

Factors Affecting Demand for Human Labour in Punjab Agriculture

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ABSTRACT:

A study was conducted in three agro-climatic zones i.e. sub-mountainous zone (Zone I), central zone (Zone II) and south-western (Zone III) zone of Punjab. Rupnagar district from the sub-mountainous zone, Jalandhar from the central zone and Bathinda from the south-western zone were selected randomly for the study. The primary data were collected from 144 farmers to examine the factor affecting demand for human labour. To analyze the data mean, range and Cobb-Douglas production function were used. The average size of land holding on sample farms was 7.38 hectares who made an annual overall expenditure on hired labour to the extent of Rs. 3.04 lakh. On the other hand, the average annual household income of cultivators was Rs. 17.20 lakh. The cropping intensity estimate stood in the range of 100 to 220 per cent; however, overall average was 112.19 per cent. The average use of human labour utilization per farm stood at 1010.94 mandays. The production function revealed that 97 per cent of the variation in the human labour employment was explained by the selected explanatory variables such as hired labour charges, farm size and family annual income. The coefficients of hired labour charges (0.161), farm size (1.316) and family annual income (0.001) were statistically significant. However, the results for cropping intensity were opposite to prior expectation. With regards to farm labour demand, the farm size and family annual income makes significant contribution to the increased use of hired labour and measures should be taken to expand the cropping intensity which could serve as an instrument for expanding the market for hiring labour.

Keywords Wage rate, Farm size, Family annual income, Cropping intensity and Human labour

I. INTRODUCTION

Punjab is one of India's most agriculturally developed states. Agriculture in the state has grown at an unprecedented rate since the mid-1960s, due to the advancement of high-yielding crop varieties and the adoption of modern and improved farm practices. During the late 1970s, the state had seen a significant increase in demand for farm labour due to an increase in cropping

intensity and farm output, as well as a shift in cropping pattern toward labour-intensive crops such as paddy (Sidhu, Rangi and Singh 1997). However, after the mid-1980s, increased mechanization, particularly in wheat and paddy, as well as increased use of inputs such as weedicides and herbicides, resulted in significant displacement of labour in agriculture (Rangi and Sidhu 2004, Sidhu and Singh 2004). Despite shifts toward more labour-intensive crops, total labour use has remained stable or fallen (Bhalla 1987). On the other hand, lack of sufficient farm labour may be a barrier to the adoption of a more sustainable labour-intensive farming system. The labour intensive farming system's technique was to offer the potential to increase productivity and farm incomes through the use of intensive farm labour, but it has been largely overlooked and overshadowed instead by a plethora of research on off-farm labour (Tegegne et al. 2001).

A variety of factors, including increased cropping intensity, cropping pattern shifts, wider adoption of bio-chemical and mechanical technologies and so on, all had a significant impact on labour demand (Bardhan 1997, Parthasarathy 1990, Sidhu and Grewal 1990, Acharya 1992). While the demand for human labour is increased with the increase in the use of bullock labour, tractor, pesticide and irrigation machinery, it declined significantly with the increase in farm size, expenditure on weedicides, use of combine harvester and wage rate (Devi et al. 2013).

Increase in agricultural production is the major objectives of farmers in general and policy makers in particular in any country. In this process, what happens to employment in the agricultural sector is no less important because of acute unemployment in the country at present and in the interest of economic development in the long run. This requires identification of the factors influencing labour employment on the farm. This paper examined the factors that affect demand for farm labour in rural Punjab.

II. METHODOLOGY

In order to achieve the envisaged objectives of the study, primary data were collected 144 farmers in 12 villages across three agro-climatic zones namely Zone I, Zone II and Zone III of Punjab. The farmers were categorized into small, medium and large groups using square-root cumulative frequency method (Table 1).

Table 1: Category wise distribution and variability in size of holding of sample farmers (2018-19)

Category	Size of land holding (Hectares)	Agro-climatic Zones			Total
		Zone I	Zone II	Zone III	
Small	up to 5.79	17 (35.42)	08 (16.67)	20 (41.67)	45 (31.25)
Medium	5.79 to 11.60	22 (45.83)	12 (25.00)	25 (52.08)	59 (40.97)
Large	Above 11.60	09 (18.75)	28 (58.33)	03 (6.25)	40 (27.78)
All farms		48 (100)	48 (100)	48 (100)	144 (100)

Note: Figures in the parentheses are the percentage of the total number of farmers in the respective category

It is evident from the table that across Zone I and III majority of sample farmers belonged to medium category, however, in Zone II larger chunk of 58.33 per cent comprised of large group. On the whole 40.97 sample farmers belonged to medium category, 31.25 per cent to small and rest over one-fourth to large category.

The Cobb-Douglas production function was fitted to establish input-output relations and calculate the inputs' efficiency:

$$Y = b_0 \prod_{i=1}^n X_i^{b_i} e^u$$

$$\text{Log } Y = \text{Log } b_0 + \sum_{i=1}^n b_i \text{Log } X_i + U$$

The actual form of the production function was:

$$\text{Log } Y = \text{Log } b_0 + b_1 \text{Log } X_1 + b_2 \text{Log } X_2 + b_3 \text{Log } X_3 + b_4 \text{Log } X_4 + U$$

Where,

Y = Total human labour use (mandays),

b_i = Coefficient of production elasticity of the respective variable X_i at the geometric mean level of input used and output obtained.

X_1 = Hired labour charges (Lakh Rs. /farm)

X_2 = Farm Size (Hectare)

X_3 = Family annual income (Lakh Rs. /farm)

X_4 = Cropping intensity (%)

U = Error term

The function was fitted for Zone I, Zone II and Zone III and at the overall level.

III. RESULTS AND DISCUSSION

Factors affecting labour demand

The mean value and range of the selected variables such as hired labour charges, family size, household annual income, cropping intensity and human labour used in the production function analysis are shown in Table 2. In zone I, the average hired labour charges were Rs. 1.74 lakh which ranged from Rs. 0.21 lakh to 6.68 lakh. Almost all farm households possessed land ranging from 1.42 to 18.22 hectares with an average land holding of 5.24 hectares in zone I.

The average annual household income was Rs. 17.64 lakh ranging from Rs. 1.66 to Rs. 47 lakh.

Table 2: Mean and range of selected variables used in the production function analysis (2018-19)

S. No.	Variables	Units	Zone I		Zone II		Zone III		Pooled	
			Range	Average	Range	Average	Range	Average	Range	Average
1	Hired labour charges	Lakh Rs./fam	0.21-6.68	1.74	0.30-17.19	4.51	0.12-5.87	1.41	0.12-3.32	3.04
2	Farm size	Hectare	1.42-18.22	5.24	1.21-62.75	13.07	0.40-14.17	3.80	0.40-62.75	7.38
3	Family annual income	Lakh Rs./fam	1.66-47.00	17.64	3.00-64.80	21.59	3.00-36.00	13.52	1.66-64.80	17.20
4	Cropping intensity	Per cent	100-160	115.82	100-220	111.73	100-150	109.09	100-220	112.19
5	Human labour	mandays	72.37-2226.72	580.31	100.40-11072.39	1972.84	41.03-1957.51	470.70	41.03-11072.39	1010.94

Cropping intensity ranged from 100 to 160 per cent however, average cropping intensity was 115.82 per cent in Zone I. Similarly, the average human labour utilization in Zone I was found to be 580.31 mandays which ranged from 72.37 to 2226.72 mandays in this Zone.

In zone II, the hired labour charges ranged from Rs. 0.30 to Rs. 17 lakh with an average figure of Rs. 4.51 lakh. The average farm holding was 13.07 hectares in zone II and varied from 1.21 to 62.75 hectares. The household income of cultivators varied from Rs. 3.00 to 64.80 lakh per annum with an average of Rs. 21.59 lakh. Cropping intensity in this Zone varied widely from 100 to 220 per cent with average of 111.73 per cent.

Human labour utilization in Zone II, showed stark variation range from 100.40 to 11072.39 mandays and with average figure of 1972.84 mandays as in this Zone both sugarcane and potato cash crops were grown which required more labour at the time of sowing and harvesting.

In zone III, the expenditure made on average hired labour was Rs. 1.41 lakh which ranged from Rs. 0.12 to Rs. 5.87 lakh. Whereas, the average farm size in zone III was 3.80 hectares and varied from 0.40 to 14.17 hectares. The annual income earned by average household varied from Rs. 3 to 36 lakh with an average earning of 13.52 lakh. Cropping intensity in Zone III, stood nearby which ranged from 100 to 150 per cent with an average estimate of 109.09 per cent. In Zone III, the average human labour use stood at 470.70 mandays and varied from 41.03 to 1957.51 mandays.

Overall expenditure made on hired labour ranged from Rs. 0.12 to Rs. 3.32 lakh with an average of Rs. 3.04 lakh. Farm households owned land which varied from 0.40 to 62.75 hectares with an average land holding of 7.38 hectares. The average annual household income of cultivators was Rs. 17.20 lakh which varied from Rs. 1.66 to Rs. 64.80 lakh annually. Cropping intensity estimate stood in the range of 100 to 220 per cent however, the average was 112.19 per cent. The average use of human labour utilization stood at 1010.94 mandays which varied from 41.03 to 11072.39 mandays.

Table 3: Estimated parameters of Cobb-Douglas production function (2018-19)

Variables	Zone I	Zone II	Zone III	Pooled
Intercept	1.830** (0.665)	2.511* (0.565)	2.718** (1.195)	2.310* (0.461)
Hired labour charges (Lakh Rs./farm)	0.235* (0.068)	0.039*** (0.074)	0.279** (0.100)	0.161* (0.043)
Farm size (Hectare)	1.266* (0.041)	1.390* (0.033)	1.167* (0.090)	1.316* (0.029)
Family annual income (Lakh Rs./farm)	0.004*** (0.024)	0.028*** (0.034)	0.102*** (0.071)	0.001*** (0.022)
Cropping intensity (%)	-0.723** (0.224)	-0.639** (0.221)	-1.278* (0.515)	-0.818* (0.168)
R ²	0.983	0.983	0.985	0.972

Note: *, **,*** denote significance at 1 per cent, 5 per cent and 10 per cent level and NS: Non-significant

The figures within the parentheses indicate the standard errors

Cobb-Douglas production function was used to establish the relationship between human labour use and some of its important factors such as labour wage rate, farm size, family annual income and cropping intensity. The Cobb-Douglas specification is used because it is linear and homogenous. It has an advantage in that its result can easily be interpreted in economic terms.

The Cobb-Douglas production function estimates for finally selected explanatory variables like labour wage rate, farm size, family annual income and cropping intensity are presented in Table 3. With respect to Zone I, the value of the coefficient of multiple determination (R²) came out to be 0.983. The coefficient has explained 98.3 per cent of variation in human labour employment due to various selected explanatory variables in the function. The coefficients of

labour hired labour charges, farm size and family annual income were 0.235, 1.266 and 0.004, respectively and these were statistically significant. The coefficient of cropping intensity was negatively significant at 5 per cent. Here the sign was negative because the cultivators could not increase the intensity of the use of other inputs commensurate with the increase in cropping intensity.

In Zone II, the coefficient of multiple determination (R^2) was 0.983 which demonstrated that 98.3 per cent variation in human labour employment was specified by the independent variables in the function. Among the various independent variables, hired labour charges, farm size and family annual income had positive regression coefficients (1.830, 0.235 and 1.266, respectively) and were statistically significant. The coefficient of cropping intensity was negatively significant thereby showing that with the increase in cropping intensity the demand for human labour cannot be increased.

In Zone III, the coefficient of multiple determination (R^2) came out to be 0.985. This coefficient has explained about 98 per cent variation in human labour demand due to various selected explanatory variables in the model. The coefficients of hired labour charges, farm size and family annual income were 2.718, 0.278 and 1.167, respectively and statistically significant. The coefficient of cropping intensity showed negative relationship as it was -1.278 and statistically significant at one per cent.

As evident from the table, the production function fitted the data quite well because overall about 97 per cent of the variation in the human labour employment was specified by the selected explanatory variables in the model. The coefficients of hired labour charges (0.161) farm size (1.316) and family annual income (0.001) were statistically significant. However, the results for cropping intensity were opposite to prior expectation.

CONCLUSION AND POLICY IMPLICATION

Increase in agricultural production is the major objectives of farmers in general and policy makers in particular in any country. In this process, what happens to employment in the agricultural sector is no less important because of acute unemployment in the country at present and in the interest of economic development in the long run. This requires identification of the factors influencing labour employment on the farm. Overall expenditure made on hired labour ranged from Rs. 0.12 to Rs. 3.32 lakh with an average of Rs. 3.04 lakh. Farm households owned land which varied from 0.40 to 62.75 hectares with an average land holding of 7.38 hectares. The average annual household income of cultivators was Rs. 17.20 lakh which varied from Rs. 1.66 to Rs. 64.80 lakh annually. Cropping intensity estimate stood in the range of 100 to 220 per cent however, the average was 112.19 per cent. The average use of human labour utilization stood at 1010.94 mandays which varied from 41.03 to 11072.39 mandays. The production function fitted the data quite well because overall about 97 per cent of the variation in the human labour employment was specified by the selected explanatory variables in the model. The coefficients of hired labour charges (0.161) farm size (1.316) and family annual income (0.001) were statistically significant. However, the results for cropping intensity were opposite to prior expectation. With regards to farm labour demand, the farm size and family annual income makes significant contribution to the increased use of hired labour and

measures should be taken to expand the cropping intensity which could serve as an instrument for expanding the market for hiring labour.

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