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## PRODUCTION FUNCTIONS FOR COMMERCIAL CROPS IN HARYANA

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This paper attempts to investigate for Haryana, the relative economics and production functions for the commercial crops of cotton, sugarcane and oilseeds which cover 12 per cent of the total cultivated area in the State. The specific objectives of the study are : (1) to estimate the production functions for cotton, sugarcane and oilseeds in Haryana; (2) to estimate the marginal value productivities of major inputs used in these crops and (3) to compare the cost, income and employment potential in the commercial crops.

### DATA AND METHODOLOGY

The production of cotton, sugarcane and rape and mustard is confined to a few tracts in Haryana. For cotton Sirsa tehsil of Hissar district, for sugarcane Jagadhri tehsil of Ambala district and for rape and mustard, Rewari tehsil of Mahendergarh district were included in the sample. A cluster of five villages from each tehsil was selected for the collection of the desired data. The input-output data for these three commercial crops as well as the data on prices received by the farmers were collected by the survey method. Information collected relates to the agricultural year 1973-74 from 41, 44 and 60 farmers for cotton, sugarcane and rape and mustard respectively.

To estimate the marginal value productivities of inputs and the crop production functions, Cobb-Douglas type production function of the following form was used :

$$Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4}$$

where, Y =value of crop output in rupees per hectare,  
 $X_1$  =value of fertilizers used per hectare,  
 $X_2$  =per hectare cost of irrigation water in rupees,  
 $X_3$  =value of insecticides used per hectare,  
 $X_4$  =cost of human labour in rupees per hectare.

To estimate the economics of commercial crops, cost C concept as used in the Farm Management studies was followed.

## THE FINDINGS

(i) *Crop Production Functions*

Table I shows the crop production functions of the three commercial crops included in the sample. The coefficient of multiple determination

TABLE I—PRODUCTION FUNCTIONS FOR COMMERCIAL CROPS IN HARYANA : 1973-74

Crop	No. of observations	Constant	Regression coefficients				R <sup>2</sup>
			X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	
Sugarcane	44	11.92	-0.4898*** (0.0061)	-0.4924*** (0.1409)	—	-2.5999*** (0.3996)	0.87
Cotton	41	383.1	0.5328*** (0.0559)	-0.0479*** (0.0141)	—	-0.0891*** (0.0245)	0.72
Rape and mustard	60	2.019	0.0451 (0.0435)	—	0.0469 (0.0387)	-1.7173** (0.0685)	0.59

\*\* Significant at 5 per cent level of significance.

\*\*\* Significant at 1 per cent level of significance.

indicates that 87, 72 and 59 per cent of variation in the value of crop output of sugarcane, cotton and rape and mustard respectively is caused by fertilizer, irrigation and human labour alone. The regression coefficients for fertilizer and irrigation with respect to sugarcane, irrigation and human labour coefficients for cotton and human labour coefficients for rape and mustard are negative as well as statistically significant. This indicates negative contribution of these inputs on the production of sugarcane, cotton and rape and mustard. This also indicates the possibilities of reducing the use of fertilizer and irrigation on sugarcane farms of Ambala district, irrigation and human labour on cotton farms of Hissar and human labour on oilseeds growers in Mahendergarh district. Since most of these farms are canal irrigated, the possibilities of excess application of canal water cannot be ruled out. The statistical significance of the regression coefficients for human labour for sugarcane and of fertilizers for cotton indicate positive contribution of these inputs on the production of sugarcane and cotton respectively. The statistical non-significance of fertilizer and insecticides for rape and mustard indicates that these two inputs do not significantly affect the production of rape and mustard in Mahendergarh district and the use of these inputs is below optimum.

(2) *Marginal Value Productivities*

Based on the estimated production functions in Table I, the marginal value productivities of different inputs are shown in Table II. Here again, due to negative regression coefficients the marginal value productivities of fertilizers and irrigation for sugarcane, irrigation and human labour for cotton and human labour for rape and mustard are negative. These findings indicate the possibilities of reduction of these inputs so that production of sugarcane,

TABLE II—MARGINAL VALUE PRODUCTIVITIES OF MAJOR INPUTS

Inputs				Crops		
				Sugarcane	Cotton	Rape and mustard
Fertilizer (X <sub>1</sub> )	..	..	..	-0.73	0.81	0.07
Irrigation (X <sub>2</sub> )	..	..	..	-0.71	-0.08	—
Insecticides (X <sub>3</sub> )	..	..	..	—	—	0.80
Human labour (X <sub>4</sub> )	..	..	..	4.65	-3.14	-0.15

(Rupees)

cotton and rape and mustard is carried in the second stage of production functions and the marginal productivities of these inputs become positive. The positive marginal value productivity of human labour in sugarcane indicates the possibilities of further increasing the human labour employment on sugarcane farms of Jagadhri tehsil in Ambala district.

### (3) Cost, Income and Employment in Commercial Crops

Table III shows the comparative economics of sugarcane, cotton and rape and mustard as well as the employment potential from these crops. The per hectare total cost of production of sugarcane is highest, being Rs. 5,748 followed by cotton (Rs. 2,394) and rape and mustard (Rs. 1,815). However, cotton yields the maximum per hectare net income of Rs. 1,358 whereas sugarcane and rape and mustard give a per hectare net income of Rs. 975 and Rs. 655 respectively. This results in higher input-output ratios for cotton followed by rape and mustard and sugarcane. The per quintal cost of production from sugarcane, cotton and rape and mustard is Rs. 10.93, Rs. 198.51 and Rs. 256.12 respectively. Based on this economics, cotton seems to be more profitable than either sugarcane or rape and mustard for Haryana State. This is perhaps the reason why the growth rates for cotton over the years have been positive in the State whereas for sugarcane and rape and mustard they have been negative.\* Although cotton is more profitable and its water and fertilizer requirements per unit of land are lower than those for sugarcane, and the duration of the cotton crop permits the cultivation of one additional crop from December to May, its production is confined only to Hissar district because of soil and climatic factors.

In regard to the individual crops, sugarcane leads in the use of human labour followed by cotton and rape and mustard (Table III). Sugarcane and cotton involve interculture operations which are however practically non-existent in the case of rape and mustard. The per hectare employment

\* The annual acreage growth rates for sugarcane, oilseeds and *desi* cotton were -5.04, -2.79 and 6.21, respectively during 1965-66 to 1971-72. Regional Differences in Crop Output Growth in Haryana, 1965-66 to 1971-72, Department of Economics, Haryana Agricultural University, Hissar (unpublished).

TABLE III—COST, INCOME AND EMPLOYMENT IN COMMERCIAL CROPS

Items	Commercial crops		
	Sugarcane	Cotton	Rape and mustard
<b>Inputs</b>			
(i) Human labour (Rs.)	1355.00 (23.57)	520.00 (21.72)	320.00 (17.63)
(ii) Bullock labour (Rs.)	1230.00 (21.40)	210.00 (8.77)	555.00 (30.57)
(iii) Chemicals			
(a) Fertilizers (Rs.)	401.72 (6.99)	214.42 (8.96)	195.50 (10.77)
(b) Insecticides (Rs.)	19.78 (0.34)	147.90 (6.17)	3.41 (0.19)
(iv) Seed (Rs.)	1008.69 (17.55)	31.76 (1.33)	9.83 (0.54)
(v) Irrigation (Rs.)	264.48 (4.60)	200.71 (8.38)	—
(vi) Miscellaneous costs (Rs.)	1469.21 (25.55)	1069.42 (44.67)	731.79 (40.30)
Total costs (Rs.)	5748.88 (100.00)	2394.21 (100.00)	1815.53 (100.00)
<b>Output</b>			
(i) Main product (quintals)	526.75	11.97	6.86
(ii) By-product (quintals)	—	18.08	10.07
Value of main products (Rs.)	6723.93 (100.00)	3581.27 (98.87)	2406.83 (97.55)
Value of by-product (Rs.)	—	40.95 (1.13)	60.42 (2.45)
Total output value (Rs.)	6723.93 (100.00)	3622.22 (100.00)	2467.25 (100.00)
Net income (Rs.) (Total output—total cost)	975.03	1358.01	655.13
Input-output ratio	1 : 1.17	1 : 1.51	1 : 1.36
Cost of production per quintal (Rs.)	10.93	198.51	256.12
<b>Employment</b>			
Human labour (days)	271	114	64
Bullock labour (days)	82	14	37

Note : Figures in parentheses indicate the percentages to the total inputs and total output.

of bullock labour is highest for sugarcane and lowest for cotton; sugarcane requires more number of ploughings, when compared to rape and mustard. In regard to rape and mustard, the cultivation of which is confined to the dry farming areas bordering Rajasthan, more ploughings are done to conserve the soil moisture. Bullock labour is needed only for land preparation and sowing in the case of cotton

## CONCLUSIONS

(1) The use of fertilizers, irrigation water and human labour explains about 87, 72, and 59 per cent of the variation in the production of sugarcane, cotton and rape and mustard respectively. However, the regression coefficients of fertilizer and irrigation with respect to sugarcane, of irrigation and human labour for cotton and of human labour for rape and mustard indicate negative contribution to the production of the respective crops in Haryana during 1973-74. The canal irrigated farms seem to have a tendency to use excess of canal water.

(2) The marginal value productivity of fertilizer and irrigation for sugarcane, of irrigation and human labour for cotton and of human labour for rape and mustard are found to be less than zero. This indicates that the production of sugarcane, cotton, rape and mustard with respect to the inputs which have negative marginal value productivity is carried on in the third stage of production function.

(3) Cotton is more profitable than sugarcane and rape and mustard in Haryana. However, sugarcane affords more employment potential for human as well as for bullock labour compared to cotton or rape and mustard.

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CULTIVATION OF JUTE VIS-A-VIS AUTUMN PADDY IN ASSAM :  
A CASE STUDY IN NOWGONG DISTRICT

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*Introduction*

Besides winter paddy (*Sali*), jute and autumn paddy (*Ahu*) are the two important crops grown in the State of Assam. The importance of these two crops is due to their short maturity period. The time required from sowing to harvesting is about 17 weeks for autumn paddy and 20 weeks for jute as compared to 25-30 weeks for the other major crop, *i.e.*, winter paddy. Moreover, the area under these crops is usually used as double cropped area. In