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A Study Of Structural Changes In Total Variable Cost Of Cotton and Sugarcane in Haryana

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ABSTRACT
The study was conducted in Haryana. As the state is second largest contributor to India's central pool of food grains. At a time when cereal crop production, reaching a plateau in terms of production and productivity. There is a need for diversification by take up some other alternative crops with immense commercial potential. In such a scenario, the cash crops (i.e. cotton and sugarcane) production offers itself as a prospective alternative.The study was based on time series secondary data, pertains to seventeen years (1994-95 to 2010-2011) on cost of production was collected under comprehensive cost of cultivation scheme from the Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi. Since all the data was in nominal values, it was deflated in order to remove the effect of inflation. The structural changes in total variable cost (TVC) have been analysed through change in percentage share of each cost component and their growth rates overtime.In order to study trends in profitability, growth ratein gross margin (GM) was estimated. Study revealed that in absolute term, TVChas gradually increased and registered positive growth rate (4.37%)for cotton, while registered negative growth (-1.91%) in sugarcane.The percentage share of human labour has continuously decreased in cotton and followed decreasing trend in sugarcane. The percentage share of bullock labour has continuously decreased in both the crops, while machine labour share has continuously increased in sugarcane and exhibited increasing trend in cotton.The percentage share of fertilizer and irrigation has shown increasing trend in both cash crops.The proportionate share of seed has shown increasing trend in cotton and sugarcane.The cost of seed in cotton inclined by 11.26 per cent between TE 2003-04 and TE 2010-11, which may be because of introduction of superior varieties of BT cotton in the region. In sugarcane, positive growth rate in GM were observed, while cotton has registered negative growth rate indicating a reason for present agrarian crisis. Apparently, these crises had been due to either stagnated or negligible growth in productivity, accompanied by significant increase in real value of input costs.
Key words: *Cash Crop, Gross Margin, Growth rate,Total variable cost*

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INTRODUCTION

The contribution of Indian agriculture to economy of the country cannot be assessed only from its contribution to gross domestic product (GDP) but rather from its biggest employer, provider of raw material to industry and source of food and nutrition security. Two third population of the country is engaged in agriculture and earn livelihood directly from this occupation. The Indian economy has undergone structural changes over the time. Indian agriculture has 140 million hectares of net cropped area and irrigated area (63.26 Mha net and 86.42 Mha gross) just next to that of USA and China in the world, respectively. The country's agriculture is well-endowed with natural resources and diverse climatic conditions. In such circumstances, the growth of agriculture is prerequisite for overall development of the economy. It is also essential for the livelihood and food security.

The study was conducted purposively in Haryana state, in view of the fact that, despite recent industrial development, Haryana is primarily an agricultural economy About 70 per cent of residents are engaged in agriculture. Haryana is self-sufficient in food production and the second largest contributor to India's central pool of food grains. Considering the diversity of soil, agro-climatic conditions and availability of canal irrigation and infrastructure services (e.g., roads and regulated markets) across the sub-regions, potentiality to cultivate varied types of crops in Haryana. In the state, at a time when cereal crop

production reaching a plateau in terms of production and productivity, to avoiding mono-cropping, there is a need for diversification within the crop production system by take up some other alternative crops with immense commercial potential. In such a scenario, the cash crops(i.e. cotton and sugarcane) production offers itself as a prospective alternative to generate better returns.

The structural changes in the cost components are indicative of substitution of one input for the other on account of technological improvements and relative prices. Hence it's necessary to estimate the changes in cost structure of total variable cost components.

Keeping all these facts in view, research topic entitled "A Study of Structural Changes in Total Variable Cost of Cotton and Sugarcane in Haryana" was taken up.

METHODOLOGY

(i)The Database: The study was based on time series secondary data. The data pertains to seventeen years from the year 1994-95 to 2010-2011 on cost of production was collected under comprehensive cost of cultivation scheme from the Directorate of Economics and Statistics, Department of Agricultural Cooperation and Farmers' Welfare, Ministry of Agriculture GOI, New Delhi. The information on required parameters were compiled for two major cash crops grown in Haryana, namely cotton and sugarcane.

(ii)Analytical Tools: Thestructural changes in total variable costhave been analysed through change in percentage share of each cost component and their growth rates overtime. With the help of these two parameters, structural changes were analysed in terms of whether the costs have increased or decreased and what was the change in their percentage share overtime. The components included in total variable were human labour (HL), bullock labour (BL), machine labour(ML), irrigation (IR), seed (SD) and fertilizer (FER). The growth rates estimated were compound growth rate (CGR) using exponential function of the type Ln Y= Ln a + t*Lnb, where CGR is equal to {Antilog(Lb)-1} *100. In order to understand the effect of these structural changes on gross margin of the farmer, growth rates were, also, estimated in value of product and the gross margin, where gross margin was taken as value of product *minus* total variable cost on per hectare basis.The value of product was estimated by multiplying yield with output prices of the main product.

To remove the impact of inflation, cost of production data for input and output were deflated at 1993-94 constant prices, with the help of wholesale price indexes (WPI) for farm input and output respectively. The labour prices were deflated with help of consumer price index (CPI) for agricultural labourers.In order to remove year to year fluctuations, the whole period was divided into three triennium averages ending 1996-97 (TE 1996-97), 2003-04 (TE 2003-04) and 2010-11 (TE 2010-11) to determine the changes in percentage share of cost components. The gross margin was estimated for two sub time-period (TP) i.e. TP-I (1994-95 to 2001-02) and TP-II (2003-04 to 2010-11) and overall time period (1994-95 to 2010-11).

Results and Discussion

Structural changes in proportionate share of cost components of total variable cost

The structural changes in the cost components are indicative of substitution of one input for the other on account of technological improvements and relative prices. Only variable cost components were taken into consideration assuming that these components count for major share in production and get affected by the latest technological changes. The following section discusses the changes in proportionate share of cost components for major cash crops grown in the state.

Cotton

The expenditure on various cost components in total variable cost (TVC) of cotton production are given in Table 3.1. It was noted that there was systematic increase in the real value of variable cost in absolute term over the time. It increased from `5888.73 per hectare in TE 1996-97 to `10681.87 per hectare in TE 2010-11.

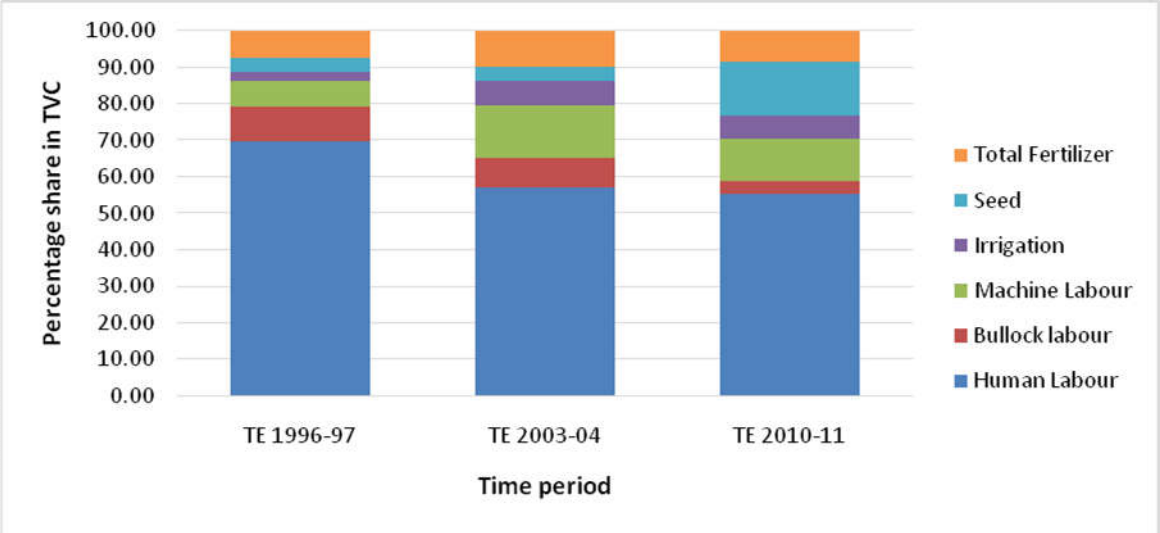
Table 3.1: Expenditure on various cost components in total variable cost of cotton production, 1994-95 to 2010-11 (Rs/hectare)

Time Period	Human Labour	Bullock labour	Machine Labour	Irrigation	Seed	Total Fertilizer	TVC
TE 1996-97	4107.77 (69.76)	564.30 (9.58)	404.50 (6.87)	137.81 (2.34)	234.62 (3.98)	439.73 (7.47)	**5888.73 (100.00)**
TE 2003-04	3468.97 (57.06)	483.56 (7.95)	883.81 (14.54)	409.79 (6.74)	225.60 (3.71)	607.80 (10.00)	**6079.54 (100.00)**
TE 2010-11	5919.22 (55.41)	345.52 (3.23)	1245.84 (11.66)	678.01 (6.35)	1598.71 (14.97)	894.57 (8.37)	**10681.87 (100.00)**
CGR (%)	2.49	-2.03	10.12	12.30	10.06	5.49	**4.37**

Note: Figures in the parentheses are percentage of total variable cost

The percentage share of cost component for triennium TE 2010-11 shows that 70.30 per cent share is accounted by labour cost, out of which HL, ML and BL has accounted 55.41 per cent, 11.66 per cent and 3.23 per cent, respectively. The SD, FER and IR constituted 14.97 per cent, 8.37 per cent and 6.35 per cent, respectively. Figure 3.1 shows the percentage share of various components in total variable cost for cotton production in Haryana.

Figure 3.1 Cost component of total variable cost in percentage for cotton crop production



State level cost component analysis over TE 1996-97 to TE 2010-11 revealed that proportionate share of seed, machine labour, irrigation and fertilizer has increased by 10.98 percent, 4.79 percent, 4.01 percent and 0.91 percent, respectively. However human labour (-14.34%) and bullock labour (-6.35%) has continuously decreased.

Sugarcane

The expenditure on various cost components in total variable cost of sugarcane production are given in Table 3.2. It was noted that there was decrease in the real value of variable cost in absolute term over the time. It decreased from `12246.55 per hectare in TE 1996-97 to `11815.71 per hectare in TE 2010-11.

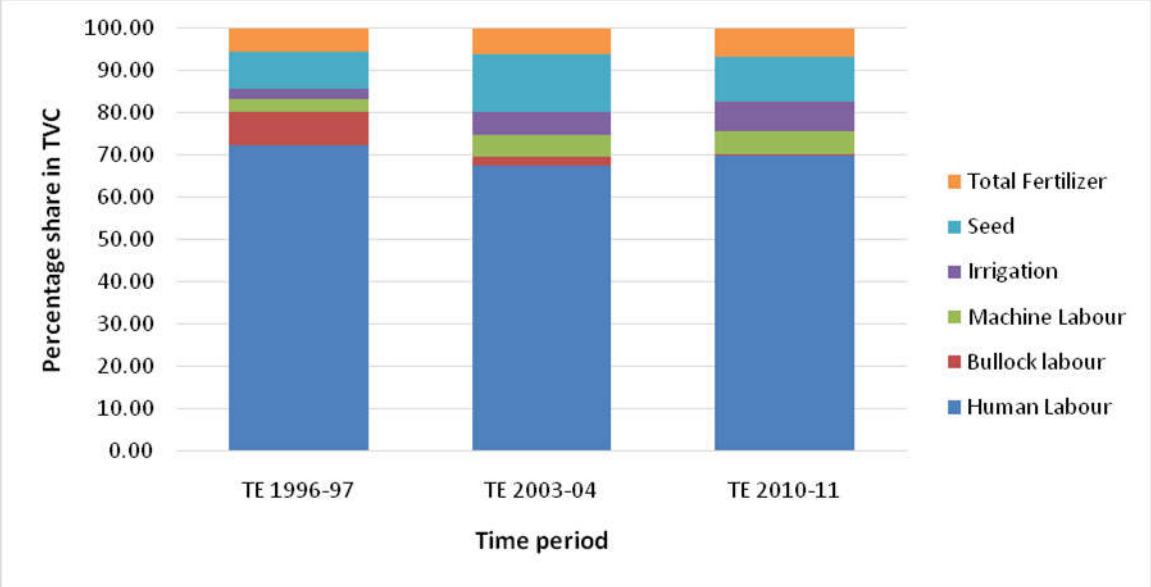
Table 3.2: Expenditure on various cost components in total variable cost of sugarcane production,1994-95 to 2010-11 (₹/hectare)

Time Period	Human Labour	Bullock labour	Machine Labour	Irrigation	Seed	Total Fertilizer	TVC
TE 1996-97	8849.10 (72.26)	978.00 (7.99)	369.48 (3.02)	316.40 (2.58)	1065.11 (8.70)	668.47 (5.46)	**12246.55 (100.00)**
TE 2003-04	7498.95 (67.37)	239.62 (2.15)	595.50 (5.35)	599.71 (5.39)	1518.13 (13.64)	679.67 (6.11)	**11131.59 (100.00)**
TE 2010-11	8261.38 (69.92)	30.08 (0.25)	661.43 (5.60)	803.84 (6.80)	1271.07 (10.76)	787.91 (6.67)	**11815.71 (100.00)**
CGR (%)	-1.27	-21.14	3.24	1.82	-3.74	-1.35	**-1.91**

Note: Figures in the parentheses are percentage of total variable cost

The percentage share of cost component for triennium TE 2010-11 showed that 75.77 per cent share was accounted by labour cost, out of which HL, ML and BL has accounted 69.92 per cent, 5.60 per cent and 0.25 per cent, respectively. The SD, IR and FER constituted 10.76 per cent, 6.80 per cent and 6.67 per cent, respectively. Due to the highest proportion of human labour in TVC, sugarcane was found as highly human labour intensive crop. Figure 3.2 shows the percentage share of various components in total variable cost for sugarcane production in Haryana.

Figure 3.2 Cost component of total variable cost in percentage for sugarcane crop production



State level cost component analysis for changes over TE 1996-97 to TE 2010-11 revealed that machine labour, irrigation and fertilizer has gradually increased by 2.58 per cent, 4.22 per cent and 1.21 per cent, respectively, while seed has increased by 2.06 per cent. However, bullock labour has gradually decreased (-7.73%), whereas human labour has shown decreasing trend (-2.34%).

Trends overtime in gross margin for cotton and sugarcane crop

The study of structural changes in cost of production in isolation does not display economic variability of a sector. This section has analysed the trends in gross margin (GM) along with the total variable cost (TVC) and value of product (VOP). Gross margin revealed profitability level in production of major cash crops of the state. The GM were taken as difference between value of product and total variable cost on per hectare basis. It was assumed that the farmer would invest more in that commodity which has positive and higher growth rates in gross margin. In order to have positive growth rate in gross margin the growth rates of value of product should be higher than the total variable costs.

Table 3.3 shows the annual growth rates in TVC, VOP and GM of cotton and sugarcane for TP-I (1994-95 to 2001-02), TP-II (2003-04 to 2010-2011) and overall time period i.e. (1994-95 to 2010-11). The growth rates for total variable cost, value of product and gross margin of cotton were 4.37 per cent, 1.82 per cent and -0.55 per cent, respectively during 1994-95 to 2010-11. Though both the productivity and the variable cost of cotton production has increased over time but the increase in TVC at higher rate than the VOP was the main reason for decrease in real value of gross margin. State level growth pattern over two sub time periods depicted increment in growth rate of total variable cost from 1.42 per cent to 7.65 per cent and in value of product from (-12.23 %) to(4.06 %).

Table 3.3: Growth rate of gross margin in cotton and sugarcane over time, 1994-95 to 2010-11 (Per cent)

Crop	Time Period	Total Variable Cost	Value of Product	Gross Margin
Cotton	TP - I (1994-95 to 2001-02)	1.42	-12.23	-8.62
	TP-II (2003-04 to 2010-11)	7.65	4.06	1.28
	Overall (1994-95 to 2010-11)	**4.37**	**1.82**	**-0.55**
Sugarcane	TP - I (1994-95 to 2001-02)	-1.74	4.75	9.43
	TP-II (2003-04 to 2010-11)	5.40	0.44	-2.87
	Overall (1994-95 to 2010-11)	**-1.91**	**1.28**	**3.01**

The same has resulted an improvement in growth rate of gross margin from (-8.62) per cent to 1.28 per cent. This can be inferred from the improved scenario of gross margin (1.28%) in later time period TP-II (2003-04 to 2010-11) that the effects of introduction of BT cotton has resulted much improvement in productivities and hence it has resulted significantly higher value of product (4.06%) in the region.

This is also noted that post introduction of BT cotton, the total variable cost has significantly increased from 1.42 per cent to 7.65 per cent, but the same was being compensated by much higher returns in the real value of product.

During study period, there was overall increase in the gross margin (3.01%) of sugarcane and this has been because of positive growth in its value of product (1.28%) and negative growth rate in total variable cost (-1.91%). This also indicated that the real value of product has increased while the total variable cost in real value terms has decreased resulting in the positive gross margins.

CONCLUSION

The above discussion clearly portrays the situation of overall structural changes in various components of total variable cost (TVC) for two major cash crops of Haryana.

- In absolute term, total variable cost (TVC) has gradually increased over time for cotton crop and same was not in the case of sugarcane. As Haryana ranks eighth in sugarcane production and due to continuous reduction in area under this crop, the government was providing incentives.
- In case of cotton the growth rate in TVC was registered 4.37 per cent, while in case of sugarcane the negative growth in TVC was registered as 1.91 per cent per annum.
- During the analysis, it was noted that human labour(HL) held more than 50 per cent of the proportionate share of total variable cost of both the crops viz sugarcane (69.92%), and cotton (55.41%). It reflects that these crops are human labour intensive crops. The percentage share of human labour has continuously decreased in cotton and followed decreasing trend in sugarcane. It can be concluded that percentage expenditure in real value for HL has decreased in both the cash crops.
- The percentage share of bullock labour (BL) has continuously decreased in both the crops systematically.
- The structural change in cost components revealed that the percentage share of machine labour (ML) has continuously increased overtime in sugarcane crop and exhibited increasing trend in cotton. The systematic decrease in the proportionate share of BL and increase in the share of ML clearly revealed the extent of mechanization in both the cash crops in Haryana.
- In case of fertilizer (FER) and irrigation (IR), the percentage share of FER and IR has shown increasing trend overtime in both the cash crops sugarcane and cotton.
- The proportionate share of seed SD has shown increasing trend in cotton and sugarcane. The cost of seed in cotton inclined by 11.26 per cent between TE 2003-04 and TE 2010-11 which may be because of introduction of superior varieties of BT cotton in the region leading to the increased focus of the farmer.
- This is also noted that post introduction of BT cotton, the total variable cost has significantly increased from 1.42 per cent to 7.65 per cent, but the same was being compensated by much higher returns in the real value of product.
- The real value of gross margin (GM) of cotton have registered negative growth rate indicating a reason for present agrarian crisis. Apparently, these crises had been due to either stagnated or negligible growth in productivity, accompanied by significant increase in real value of input costs.
- In case of sugarcane positive growth rate in GM were observed. It was due to the higher growth rate in value of productthan the total variable cost in initial triennium.

POLICY IMPLICATION

The decrease in real value of product of both the cash crops need to be reverted with the help of technology and policy support in order to improve condition of the farmers of Haryana. Higher increase in the real value of variable costs also should be tackled at policy level and have parity with output prices.The results of the study also highlight the situations heading for agricultural crisis especially in profitability which may be reverted by taking appropriate actions either through technological interventions or supportive investments

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