THE IMPACT OF AGRICULTURAL DEVELOPMENT ON EMPLOYMENT: A CASE STUDY OF PUNJAB

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I. INTRODUCTION

WHEN agriculture in a predominantly agrarian country starts developing rapidly with replacing traditional agricultural methods by an improved technology there is bound to be considerable impact on employment. When the same new technology is applied in different regions, while its effect on agricultural output may be more or less uniform, its effect on employment is bound to differ from region to region. The extent to which its effect on employment varies depends on the agro-economic character of the region. For example, in a state like Orissa, which is relatively less developed than Punjab, when agriculture develops rapidly it will take some time for labor shortages to appear in the economy. This is primarily due to two reasons: firstly, the existence of considerable disguised unemployment or surplus labor capacity, which means that increased demand for labor can be met within the agricultural sector itself, and, secondly, because surplus labor in agriculture has no alternative except to take advantage of additional employment opportunities created within agriculture as the industrial sector occupies an insignificant place in the economy of the state. On the other hand, in a state like Punjab where the economy is developed, rapid agricultural development leads to immediate shortage of labor, which can be met either by mechanization of agricultural operations or by importing labor from other regions. In fact, Punjab has dealt with its labor shortage partly by agricultural mechanization and partly by importing labor from neighboring states. There are three factors to explain this experience. Firstly, there is very little disguised unemployment in Punjab's agricultural sector. Secondly, other sectors of the economy are not in a position to supply labor to agriculture as they are themselves playing an important part in the economy and they are experiencing their own labor shortage due to expansion. Thirdly, as the agricultural sector expands rapidly, the additional purchasing power created brings about an expansion of other sectors, which leads to increased competition for labor. Since Punjab possesses the infrastructure required for rapid economic development, its industries are in a position to take advantage of new opportunities which agricultural development opens up. Thus, both agriculture and industry are growing in a complementary fashion supported by a well-developed tertiary sector.

For purposes of this paper, I have concentrated on Punjab because, of all the states in India, only Punjab has reached a stage of almost zero unemployment. An analysis of the impact of agricultural development in Punjab on employment

can give us an idea of what will happen when agricultural development takes place under conditions of minimal unemployment.

II. INCREASE IN DEMAND FOR LABOR IN AGRICULTURAL AND INDUSTRIAL SECTORS

The demand for labor in Punjab increased at a faster rate than available supply largely because of simultaneous development of agriculture and industry. Agricultural development was related to numerous factors such as improved irrigation facilities, particularly tubewell irrigation, the green revolution, and increasing demand for agricultural commodities by the industrial sector. Industries in Punjab, particularly small-scale industries, expanded rapidly as well, facilitated by such factors as availability of skilled manpower, resourceful entrepreneurs, availability of savings in the agricultural sector, and assured markets within Punjab itself stemming from prospering agriculture. Increased demand for agricultural equipment like strainers, mechanical threshers, pumps, and diesel engines, and for spare parts for such equipment helped not only in the development of small-scale engineering industry but also in increasing agricultural production. There was a similar increase in demand for consumer durables such as refrigerators, automobiles, sewing machines and bicycles, and for other consumer items like cotton and woolen textiles, hosiery, and leather goods, as well as for spare parts for the machinery involved in manufacturing these items. Industrial centers like Ludhiana and Jullunder, where the attendant industries developed, were also able to find markets for these goods in other parts of the country and abroad.

Statistical data published by the government of Punjab[1] throw some light on industrial development of the state. Until 1975 such data were derived only from registered factories, but subsequently covered unregistered factories as well. These unregistered factories are small-scale units employing only a few laborers. The available statistical data indicate that in the period 1970–78, the number of registered factories in Punjab increased from 4,501 to 6,008, and the number of workers employed increased from 116,806 to 168,072, while the average number of workers employed per factory increased from 25.9 to 27.9. The number of units using power increased from 852 to 1,418. In Ludhiana District, which accounts for nearly 30 per cent of registered factories and 22 per cent of workers employed, the number of registered factories increased from 1,160 in 1969 to 1,794 in 1978 and the number of workers employed increased from 24,109 to 48,304. Amritsar, Gurdaspur, and Jullunder also emerged as important industrial centers. Aside from registered factories, the number of unregistered industrial establishments has also grown substantially. In 1978 there were 65,466 unregistered units in Punjab providing employment to 161,720 workers and accounting for investment of Rs.1,315 million and gross production of Rs.2,294 million. Ludhiana accounts for 20.6 per cent of the unregistered factories in

[1] Government of Punjab, Economic and Statistical Organization, *Statistical Abstract of Punjab* (various years), issued by Economic Adviser to Government of Punjab (Chandigarh).

TABLE I

INDICES OF PRODUCTION, PRODUCTIVITY, AND EMPLOYMENT

Year	Total Agricultural Production	Total Value Added in Industrial Sector	Labor Productivity per Worker		Productivity of Industrial Worker/Productivity of Agricultural Worker	Labor Employed	
			Agriculture	Industry		Industry	Agriculture
1969/70	100.00	100.00	100.00	100.00	3.7912	—	—
1972/73	—	—	—	—	—	100.00	100.00
1973/74	114.65	107.03	106.60	102.14	3.9327	115.48	101.97
1974/75	118.43	116.76	107.99	124.05	4.3551	122.85	103.98
1975/76	129.13	124.32	115.48	129.57	4.4237	135.14	106.02
1976/77	136.06	137.84	119.14	140.77	4.4533	118.92	108.10
1977/78	150.11	141.62	129.12	142.83	4.4939	122.36	110.23
1978/79	—	—	—	—	—	140.05	112.40

Source: Prakash Mehta and R. S. Prihar, "Interaction of Agro Industry and Agriculture in Punjab," *Eastern Economist,* Vol. 75, No. 20 (November 14, 1980), pp. 1106–8.

Punjab, 25.3 per cent of their employment, 39.7 per cent of their investment, and 33.8 per cent of their gross value of output. The share of Jullunder in these items is 14.8, 17.9, 14.0 and 16.6 per cent respectively. These unregistered industries are small, the average number of workers employed per unit averaging only 2.5.

Over time, considerable diversification has taken place in the types of products manufactured by industries in Punjab. In 1969 nearly two thirds of registered factories in Ludhiana were manufacturing textile products, machine tools, and machine parts. By 1978 there was significant development, encompassing metal products, transport equipment, machinery, wood and wooden products, and basic metals and alloy. The industries involved developed in both the registered and unregistered sectors. During the period in question, Ludhiana and Jullunder became centers embracing large-, medium-, and small-scale industries.

The complementary development of agriculture and industry can be seen from Table I. The table indicates that while both agricultural and industrial production increased rapidly, agricultural production increased at the higher rate. However, productivity and employment increased at the higher rate in industry. In spite of differences in growth rate, both agriculture and industry developed in a complementary direction.

Due to the simultaneous rapid development of agriculture and industry the demand for labor outstripped the supply in Punjab leading to labor imports. According to the 1971 population census, immigration to rural areas of Punjab increased from 8 per cent in 1961 to 13 per cent in 1971.[2] Uttar Pradesh and Bihar accounted for 20 per cent and 14 per cent respectively of the total number of outmigrants from rural areas to rural areas in other states. Migration to rural

[2] See G. K. Mehrotra, *Birth Place Migration in India,* Census of India 1971, Special Monograph No. 1 (New Delhi: Office of the Registrar General, Ministry of Home Affairs, 1974), p. 22.

areas of Punjab from other states was mainly due to the availability of expanding job opportunities within the agricultural sector.

There was similar migration to industries in Punjab. According to a survey carried out in Jullunder city of Punjab in 1978, 43.9 per cent of the immigrants to that city during the 1970s came from east Uttar Pradesh, 22.6 per cent from other parts of the country, 11.0 per cent from Jullunder District and 22.5 per cent from other parts of Punjab [5, p. 74]. As compared to the 1960s, the percentage of migrants from Jullunder District and other parts of Punjab was much lower, decreasing from 33.3 and 40.6 per cent respectively, while migrants from east Uttar Pradesh increased from 18.8 to 43.9 per cent. The average age of migrants to Jullunder was 23.16 years. A large percentage of the immigrants had been artisans and cottage industry workers in their native places.

Due to an acute shortage of labor, both agriculture and industry are more and more heavily dependent on migrant labor. In the Hero Cycle Factory near Ludhiana, nearly 50 per cent of the unskilled labor is accounted for by migrants from east Uttar Pradesh and north Bihar [3, p. 151].

III. AGRICULTURAL DEVELOPMENT OF PUNJAB

Since the commencement of the "green revolution," which can also be called the "seed-fertilizer based technology," the demand for labor has increased sharply partly due to the new technology itself and partly to greater crop intensity which increased from 1.29 in 1965/66 to 1.51 in 1976/77, primarily because of the increase in irrigated area. Irrigated area increased from 54 per cent of the overall cultivated area in 1964/65 to 75 per cent in 1975/76. The intensity and regularity of irrigation also improved as the number of tubewells increased from 48,000 in 1966 to 468,000 in 1975/76. The success of the green revolution may be attributed to the simultaneous increase in complementary inputs like irrigation and fertilizer, the latter increasing from 8.8 kg to 47.2 kg per hectare in the period 1964/65–75/76. With the considerable complementarity between irrigation and seed-fertilizer based technology, employment in agriculture increased.

During the same period, there were relative shifts within the area under irrigation toward high yielding wheat and paddy from less-irrigated crops like gram. Thus, in the period 1966/67–76/77, while the area under wheat and rice increased by 1.44 million hectares, the area under gram declined by 0.25 million hectares. At the same time, area under high yielding wheat increased from 3.5 per cent in 1966/67 to 72.5 per cent in 1971/72 and 90.3 per cent in 1976/77 while the area devoted to high yielding rice increased from 1.5 per cent in 1966/67 to 69.1 per cent in 1971/72 and 88.3 per cent in 1976/77. Productivity per hectare increased from 1,236 kg in 1966/67 to 2,432 kg in 1976/77 for wheat and from 1,000 kg to 2,605 kg for paddy. The proportion of gross irrigated area to gross cropped area increased from 64.2 to 81.2 per cent during the period.

IV. IMPACT OF AGRICULTURAL DEVELOPMENT ON DEMAND FOR LABOR

The increases in agricultural production and agricultural productivity resulted in increased employment opportunities within agriculture, as the seed-fertilizer based technology required greater labor input.[3] For assessing the concrete effects on employment, in the absence of input details for 1970s, we have to depend upon studies based on farm management survey data[4] for the 1950s and 1960s. Estimates made by Shakuntala Mehra on the basis of the survey data for Ferozepur District of Punjab indicate that overall labor input per hectare of net cultivated area was about 40 per cent higher during the period 1966/67–69/70 than in the period 1954/55–56/57 [4, pp. 8–9]. Labor input per hectare of net cultivated area increased from 57.62 man-days in the 1950s to 80.56 in the 1960s. Thus labor input per hectare in the 1960s (the period of the green revolution) was higher by 22.94 man-days.[5] Out of this increase of 22.94 man-days, 4.72 man-days are attributed to irrigation which increased cropping intensity, 5.84 man-days to irrigation which increased labor input to individual crops and 3.15 man-days to increase in crop intensity facilitated by the new technology. The bulk of the remaining 9.23 man-days is attributed to the new technology itself [4, p. 11].

Other activities ancillary to cultivation, such as dairy production also contributed to increased employment. In the period 1971/72–76/77 output of milk increased from 2.2 to 2.7 million tons. The number of poultry birds increased from 1.68 million in 1965/66 to 3.01 million in 1971/72.

Due to an all-round increase in demand for labor, wages also increased. Real wage rates for harvest labor increased from Rs.2.59 per day in 1961/62 to Rs.3.84 per day in 1976/77 (calculated at 1961/62 prices). The daily wages of carpenters increased from Rs.4.41 in 1961/62 to Rs.5.68 in 1976/77.

There is considerable complementarity between the seed-fertilizer based technology, irrigation through private investment, and mechanization among large farmers [6]. While small farms tried to increase income by going in for more labor intensive crops by maximizing the input of family labor, large farms run by smaller families went in for mechanization partly because of the leisure preference of family workers [4, p. 28]. In Ferozepur the adoption of the seed-fertilizer based technology was accompanied by extensive mechanization, especially on the large farms. On farms of twenty hectares and above family labor days per hectare declined from 14.6 in the 1950s to 12 in the 1960s while the input of

[3] This has been borne out by several studies. See, for example, John W. Mellor, *The New Economics of Growth* (Ithaca: Cornell University Press, 1976).

[4] Studies in economics of farm management were being conducted in different parts of the country since 1954/55 by Department of Agriculture, Ministry of Food and Agriculture, Government of India. These studies aimed at collecting data regarding the structure of farms and the farm economy as a whole and enterprise studies including input-output relationships for each crop selected for study.

[5] In the case of gross area, labor input per hectare increased from 47.8 to 60.0 man-days.

hired labor increased from 26.7 to 34.7 man-days [4, p. 29]. This trend may be illustrated with reference to deployment of family labor and hired labor in harvesting operations using combines. In the case of wheat harvesting in Ludhiana District of Punjab farms of less than twenty acres used 0.24 family labor days and 0.70 days of hired labor per acre while farms of forty acres and above used 0.13 family labor days and 0.34 days of hired labor for the harvest. In the case of farms employing threshers, the breakdown is 2.77 days of family labor and 7.15 days of hired labor for farms of twenty acres and less and 1.78 days of family labor and 7.35 days of hired labor for those of forty acres and above. Similarly, in the case of paddy farmers using combines in the harvest, farms of forty acres and above required 0.30 days of family labor and 0.44 man-days of hired labor per acre, while cultivators not using combines required 1.60 man-days of family labor and 15.41 days of hired labor. On holdings of twenty acres and less, farmers not using combines required 3.14 man-days of family labor and 14.76 man-days of hired labor for the harvest [3, pp. 124, 128]. Thus the leisure preference was reflected in reduced working days by family workers in larger holdings as compared to smaller holdings.

V. THE IMPACT OF MECHANIZATION ON EMPLOYMENT

Employment opportunities in agriculture due to irrigation and the seed-fertilizer based technology could have been much greater but for extensive mechanization. The magnitude of the increase in mechanization can be seen from the fact that the number of tractors in Punjab agriculture increased from 5,000 in 1961 to 50,000 in 1975/76. The number of harvest combines is also increased—the number for the country as a whole rising from 66 prior to 1970 to 469 in 1978. At least half of these combines are in Punjab [3, p. 148].

While the seed-fertilizer based technology increased the absorption of labor, mechanization tended to work in the opposite direction [4, p. 28]. For example, in the case of paddy harvesting, farmers using combines required only 0.77 man-days per acre while farmers using manual labor required 16.65 man-days. Thus, the labor displaced amounted to 15.88 man-days per acre [3, p. 128]. In the case of wheat harvesting, farmers using combines required only 0.50 man-days per acre while those using threshers required 9.43 man-days. The labor displacement in this case amounts to 8.95 man-days per acre. Calculated on a machine basis, the labor displacement per combine is around 2,549 man-days for wheat and 3,683 man-days for paddy [3, p. 135]. If the entire Punjab harvesting operation (for farms of ten acres and above) was carried out by combines, the aggregate displacement would be 51.0 million man-days [3, p. 137].

As in the case of combines, the use of tractors also leads to displacement of labor. When used for ploughing purposes, tractors involve only 1.19 man-days per acre while bullock ploughing requires 2.84 man-days. Krishna's study indicates that the use of tractors for ploughing leads to a decline of 5.26 man-hours per hectare in the case of wheat [2, p. 280]. The estimate is based on an analysis of changes in total labor input per hectare for wheat in Punjab in the period

1968/69–73/74. However, the tractor surveys fail to provide convincing evidence that tractors are responsible for substantial increases in crop intensity, yields, timeliness and gross returns [1], and "it is unlikely that increase in output as a result of tractorisation through increase in cropping intensity and yield per cropped acre would be such as to compensate for the technological displacement of labor" [6, p. 113]. An analysis of farm management survey data for the 1950s and 1960s for Ferozepur District of Punjab shows that "tractorisation would displace between 20 to 30 per cent of total human labor days per cropped acre on account of tillage and transportation" [6, p. 112]. While tractorisation leads to displacement of labor from many agricultural operations there are no opportunities available within or outside the farm for absorbing the surplus labor thereby created.

In the case of harvest combines, "there is no significant difference between users and non-users either in crop intensity or farm productivity after adjusting for the effects of other inputs" [3, p. 172]. While there is no social gain in terms of increase in crop intensity or farm productivity, there is net social loss in terms of labor displacement, which reduces employment opportunities for the casual labor force and more particularly for migratory labor coming from surplus labor areas.

VI. LABOR AVAILABILITY

Demand for labor is going up in Punjab agriculture year by year, and Punjab is experiencing an acute labor shortage. I have tried to analyze the labor availability situation in Punjab agriculture with the help of data collected by the Agricultural Economic Research Centre in various surveys.

To begin with, let us examine what is happening to labor supply within the farm. There is evidence to indicate that labor supply from this source is not increasing at a rate sufficient to meet the requirements of a fast expanding agriculture, particularly during the busy agricultural season. I have tried to examine this situation with the help of data available for farm households in four villages, i.e., Bhatian (Ludhiana District), Ratol Rohi (Ferozepur District), Mehtiana (Hoshiarpur District), and Kukkar Majra (Patiala District). In the case of Mehtiana and Kukkar Majra the information relates to the period 1963/64–76/77 while in the case of Ratol Rohi and Bhatian the information relates to the period 1960/61–76/77. Details on demographic factors and some aspects of cultivation are given in Table II.

The table indicates that crop intensity in all the four villages increased by at least 65 per cent, and increases in crop intensity mean an increase in work on farms. Yet increased farm work was not matched by an increase in the supply of labor from within the farm, because a growing number of family laborers showed preference for nonfarm jobs. This can be seen from the fact that the number of adult males working in nonfarm jobs increased from six to twenty-six while the number of adult males working on family farms increased from 125 tc only 130. The shift to nonfarm jobs when there were sufficient opportunities on

TABLE II

CHANGES IN OCCUPATIONAL STRUCTURE AND LAND DETAILS

Particulars	Mehtiana, Kukkar Majra		Ratol Rohi, Bhatian		For All 4 Villages	
	1963/64	1976/77	1960/61	1976/77	1960/61 1963/64	1976/77
1. No. of adult males working on family farms	69	65 (−0.45)	56	65 (+1.01)	125	130
2. No. of adult male members working as agricultural laborers	0	3	1	2	1	3
3. No. of adult male members working in other occupations	3	12	3	14	6	26
Total of 1, 2, and 3	72	80 (+0.85)	60	81 (+2.19)	132	161
4. No. of adult student members	9	9	5	13	14	22
5. No. of retired adult members	—	4	4	2	4	6
6. No. of non-working adult males	1	2	7	3	8	5
Total of 4, 5, and 6	10	15	16	18	26	33
7. No. of members working abroad	—	—	—	6	—	6
8. Total adult male population	82	95 (+1.22)	76	105 (+2.37)	158	200
9. Total population of households	257	276 (+0.57)	234	254 (+0.56)	491	530
10. No. of cultivating households	35	35	34	34	69	69
11. Land cultivated (in acres)	377	311	473	538	850	849
12. Cropping intensity	1.12	1.85	1.19	1.69	1.16	1.75
13. Average size of holdings (in acres)	11.6	8.9	13.9	15.7	12.3	12.3
14. Total wage bill of permanent labor (at constant prices)	4,886	4,366	4,531	14,243	9,417	18,609
15. Total wage bill of casual labor (at constant prices)	7,313	33,177	5,890	21,693	13,203	54,870
16. No. of permanent laborers	8	4	9	15	17	19

Notes: 1. Information presented refers only to those households present at both points in time.
2. Figures in parentheses indicate the average annual growth rate in percentage terms.

the farms indicates the increasing preference of rural inhabitants for nonfarm jobs. The increased farm work load was supported partly by employing hired labor and partly by mechanization. The number of permanent laborers employed by these farm households increased from seventeen to nineteen. While we do not have information regarding employment of casual laborers, this can be indirectly judged by looking at the wage bill for casual labor. Though the cultivated area remained unchanged at 850 acres, the total wage bill (in real terms) for casual labor increased from Rs.13,203 to Rs.54,870 while the wage bill for permanent laborers increased from Rs.9,417 to Rs.18,609. Increased employment of both permanent laborers and casual labor coupled with movement of family labor to nonfarm jobs indicates that family labor was partly substituted by hired labor.

VII. MIGRANT LABOR

Increased demand for labor was partially met by importing labor from labor surplus areas of east Uttar Pradesh, north Bihar, and adjacent states. No direct estimate is available for the extent of immigration of outside labor to Punjab agriculture. However, some idea of the extent of immigrant labor can be had from data collected by us in one of our recent studies. In the case of manual harvesting of paddy in Ludhiana District, out of 18.78 man-days per acre for sample households, 13.76 days were accounted for by migrant casual labor, 0.75 days by local casual labor, 1.69 days by family labor and 2.58 days by permanent hired labor [3, p. 134]. In the case of wheat harvesting, operations are more mechanized. All the farmers surveyed by us are either using mechanical threshers or harvest combines. In the case of farmers using threshers, out of 9.43 man-days, 2.22 man-days are accounted for by family labor, 1.28 days by permanent hired labor, 3.22 days by local casual labor and 2.71 days by migrant casual labor. In the case of farmers using combines, 0.15 days are accounted by family labor, 0.20 days by permanent hired labor, 0.13 days by local casual labor and 0.03 days by migrant casual labor [3, p. 124].

Migrant labor is graviating towards Punjab because of higher wages. Wage rates for harvest labor in Punjab vary from Rs.10 to Rs.14 per day while wage rates in east Uttar Pradesh and north Bihar vary from Rs.2 to Rs.2.50. Our view is that agriculture in Punjab has been able to pay higher wages because the marginal productivity of labor is higher in Punjab as compared to east Uttar Pradesh. We have tried to show this by applying the Cobb-Douglas production function for agriculture to the situations in Punjab and east Uttar Pradesh.

VIII. MARGINAL PRODUCTIVITIES OF LABOR IN PUNJAB AND EAST UTTAR PRADESH

According to traditional economic theory, labor moves from labor surplus areas to labor deficit areas, from low wage areas to high wage areas, and from areas of lower marginal productivity of labor to areas of higher marginal productivity.

TABLE III

ESTIMATED RESULTS OF PRODUCTION FUNCTIONS

	Ferozepur	Deoria
No. of farms	150	150
Year	1969/70	1968/69
Production elasticities:		
Gross cropped area	0.19	0.34***
Improved major implements (value in Rs.)	−0.01	0.17***
Family labor in hours	0.37***	0.32
Hired labor in hours	0.21***	0.04
Bullock labor in hours	−0.02	0.07**
Fertilizer (per hectare)	0.03	0.02
Irrigation charges (per hectare)	0.03	−0.13
Sum of elasticities	0.80	0.83
R^2	0.2238***	0.5276***
Marginal productivity[a]		
Family labor	2.63	0.88
Hired labor	1.54	0.97

*** Significant at 1 per cent level of significance.
** Significant at 5 per cent level of significance.
[a] Estimated at geometric mean of input levels.

We have tried to empirically verify this proposition by applying the Cobb-Douglas production function with the help of farm management survey data for Ferozepur District of Punjab and Deoria District of east Uttar Pradesh. The data used relates to the year 1969/70 in the case of Ferozepur and to 1968/69 in the case of Deoria. It would have been very interesting to apply the production function for a later period as rapid changes have taken place in Punjab agriculture in the 1970s because of the green revolution. However, no published data is available for the 1970s as the government has not yet released materials on the cost of cultivation. Labor scarcity in Punjab agriculture is much more acute now than in the 1960s, resulting in large-scale migration of labor from east Uttar Pradesh, north Bihar and other adjoining areas. Unlike in the case of Punjab, agriculture in east Uttar Pradesh remains practically untouched by the green revolution and is characterized by a large surplus population and tiny holdings. The average size of holdings in east Uttar Pradesh is 0.89 hectares as against 4 hectares in Punjab. In the period 1960/61–75/76, the compound growth rate of agricultural productivity in east Uttar Pradesh was 1.17 per cent per annum as against 0.87 per cent in 1950/51 to 1960/61. In Punjab in the period 1965/66–76/77, the growth rate of agricultural productivity was 4.70 per cent per annum. (The growth rate was 4.82 per cent for wheat and 8.9 per cent for rice.) While agricultural production per se shows a growth rate of 7.17 per cent in the case of Punjab, it was only 1.34 per cent in east Uttar Pradesh.

The results of applying the Cobb-Douglas production function with the gross value of output per acre as dependent variable, are given in Table III.

The marginal productivities of both family and hired labor are seen to be much higher in Ferozepur than in Deoria. A part of these differences in marginal productivity is, however, the result of difference in the level of technology prevailing in these two areas. Nevertheless, the differences in productivity are substantial and are reflected in movement of labor from east Uttar Pradesh to Punjab.

While the marginal productivity of family labor is higher than that of hired labor in Ferozepur, in Deoria the marginal productivity of hired labor is higher than for family labor. This may be explained by existence of disguised unemployment in Deoria.

The sum of the elasticities of the production function being less than unity in both Deoria and Ferozepur, it may be believed that decreasing returns to scale prevail in both areas, if we assume that no relevant variables have been excluded, as we do indeed believe. On the other hand, if one assumes that constant returns to scale prevail in these areas, the importance of omitted variables is indicated.

IX. POLICY IMPLICATIONS

As agricultural development continues, the demand for labor will increase. The pressure of increased demand will be felt more strongly in those regions where industrial development is proceeding simultaneously. As such development takes place wages will also rise. When costs increase and there is shortage of labor within a region, there is an obvious temptation to go in for mechanization which also incidentally satisfies the leisure preference of farmers. In such situations, policy makers in India should think in terms of selective mechanization. Keeping to the national objective of providing employment in labor surplus areas, the policy makers should also formulate positive policies for promoting the flow of labor from depressed areas of the country like east Uttar Pradesh, north Bihar, and the Chattisgarh plains. In light of the developments in Punjab agriculture, a national policy rather than a regional outlook is necessary.

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