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RESOURCE PRODUCTIVITY IN AGRICULTURE WITH SPECIAL REFERENCE TO LABOUR*

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Study of productivity of various input factors provides essential data for a more profitable utilization of our resources. More and more such studies are being undertaken in recent years as considerable data on inputs and output on cultivators' holdings have become available now from a number of farm management and farm cost surveys. One such survey is the study of cost of cultivation of cotton and rotation crops undertaken in principal cotton tracts in India between 1960 and 1963 by the Indian Council of Agricultural Research in collaboration with the Indian Central Cotton and Oilseeds Committees. Cotton is our most important commercial crop as it provides the principal raw material for our largest industry, viz., the textile industry. Its cultivation is concentrated in certain areas and the enquiry which aimed at covering these areas was confined to 20 important cotton districts (in 4 States) which between them accounted for nearly half the area under the crop in the country. Consequently, the area under cotton is as high as 40 to 50 per cent of the total cultivated area in some of the districts. As cotton is essentially a cash crop the agricultural economy of these districts is relatively more monetized in comparison to districts where food crops predominate. The present paper aims at studying principally the productivity of labour on the basis of these data. The plan of the survey and the data studied are described in the next section.

DATA STUDIED

The survey was conducted in important cotton districts of the States of Punjab, Gujarat, Maharashtra and Mysore. The conditions of cotton growing in the above four States are quite distinct and, therefore, the districts selected in each of the States can be considered to constitute distinct zones. These were as follows :

Punjab :	Ludhiana, Bhatinda, Sangrur and Hisar.
Gujarat :	Surat, Broach, Baroda, Ahmedabad, Mehsana, Sabarkantha and Junagarh.
Maharashtra :	Buldana, Akola, Amravati, Yeotmal, Jalgaon and Aurangabad.
Mysore :	Dharwar, Bijapur and Raichur.

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In each zone 40 villages were selected randomly with probability proportional to acreage under cotton and oilseeds in the latest year for which information was available. In each selected village a list of operational holdings was prepared by the field man initially for selection of holdings. The holdings were classified into three categories, large, medium and small, the class limits for the classes being determined on the basis of all holdings in the selected villages such that each category accounted for approximately one-third of the cultivated area in each zone. The limits were as follows in the different zones.

Zone	Small	Medium	Large
Punjab	less than 15 acres	15 acres to less than 30 acres	30 acres and above
Gujarat and Maharashtra	less than 13 acres	13 acres to less than 27½ acres	27½ acres and above
Mysore	less than 15 acres	15 acres to less than 35 acres	35 acres and above

Two holdings were selected from the large size-class subject to availability and three each from the other two classes, except in Maharashtra where two were selected in each class. Thus in all data were recorded for 230 holdings in Maharashtra and about 300 holdings in each of the three zones. Data for the first three zones, *i.e.*, zones other than Mysore, for the third year, *viz.*, 1962-63, have been utilized for the present investigation.

The various data relating to costs of cultivation were recorded by specially appointed field men by the cost accounting method on the basis of day-to-day observation supplemented by enquiry to the extent necessary. The field men resided in the selected villages throughout the year for this purpose. Thus data on inputs were available crop-wise and usually field-wise. Data on output were recorded at the time of harvest for each crop for each holding. These data were usually based on enquiry with the cultivators. Such data, *i.e.*, collected by enquiry, frequently suffer from bias and other defects which render them unreliable. In the present case however the field men could collect much better data on account of the fact that they were residing in the village throughout the season and had built up contacts with the selected holdings. They were in a position to watch the crops as they matured and secure data soon after harvesting as and when the fields were harvested. Consequently the output data utilized for the investigation are considered fairly reliable except possibly in the Maharashtra zone. Data for principal crops produced by the holdings have been used for the present investigation. These were wheat in the Punjab, jowar in Maharashtra and cotton in all the three zones.

INPUT AND OUTPUT DATA

Land (X_1) : Area under the particular crop in the season, *viz.*, 1962-63, constituted the land input. No allowance has been made for possible quality differences in the land input. It may be mentioned that the cotton area in each of the zones can be considered fairly homogeneous in respect of soil and other characters. In Gujarat and Maharashtra zones the soils are generally black cotton soils whereas in Punjab they are alluvial soils. The other factor which influences

the quality of land is its moisture status. In Gujarat and Maharashtra zones all the area considered in the study are unirrigated, while in Punjab the entire area is irrigated. These considerations lend support to the assumption of a fair degree of homogeneity of land in the various zones. Further it is doubtful whether a proper adjustment for such quality differences could be made on the basis of land revenue rates which is frequently taken as basis for converting land to standardised area.

Human labour (X_2) : Human labour is measured in man-hours. In calculating the man-hours the woman-hours of work were converted to man-hours by reducing them in the ratio of their respective wage rates. Usually a distinction is made between hired labour and the labour of the cultivator and his family, in calculating labour input. Conflicting views are often expressed regarding the relative efficiencies of the two kinds of labour. But no objective basis for the measure of these relative efficiencies has yet been worked out. Therefore the two kinds of labour have been treated on the same footing in the present investigation. Further the labour of both kinds has been measured by the actual hours of work put in and as such the error, if any, involved in aggregating the two kinds of labour is likely to be negligible. Investigations on this aspect are in progress at the Institute of Agricultural Research Statistics.

Further note is taken of the fact that employment of bullock labour involves normally an equal amount of human labour for driving the bullocks. Since bullock labour is taken as an independent item of input the human labour strictly associated with the bullock labour has been excluded from consideration while measuring the human labour input.

Bullock labour (X_3) : This was measured in pair-hours, and included the labour of bullocks owned by the cultivator as well as hired or those taken on exchange basis.

Working costs and depreciation (X_4) : The working costs included the money value of manures, fertilizers and irrigation water. Cost of seed was not included in this item as seed rate is more or less a constant factor characteristic of a region and as such it was considered unnecessary to include it in the study of input-output relationship. In evaluating working costs the home produced manure was evaluated at prices prevailing locally. Depreciation of assets consisted of the apportioned share of depreciation of equipment, farm structures and bullocks in rupees. The depreciation was worked out on the basis of estimated value of the assets at the time of enquiry and the expected remaining working life. The total holding-wise depreciation thus arrived at was apportioned to various crops in proportion to the areas under them.

Output (Y) : This was estimated in maunds. It referred to seed-cotton, *kapas*, in case of cotton and grain obtained after threshing and winnowing in case of wheat and jowar. As mentioned earlier these data were collected by enquiry from the selected cultivators.

ASSETS OF SELECTED HOLDINGS

In order to have a full appreciation of the productivity of labour it is useful to have background information regarding the assets of selected holdings. The average size of holding (cultivated area) and average investment in assets other

than land in rupees per holding for each region and size-class are given in Table I. The last two columns of the table show the aggregate investment per holding and per acre. Major equipment signifies costlier equipment such as chaff-cutters, pumping sets, etc., and in a few cases in Punjab, tractors. Farm structures comprise mainly cattle sheds and storage sheds.

It is seen from Table I that farm structures constitute the principal item of investment in assets other than land, and range from about 50 to 80 per cent of the total investment. Draught animals constitute the next largest item of investment in fixed assets. Investment on major equipment is usually small except in the large size-class of holdings in the Punjab zone. In this case a few holdings possessing tractors have made appreciable difference to the average investment. But for this factor the average investment per holding as well as per acre is seen to be slightly higher in the Gujarat zone in comparison to the Punjab zone. Average investment on different items as well as the total, is seen to be distinctly lower in the Maharashtra zone in comparison to the other two zones. In general the average investment per acre declines with increase in holding-size as might be expected.

INPUT-OUTPUT RELATIONSHIPS

As mentioned earlier, data were studied for wheat in Punjab, for jowar in Maharashtra and for cotton in all the three zones. The numbers of holdings for which data were available for study for the respective crops in the various zones as well as average area per holding under the crop and the average output and inputs per holding are given in Table II. The average area per holding under cotton is more or less of the same order in the Maharashtra and Gujarat zones whereas it is much less in the Punjab zone as cotton occupies only about 10 per cent of the cultivated area in this zone. Even the area under pure wheat is rather small as wheat is frequently grown as a mixture with gram in this zone.

Table III gives the output and inputs per acre. Except for the working costs and the depreciation, X_4 , the various items are given in physical terms.

The human labour inputs are seen to be higher in the Punjab zone in comparison to the other two zones as could be expected since both cotton and wheat are grown under the irrigated condition in this zone. Between Gujarat and Maharashtra zones the human labour input is seen to be a little higher in the former. In respect of bullock labour on the other hand the input is highest in the Maharashtra zone followed by Gujarat and Punjab in that order, for cotton for which such a comparison is possible.

It is also observed from Table III that the labour inputs per acre tend to decline with increase in holding-size and this tendency is more marked in the Punjab zone.

It is also observed that unlike the other two zones the proportion of family labour in the total human labour input is particularly high in this zone and it is possible that this is responsible at least partly for a more rapid decline in human labour input per acre with increase in holding-size.

TABLE 1—ASSETS OF SELECTED HOLDINGS: VALUE OF ASSETS IN RUPEES PER HOLDING

Zone	Size-class	Average size (acres)	Draught animals (Rs.)	Carts (Rs.)	Major equipments (Rs.)	Minor equipments (Rs.)	Farm structures (Rs.)	Total (Rs.)	Fixed capital (Rs./acre)
Punjab	Small	..	766(24)	230(7)	224(7)	181(6)	1,804(56)	3,205(100)	311
	Medium	..	1,182(28)	269(6)	418(10)	273(6)	2,104(50)	4,246(100)	206
	Large	..	1,829(19)	465(5)	2,111(22)	379(4)	4,605(50)	9,389(100)	227
	Average	..	1,259(24)	321(6)	918(13)	278(5)	2,838(52)	5,613(100)	248
Maharashtra	Small	..	265(13)	74(4)	2(0.1)	82(4)	1,585(79)	2,008(100)	240
	Medium	..	565(27)	177(8)	7(0.3)	158(8)	1,197(57)	2,104(100)	116
	Large	..	1,400(29)	310(6)	413(8)	327(7)	2,398(50)	4,848(100)	95
	Average	..	743(23)	187(6)	141(3)	189(6)	1,726(62)	2,986(100)	150
Gujarat	Small	..	766(20)	230(6)	87(2)	196(5)	2,490(67)	3,769(100)	521
	Medium	..	906(19)	396(8)	408(8)	249(5)	2,854(60)	4,813(100)	281
	Large	..	1,414(24)	519(9)	490(8)	320(6)	3,036(53)	5,779(100)	181
	Average	..	1,029(21)	382(8)	328(6)	255(5)	2,793(60)	4,787(100)	328

Note : The averages are simple averages over the three size-groups.
The figures in brackets are percentages of total investment.

TABLE II—OUTPUT AND INPUTS PER HOLDING FOR VARIOUS CROPS

State	Size-class	No. of holdings	Out-put (md.)	Inputs					Work- ing costs (Rs.)
				Land (acres)	Human labour			Bul- lock labour (pair-hours)	
					Hired (man-hours)	Family (man-hours)	Total labour (man-hours)		
Crop: Cotton									
Punjab	Small	74	11.11	1.47	63	240	303	49	152.17
	Medium	100	16.56	2.42	109	312	421	76	190.18
	Large	38	30.86	4.05	235	359	594	82	325.37
Maharashtra	Small	32	13.97	4.67	368	137	505	222	78.01
	Medium	39	22.61	9.33	825	148	973	394	224.34
	Large	56	53.29	23.20	1,880	170	2,050	921	674.23
Gujarat	Small	70	23.61	4.21	364	212	576	151	282.50
	Medium	75	47.09	8.04	883	253	1,136	287	289.37
	Large	44	90.09	16.35	1,938	423	2,361	460	470.24
Crop: Wheat									
Punjab	Small	70	36.12	2.38	53	282	335	213	215.92
	Medium	90	68.48	4.59	151	435	586	342	376.41
	Large	37	116.71	7.44	352	501	853	444	630.88
Crop: Jowar									
Maharashtra	Small	30	23.95	4.89	447	106	553	229	108.09
	Medium	34	36.86	6.88	479	106	585	297	132.81
	Large	52	79.64	14.70	1,114	149	1,263	660	354.74

Working costs which broadly reflect the capital investment in the various zones are seen to be highest in the Punjab zone followed by Gujarat and Maharashtra zones in that order. This is also the order of human labour inputs and output of cotton in the three zones.

Last three columns of Table III show the average output per acre estimated from the output data of the selected holdings, the average yield of the crop for the State during the year and the average for the quinquennium ending 1962-63. It

is observed from the figures that the averages of output for the selected districts covered by the enquiry agree reasonably well with the State averages which is to be expected since the selected districts covered principal producing areas with respect to the crops studied. The crop coverage was comparatively lower in the Punjab zone and the rather large difference between the estimates of cotton output for the State and for the districts selected for the enquiry might be due to this cause. It is also noted from the comparison of State averages for the year 1962-63 and for the quinquennium ending with that year that the season was normal for the crops studied in the Punjab and Maharashtra zones, whereas it was particularly favourable to the cotton crop in the Gujarat zone. This has to be borne in mind in interpreting the results.

TABLE III—OUTPUT AND INPUTS PER ACRE FOR VARIOUS CROPS

State	Size-class	Inputs per Acre					Output per Acre		
		Human labour			Bullock labour (pair-hours)	Working costs (Rs.)	Enquiry data (md.)	State average for 1962-63 (md.)	State average for quinquennium ending 1962-63 (md.)
		Hired (man-hours)	Family (man-hours)	Total (man-hours)					
Crop : Cotton									
Punjab	Small	43	163	206	33	103.52	7.56	9.10	8.38
	Medium	45	129	174	31	78.58	6.84		
	Large	58	89	147	20	80.33	7.62		
Maharashtra	Small	79	29	108	48	16.70	2.99	2.68	2.56
	Medium	88	16	104	42	24.05	2.42		
	Large	81	7	88	40	29.06	2.30		
Gujarat	Small	86	50	136	36	67.09	5.61	5.29	4.26
	Medium	110	31	141	36	35.99	5.86		
	Large	119	26	145	28	28.76	5.51		
Crop : Wheat									
Punjab	Small	22	118	140	90	90.73	15.18	14.64	12.74
	Medium	33	95	128	75	82.02	14.92		
	Large	47	67	114	60	84.79	15.69		
Crop : Jowar									
Maharashtra	Small	91	22	113	47	22.10	4.90	5.74	5.89
	Medium	70	15	85	43	19.30	5.36		
	Large	76	10	86	45	24.12	5.42		

RESOURCE RATIOS AND GROSS PRODUCTIVITY OF FACTORS

The mean value of output per man-hour employed at the farm harvest price prevailing during the season are given in Table IV for the different size-classes and regions. Similar ratios for output per unit investment as well as the ratios of investment and land to labour are also given in the same table. The ratios are based on respective arithmetic averages.

TABLE IV—RESOURCE RATIOS AND PRODUCTIVITY OF FACTORS

State	Size-class		Output	Investment	Output	Land/Labour cents/man- hour
			Labour Rs./ man- hour	Labour Rs./ man- hour	Investment Rs./Re.	
Crop : Cotton						
Punjab	Small	..	1.10	0.50	2.18	0.485
	Medium	..	1.18	0.45	2.60	0.575
	Large	..	1.55	0.55	2.84	0.682
Maharashtra	Small	..	1.18	0.15	7.60	0.925
	Medium	..	0.99	0.23	4.27	0.959
	Large	..	1.11	0.33	3.36	1.132
Gujarat	Small	..	1.80	0.49	3.65	0.731
	Medium	..	1.81	0.26	7.11	0.708
	Large	..	1.66	0.20	8.37	0.693
Crop : Wheat						
Punjab	Small	..	1.73	0.65	2.67	0.710
	Medium	..	1.86	0.64	2.90	0.783
	Large	..	2.20	0.74	2.96	0.872
Crop : Jowar						
Maharashtra	Small	..	0.65	0.20	3.35	0.884
	Medium	..	0.95	0.23	4.19	1.176
	Large	..	0.95	0.28	3.39	1.164

Output per man-hour for cotton is highest in Gujarat and least in Maharashtra where the associated investment per man-hour is also least. In Punjab there is an increase in labour productivity with increase in the size of farm while in Gujarat the labour productivity is less in the large farms. It will be observed that land to labour ratio is relatively small in the small size farms in the Punjab zone while it is not so in Gujarat. It is also to be observed that investment per man-hour employed decreases rapidly with increase in farm-size in Gujarat region unlike in Punjab. This probably explains the differences in labour productivity observed between the different size-classes in the two regions.

In Punjab for wheat the same trend of increasing labour productivity with larger size is observed : In this case investment per man-hour is also seen to increase noticeably in the large size-group.

COMPONENTS OF COST OF CULTIVATION

The importance of labour input in crop production in the regions can be seen from Table V, which gives the labour cost, the other cost involved in cultivation as well as the total prime cost in monetary terms. By prime cost is meant the cost of labour and materials involved in cultivation including the depreciation and repairs of implements. In working out these costs the money value of family labour was arrived at on the basis of prevailing wage rates for casual labour and the cost of bullock labour was arrived at on the basis of cost of maintenance, the feeds and labour involved being evaluated at rates prevailing locally. The total cost of bullock labour thus arrived at was apportioned to various crops in proportion to the hours of work put in each. The labour costs have been expressed as percentages of the prime cost and it may be seen from the table that human and bullock labour costs together account for nearly 70 to 85 per cent of the prime cost in various crops, regions, and size-classes. There does not seem to be any striking difference in this proportion either between different regions or between different size-groups. The bullock labour cost is seen to be quite as important as the human labour cost though the higher proportion accounted for by this input item in Gujarat is due largely to the higher prices of cattle feeds and under-utilization of bullock pairs during the year.

PRODUCTION FUNCTIONS AND MARGINAL PRODUCTS

In order to work out marginal products it is necessary to fit suitable production functions to the holding-wise data. Cobb-Douglas type of functions were fitted for this purpose. The results are given in Table VI. The table gives the elasticities of various input factors, their standard errors, the sum of elasticities, the coefficient of determination, R^2 and the multiple correlation coefficient, R .

It is seen from Table VI that the input variables together show good relationship with the output, the coefficient of determination ranging broadly from 70 to 90 per cent in the various size-classes in Punjab and Gujarat zones. The sum of coefficients is usually close to one indicating near constant returns to scale except in the Maharashtra zone where the Cobb-Douglas production function did not give a satisfactory fit. Even in this zone the sum of coefficient is close to one for large size-class.

From Table VI it is seen that for cotton crop the elasticities are significant for both land and labour in Punjab and Gujarat zones except for human labour in small size farms in Gujarat. In Maharashtra however, the standard errors are very large and with one exception the coefficients for land and labour are non-significant. Comparing Punjab region with Gujarat it is seen that the elasticities for both land and human labour are generally larger in Punjab. There are no significant differences in the elasticities in different size-groups, although in both Punjab and Gujarat there is an indication of larger elasticities with increase in farm-size indicating thereby the relative advantage of increasing labour input

TABLE V—COST OF CULTIVATION PER ACRE (PRIME COST)

(Inputs in rupees per acre)

State	Size-class	Human labour	Bullock labour	Total labour cost	Other costs	Prime cost
Crop : Cotton						
Punjab (<i>Desi</i>)	Small	.. 75.4(52.5)	40.6(28.2)	116.0(80.7)	28.0(19.4)	143.7
	Medium	.. 60.2(51.2)	32.8(27.9)	93.0(79.1)	24.4(20.8)	117.5
	Large	.. 58.8(54.5)	22.8(21.2)	81.6(75.7)	26.3(24.4)	107.8
Maharashtra	Small	.. 28.0(36.8)	30.9(40.7)	58.9(77.5)	16.9(22.5)	76.0
	Medium	.. 24.5(39.5)	23.6(38.0)	48.1(77.5)	14.1(22.6)	62.1
	Large	.. 23.2(39.1)	22.1(37.3)	45.3(76.4)	14.0(23.6)	59.3
Gujarat	Small	.. 30.5(20.5)	83.1(56.0)	113.6(76.5)	34.9(23.5)	148.5
	Medium	.. 33.8(31.0)	49.6(45.4)	83.4(76.4)	25.8(23.6)	109.2
	Large	.. 29.5(34.8)	31.2(36.8)	60.7(71.6)	24.0(28.3)	84.7
Crop : Wheat						
Punjab	Small	.. 84.8(36.6)	106.5(46.0)	191.3(82.6)	40.3(17.4)	231.7
	Medium	.. 65.1(35.9)	80.3(44.3)	145.4(80.2)	36.0(19.8)	181.4
	Large	.. 48.6(33.7)	49.3(34.2)	97.9(67.9)	46.5(32.1)	144.3
Crop : Jowar						
Maharashtra	Small	.. 24.7(37.6)	30.0(45.7)	54.7(83.3)	10.9(16.6)	65.7
	Medium	.. 22.6(44.8)	22.0(43.7)	44.6(88.5)	5.9(11.6)	50.4
	Large	.. 22.1(39.7)	25.4(45.6)	47.5(85.3)	8.2(14.7)	55.7

Note : Figures in brackets indicate percentage of prime cost.

TABLE VI—PRODUCTION FUNCTION—COEFFICIENTS OF FACTORS

State	Size-class	Factor : (acres)	Working cost				R ²	R	
			Human labour (man-hours)	Bullock labour (pair-hours)	and depreciation (Rs.)	Σb_i			
			X ₁	X ₂	X ₃	X ₄			
Crop : Cotton Punjab	Small	..	0.5452** (0.1349)	0.4665* (0.1118)	-0.1375 (0.0924)	0.0449 (0.0698)	0.9191	0.799	0.89
	Medium	..	0.6397** (0.1020)	0.4095** (0.0918)	-0.1160 (0.0696)	-0.0341 (0.0769)	0.8991	0.777	0.88
	Large	..	0.7176** (0.1834)	0.5770** (0.1792)	-0.2432 (0.1357)	0.0153 (0.1202)	1.0667*	0.915	0.96
Maharashtra	Small	..	0.2020 (0.4661)	0.4337 (0.2624)	-0.2019 (0.3346)	0.0121 (0.1062)	0.4459	0.240	0.49
	Medium	..	0.3384 (0.3535)	0.5440* (0.2200)	-0.0674 (0.3316)	0.0821 (0.0985)	0.8971	0.486	0.70
	Large	..	0.3558 (0.2668)	0.2797 (0.1962)	-0.0104 (0.2120)	0.3602** (0.1133)	0.9853	0.586	0.77
Gujarat	Small	..	0.5350** (0.0953)	0.0767 (0.1334)	0.4013** (0.1363)	0.0319 (0.0621)	1.0449	0.752	0.87
	Medium	..	0.5064** (0.1179)	0.2702* (0.1012)	0.1419 (0.1394)	0.0504 (0.0590)	0.9689	0.749	0.86
	Large	..	0.5104* (0.1918)	0.3324* (0.1514)	0.2610 (0.1545)	-0.0140 (0.1521)	1.0898	0.833	0.91
Crop : Wheat Punjab	Small	..	0.7050** (0.1080)	0.1504 (0.1083)	0.1284 (0.1143)	-0.0292 (0.0816)	0.9546	0.808	0.90
	Medium	..	0.7142** (0.1145)	0.3613** (0.1196)	-0.1678 (0.0860)	-0.0200 (0.0770)	0.8877	0.732	0.86
	Large	..	0.5387** (0.1163)	0.4677** (0.1613)	0.0167 (0.0771)	-0.0809 (0.0824)	0.9422	0.900	0.95
Crop : Jowar Maharashtra	Small	..	0.7854** (0.2744)	-0.1803 (0.2640)	-0.0686 (0.2669)	0.0507 (0.0833)	0.5872	0.382	0.62
	Medium	..	-0.7373 (0.3667)	0.5579** (0.2260)	0.0159 (0.1995)	0.3806** (0.0983)	0.2171	0.496	0.70
	Large	..	0.5093 (0.1992)	0.1175 (0.1844)	0.0254 (0.1938)	0.0888 (0.1194)	0.9210	0.661	0.81

Note: Figures in brackets denote standard errors.

*Significant at 5%.

**Significant at 1%.

in larger farms. In Punjab even for land there is an indication of increase in the elasticity with farm-size which is not in accordance with usual expectation. However, as already mentioned the differences are not statistically significant.

The small and non-significant coefficients for bullock labour except in the small size farms in Gujarat indicate that bullock labour is used beyond the optimum. It is interesting to observe that even for the investment factors studied here (X_4) the elasticity is small and non-significant contrary to expectation. Depreciation and bullocks constituted a major component of the investment included in this item. There was very little outlay on productive factors like fertilizers and plant protection measures. This might account for the low elasticity of this factor. This therefore, indicates not the need for a reduction in investment, but for a change in the pattern of investment to more productive factors. Generally the results for wheat in Punjab are similar to those for cotton except for the fact that in small farms the coefficient for labour is rather small and non-significant. This indicates comparatively higher intensity of labour use for wheat-growing compared to cotton in small farms. It may be mentioned in this connection that in these districts wheat is relatively much more important than cotton which might account for the higher intensity of labour input, particularly family labour.

MARGINAL PRODUCTIVITY OF LABOUR

An important objective of the present investigation was to work out the marginal productivities of human labour in different regions, holding-sizes, etc. This

TABLE VII—MARGINAL PRODUCT OF HUMAN LABOUR

State	Size-class		Marginal product Rs./man-day@	S.E. of Marginal product Rs./man-day	Wage Rs./man-day
Crop : Cotton					
Punjab (<i>Desi</i>)	Small	..	4.09**	0.98	2.56
	Medium	..	3.85**	0.86	
	Large	..	7.18**	2.23	
Maharashtra	Small	..	4.08	2.47	1.37
	Medium	..	4.28*	1.74	
	Large	..	2.48	1.73	
Gujarat	Small	..	1.08*	1.91	1.40
	Medium	..	3.91	1.46	
	Large	..	4.44*	2.02	
Crop : Wheat					
Punjab	Small	..	2.07	1.49	2.82
	Medium	..	5.39**	1.78	
	Large	..	8.17**	2.64	
Crop : Jowar					
Maharashtra	Small	..	-0.94	1.38	1.40
	Medium	..	4.24**	1.72	
	Large	..	0.89	1.40	

@Man-day = 8 hours.

* Significant at 5%.

** Significant at 1%.

has been done on the basis of elasticities worked out. The marginal productivities of human labour cost in rupees per man-day (8 hours) at the arithmetic mean level of other input factors are shown in Table VII, along with their standard errors. It is observed from the table that marginal products are positive and significant in most cases. In Punjab and Gujarat zones particularly all the values are significant except in small size holdings for cotton in Gujarat and wheat in Punjab. Both in Punjab and Gujarat, the marginal products of labour are highest in the large size-class of holdings indicating thereby the relative advantage of more labour input in larger farms.

It is interesting to compare the marginal productivities with the wage rates of human labour prevailing in the different regions. These are also shown in Table VII. Except for small farms in Gujarat, the marginal value of labour input for cotton is higher than the wages paid to labour in both Punjab and Gujarat zones, particularly in large size farms where the marginal value is more than double the wage rate. The same is true also of wheat crop in Punjab. The wage rate is higher in Punjab by nearly 80 per cent compared to that prevailing in Gujarat zone. Comparison of the marginal values of labour clearly shows that the differential wage rate is in accordance with the marginal productivity of labour in the two regions.