Percent change
			1990-91	2009-10	
1	Number of Cultivators		14	22	
2	Total Area	Hectare	32.26	26.04	
3	Male Labour	Days	20.73	22.48	8.44
4	Female Labour	Days	72.64	97.30	33.95
5	Bullock Labour	Days	15.93	15.03	-5.65
6	Machine Labour	Days	2.39	2.97	24.27
7	Seed	Kg	6.25	2.30	-63.36
8	FYM	Quintals	16.67	27.67	65.99
9	N	Kg	33.67	48.15	43.00
10	P	Kg	15.30	41.60	171.90
11	K	Kg	6.93	8.12	17.18
12	Yield	Quintals	6.08	14.23	134.05

Hybrid Jowar

Input use for Hybrid Jowar is presented in Table 2. It is observed from this table that use of male labour in hybrid jowar increased from 13.91 days in 1990-91 to 28.59 days in 2009-10 with percent increase of 105.34. Use of female labour increased from 30.39 days in 1990-91 to about 38.12 days in 2009-10. Bullock labour use declined by 8.59 percent in 2009-10 which could be attributed to increased machine labour use to the extent of 26.48 percent in 2009-10. Use of seed increased in 2009-10 by 20.66 percent. Use of FYM declined by 40.39 percent in 2009-10. Use of chemical fertilizers increased over the period of time. Use of nitrogen increased from 42.03 kg in 1990-91 to 58.41 kg in 2009-10 (38.97 percent). The use of phosphorus also increased from 16.95 kg in 1990-91 to 22.31 kg in 2009-10 (31.62 percent) while potash use increased from 6.79 kg in 1990-91 to 8.67 kg in 2009-10 (27.69 percent). Per hectare yield of hybrid jowar in the year 1990-91 was 12.70 quintals which increased to 23.33 quintals in 2009-10. This indicates an increase of 83.70 percent in yield during 2009-10. The reason of increase

in yield could be the increased use of inputs particularly chemical fertilizers.

Table 2
Temporal changes in per hectare input use in Hybrid Jowar.

Sr. No.	Particulars of input use	Units	Per hectare input used		Percent change
			1990-91	2009-10	
1	Number of Cultivators		32	19	
2	Total Area	Hectare	30.46	15.18	
3	Male Labour	Days	13.91	28.59	105.54
4	Female Labour	Days	30.39	38.12	25.44
5	Bullock Labour	Days	13.16	12.03	-8.59
6	Machine Labour	Days	0.34	0.43	26.48
7	Seed	Kg	6.63	8.00	20.66
8	FYM	Quintals	5.52	3.29	-40.39
9	N	Kg	42.03	58.41	38.97
10	P	Kg	16.95	22.31	31.62
11	K	Kg	6.79	8.67	27.69
12	Yield	Quintals	12.70	23.33	83.70

Cost of cultivation and cost of production

Per hectare cost of cultivation covering the various items of cost and per quintal cost of production was estimated at the various cost concepts, namely Cost A, Cost B and Cost C. The results in this behalf are the presented and discussed crop wise.

Cotton

Per hectare cost of cultivation of cotton crop for 1990-91 and 2009-10 is presented in Table-3. As seen from this table, the total cost of cultivation (cost C) of cotton in the year 1990-91 was Rs.4110.51/-. The rental value of land was the major item of cost accounting for about 28.08 percent of total cost. Human labour, bullock labour and manure and fertilizers were the other important items of cot accounting for 21.79 percent, 12.23 percent and 11.23 percent of the total cost respectively.

Cost A, which corresponds to the actual expenses in the crop production accounted for 64.23 percent of the total cost. The other items of cost were plant protection (3.92 percent), depreciation (2.07 percent) and miscellaneous expenses (0.49 percent).

In 2009-10, the per hectare cost of cultivation of cotton was Rs. 29545.90/-. In 2009-10 also the rental value of land was the major item of cost accounting for about 24.35 percent of the total cost. Human labour, seed and manure and fertilizers were also important cost items in terms of their share in total cost, being 25.27 percent, 12.35 percent and 10.27percent respectively. Share of cost 'A' in total cost was 66.74 percent and it was less than the share in 1990-91.

Table 3
Temporal changes in per hectare cost of cultivation in Cotton

Sr. No.	Particulars of Cost	Per Hectare Cost Incurred		Change in percent
		1990-91	2009-10	
1	No. of cultivators	14	22	
2	Total Area	32.26	26.04	
3	Human Labour	895.89	7467.71	
		(21.79)	(25.27)	3.48
4	Bullock Labour	502.46	2372.86	
		(12.23)	(8.03)	-4.2
5	Machine Labour	36.98	315.3	
		(0.89)	(1.06)	0.17
6	Seed	230.91	3649.62	
		(5.62)	(12.35)	6.73
7	FYM	137.26	1615.67	
		(3.34)	(5.47)	2.13
8	NPK	324.43	1418.66	
		(7.89)	(4.8)	-3.09
9	Irrigation	-	-	-
		-	-	-
10	Plant Protection	161.17	1048.04	
		(3.92)	(3.55)	-0.37
11	Miscellaneous	20.36	169.35	
		(0.49)	(0.57)	0.08
12	Depreciation	85.36	464.62	
		(2.07)	(1.57)	-0.5
13	Land Revenue	21.35	45.37	
		(0.52)	(0.15)	-0.37
14	Interest on Working capital	223.81	1151.48	
		(5.44)	(3.89)	-1.55
15	Cost A	2639.98	19718.68	
		(64.23)	(66.74)	2.51
16	Rental value of Land	1154.56	7195.43	
		(28.08)	(24.35)	-3.73
17	Interest on Fixed capital	116.52	991.33	
		(2.83)	(3.35)	0.52
18	Cost B	3911.06	27905.44	
		(95.15)	(94.45)	-0.7
19	Family Labour	199.45	1640.46	
		(4.85)	(5.55)	0.7
20	Cost C	4110.51	29545.9	
		(100)	(100)	

*Figures in parentheses indicate the percentage to the total cost.

The comparison of the share of different items in the total cost for the period under study revealed that, there was an increase in the share of human labour (3.48 percent), seed (6.73 percent) machine labour (0.17 percent) and FYM (2.13 percent). The share of other factors in the total cost, however declined over the period of time.

Hybrid Jowar

Per hectare cost of cultivation of hybrid jowar crop for the year 1990-91 and 2009-10 is shown in Table 4. From the table, it is noted that the total cost of cultivation that is cost 'C' for hybrid jowar was Rs. 2697.56/- during 1990-91 in which the major item of cost was rental value of land accounting for 22.57

percent. The other cost items that is human labour, bullock labour, seed and manure and fertilizers accounted for 15.01 percent, 13.14 percent, 3.63 percent and 16.77 percent in the total cost respectively. Share of cost 'A' which includes the actual production expenses was 62.61 percent in the total cost. The expenses on plant protection, depreciation and miscellaneous charges had their share of 3.24 percent, 3.23 percent and 0.8 percent in the total cost respectively.

In 2009-10, the per hectare cost of cultivation was Rs. 19590.1/-. The share of rental value of land the total cost was 21.87 percent which was slightly less than the year 1990-91. The other cost items like human

Table 4
Temporal changes in per hectare cost of cultivation in Hybrid Jowar

Sr. No.	Particulars of Cost	Per Hectare Cost Incurred		Change in percent
		1990-91	2009-10	
1	No. of cultivators	32	19	
2	Total Area	30.46	15.18	
3	Human Labour	405.06 (15.01)	5319.05 (27.15)	12.14
4	Bullock Labour	354.55 (13.14)	3326.21 (16.98)	3.84
5	Machine Labour	77.51 (2.87)	351.51 (1.79)	-1.08
6	Seed	97.88 (3.63)	753.69 (3.85)	0.22
7	FYM	73.61 (2.73)	204.22 (1.04)	-1.69
8	NPK	378.6 (14.04)	1047.89 (5.35)	-8.69
9	Irrigation	- -	- -	
10	Plant Protection	87.53 (3.24)	18.12 (0.09)	-3.15
11	Miscellaneous	21.85 (0.8)	272.95 (1.39)	0.59
12	Depreciation	87.13 (3.23)	730.54 (3.73)	0.5
13	Land Revenue	8.23 (0.31)	37.85 (0.19)	-0.12
14	Interest on Working capital	96.93 (3.59)	662.17 (3.38)	-0.21
15	Cost A	1688.88 (62.61)	12724.19 (64.95)	2.34
16	Rental value of Land	608.77 (22.57)	4284.49 (21.87)	-0.7
17	Interest on Fixed capital	103.14 (3.83)	1062.4 (5.43)	1.6
18	Cost B	2400.79 (88.99)	18071.08 (92.23)	3.24
19	Family Labour	296.77 (11)	1519.03 (7.75)	-3.25
20	Cost C	2697.56 (100)	19590.1 (100)	

*Figures in parentheses indicate the percentage to the total cost.

labour, bullock labour, seed and manure and fertilizers accounted for 27.15 percent, 16.98 percent, 3.85 percent and 6.39 percent of the total cost respectively. The comparison of shares of different items in the total cost for both the periods revealed that, there was an increase in the share of human labour (12.14 percent), bullock labour (3.84 percent), seed (0.22 percent) in total cost. The share of other factors in the total cost, however declined over the period of time.

Input-Output Price Change

Price of inputs and output affect the economics of crop production and also the financial position of the farmer at a point of time and also over the period of time. It was therefore thought necessary to study the temporal changes in the input and output prices. Results in this behalf are presented in Table 5.

Table 5
Temporal changes in input prices

Sr. No.	Inputs	Input prices		Percent Change
		1990-91	2009-10	
1	Male labour	12.79	93.68	632.45
2	Female labour	8.72	60.46	593.35
3	Bullock labour	29.95	108.81	503.71
4	FYM	9.44	61.37	550.11
5	N	5.57	13.44	141.30
6	P	6.07	17.10	181.72
7	K	6.12	8.65	41.34

As revealed from this table, the prices of selected inputs were quite low in the year 1990-91. Price (wage rate) of male and female labour in 1990-91 was Rs. 12.79/- and Rs. 8.72/- per day respectively. In 2009-10, the male and female wage rate was Rs. 93.68/- and Rs. 60.46/- per day respectively. This shows that, the price of male labour in 2009-10 increased by 632.45 percent and female labour wage rate exhibited an increase of about 593.35 percent over the period of time.

The increase in the wage rate of male and female labour over the period of time could be attributed the availability of alternative employment in the non-farm sector, like employment guarantee scheme, creating shortage of labour in agriculture sector. Bullock labour and FYM recorded more than 500 percent increase in the price over the period of time. Bullock labour price increased from Rs.29.95/- per day in 1990-91 to Rs.108.81/- per day in the year 2009-10. Price of FYM increased from Rs. 9.44/- per quintal in 1990-91 to Rs.61.37/- per quintal in 2009-10, showing an increase of about 550.11 percent. The

Table 6
Temporal change in output prices

Sr. No.	Crops	Minimium Support Price	Average Price Received 1990-91	Minimum Support Price	Average Price Received 2009-10	Percent Change
1	Cotton	750	771.2	3000	2604.84	237.77
2	Hy. jowar	180	135.6	840	805.58	494.09

growth in the price of FYM could be attributed to the increased demand and almost stable supply of this input in the village. Price of N and P increased moderately, being 141.30 percent and 181.72 percent respectively while the price of potash substantially increased from Rs.6.12/- per kg in 1990-91 to Rs.8.65/- per kg in 2009-10, showing an increase of about 41.34 percent. The increase in the fertilizers prices could be attributed to the policies adopted by Government from time to time.

Changes in the output prices of selected crops are presented in Table 6. As seen from this table, the prices of all the crops increased over the period of time. Price of Cotton in the base year was Rs.771.2/- per quintal which was increased by Rs.2604.84/- per quintal in 2009-10, exhibiting on increase of 237.77 percent. Price of Hybrid Jowar increased from Rs. 135.60/- in 1990-91 to Rs.805.58/- in 2009-10 that is by 494.09 percent.

CONCLUSION

The study revealed that Use of key inputs particularly human labour and fertilizers increased over the period of time. Cost of cultivation of the selected crops also increased substantially over the period of time this increase could be due to increase in the level of input use. The production of Cotton, Hybrid Jowar, was profitable in both the years under study as indicated by the positive farm business income and output-input ratio greater than unit.

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