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ARTICLES

Agricultural Incomes of Cultivators and Agricultural Labourers by Crop Regions and by States: Analysis Based on Cost of Cultivation Data

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INTRODUCTION

The purpose of the paper is to compute agricultural incomes of farmers and develop an explanation of their variation, by region, crop and claimant category. The data used are drawn from the Cost of Cultivation (COC) surveys for the period of the eighties. Details on the data are given in the Appendix. Conclusions are drawn for the agricultural sector alone, since the COC surveys have no information on other rural activities. The aim here is not to measure poverty *per se* but to assess it in the light of the farm incomes and their distribution. In this regard, this exercise is perhaps the first attempt at estimating earners' shares in Indian agriculture.¹

In the context of the poverty debate, it would help to judge whether an entirely different approach and data base support the extant hypotheses on this subject. Being essentially cross-sectional, this analysis may not reflect upon structural changes in the economy and their impact on the levels of living, but regional/crop disaggregations are expected to provide insights that are, at best, conjectural in aggregate time-series.

The Approach

There are several claimants of incomes from agriculture in peasant societies. Some typical ones are: the pure cultivators, pure hired labourers, share-croppers, rentiers, moneylenders and the like. The Indian statistical system, however, defines only two main categories, those who receive incomes from land, entrepreneurship and capital (cultivators), and those who get compensation for their labour (agricultural labourers).² Accordingly, the incomes of cultivators are calculated by deducting all paid out costs from the received value of production. They include the imputed value of owned labour, rent on owned land and interest on owned capital equipment. The incomes of labourers are the wages and equivalents actually paid out in cash, kind or any form of output sharing arrangement.³

There are three types of computations made: (i) per worker earnings by crop, (ii) per worker earnings by crop and state and (iii) earners' share. A disaggregation of workers by the two categories is maintained at each level so as to reflect upon the distribution of income.

REGIONAL AND INTER-CROP VARIATIONS

Inter-Crop Comparisons

An attempt is made here to compare the inter-crop differences in per worker incomes

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earned and the earners' shares at the all-India level. The data on mean values of incomes (per day) received by the two categories of workers from 14 major crops are presented in Table I. These are computed at 1980-81 prices and averaged over 1980-81 to 1987-88. The aggregate picture painted by these data suggests rather modest incomes from each crop other than sugarcane. The incomes are low not only from an inter-industry comparative perspective, they are low in absolute amounts as well. This is true of the incomes of cultivators and agricultural labourers alike.

TABLE I. MEAN VALUES OF INCOMES EARNED BY CULTIVATORS AND AGRICULTURAL LABOURERS (1980-81-1987-88), PER PERSON PER DAY BY CROP, ALL-INDIA
(1980-81 prices) (mean earnings in Rs.)

| Crop (1) | Cultivators' earnings per day | | Hired labour earnings per day | |
|--------------------|-------------------------------|---------------------------------|-------------------------------|---------------------------------|
| | Mean (2) | Coefficient of variation (3) | Mean (4) | Coefficient of variation (5) |
| Paddy | 43.49 | 57.35 | 6.07 | 28.37 |
| Wheat | 55.73 | 42.53 | 7.48 | 29.01 |
| Sorghum | 24.13 | 36.80 | 4.83 | 11.80 |
| Maize | 20.92 | 27.72 | 5.09 | 21.41 |
| Bajra | 21.87 | 35.94 | 6.64 | 17.67 |
| Cotton | 49.35 | 113.15 | 6.07 | 33.11 |
| Sugarcane | 155.43 | 90.97 | 6.88 | 19.91 |
| Jute | 20.25 | 65.14 | 5.00 | 0.19 |
| Moong (green gram) | 22.54 | 47.12 | 4.57 | 22.10 |
| Tur (red gram) | 38.97 | 55.22 | 5.93 | 32.21 |
| Urad (black gram) | 45.96 | 102.22 | 5.48 | 22.63 |
| Gram | 46.76 | 42.37 | 8.00 | 54.13 |
| Groundnut | 42.26 | 31.59 | 5.39 | 22.82 |
| Mustard | 52.88 | 59.80 | 7.09 | 22.14 |

The cultivators receive relatively high incomes from paddy and wheat, in the range of Rs. 40 to Rs. 60 per worker. In contrast, coarse cereals - sorghum, maize and bajra - yield less than Rs. 25 per cultivator per day. The cultivators' incomes from cash crops, except jute, are uniformly high; sugarcane tops the list with over Rs. 150 realised income. Cotton shows figures comparable to those of paddy and wheat. Pulses, other than *moong*, present a uniformly medium figure, while among oilseeds, mustard shows a relatively high figure compared to groundnut. These figures coincide with the usual taxonomy which classifies some crops as high quality ones, namely, wheat, paddy and some cash crops, and, of late, some pulses; and others as low quality ones.

The reasons for the inter-crop variations in absolute incomes originate in the prices paid to different crops including the state administered prices and the natural productivity of a crop. The government introduced a system of supporting prices of agricultural commodities in the mid-sixties, which has gained strength over time. Input price subsidies were also introduced through the seventies and the eighties which increased the productivity of some crops without raising the costs proportionately (Mruthyunjaya and Kumar, 1989). Rich farmers' lobbies have emerged which exert pressure on the government to continue with these supports. Crops which do not command high prices due to low demand and/or have low market surplus are unable to use the subsidies and supports and hence yield low incomes.

Column (3) in Table I presents the coefficient of variation of cultivators' incomes across different cross-sections. In as many as seven out of the 14 crops the variation is high (greater than 50 per cent) suggesting that the same crop yields quite dissimilar results in different

areas. But the inter-crop variation is greater than intra-crop variation.⁴ High value/high price crops, mostly grown under well endowed conditions, reap rich harvests. In contrast, the low value crops are usually grown in poor quality soils under scanty rainfed conditions and provide low incomes. Unlike the former crops, the latter ones neither have very many modern variety seeds available to them nor are they supported by prices and subsidies. Many cultivators are poor because they are unable to sow certain crops and crop combinations.⁵

The per person (daily) income derived by agricultural labourers in different crops is a fraction of the corresponding income of the cultivators. In no crop does this exceed Rs. 10 per day. These income levels classify all agricultural labourers as uniformly poor. A crop-specific classification shows that, as earlier, paddy and cash crops (other than jute) yield a relatively high income of Rs. 6 or above per day (1980-81 prices), and other cereals (except bajra), pulses (except gram) and groundnut, yield low incomes of Rs. 5 or less per day. In general, the *rabi* crops pay more since they are grown under better endowment conditions compared to those of *kharif*. Thus there is difference even between different pulses [gram (*rabi*) versus others] and oilseeds [mustard (*rabi*) versus groundnut].

The values of coefficients of variations are low in the labourers' incomes except in gram. This indicates that inter-crop variation in these incomes across states is not very high. The wage rates appear to be crop-specific, implying that the techno-economics of crops appear no less important than regional labour markets.

The differences in wage rates across crops point towards a possibility of seasonal concentration in the demand for labour in some crops, but there appears to be some variation originating from an 'income sharing' mechanism as well, i.e., lucrative crops pay more to labourers.

Next, the share of the cultivators and agricultural labourers in the total disposable income is discussed. The data on their absolute incomes, presented in Table II, show a somewhat similar pattern to the one observed in Table I, with minor differences possibly owing to the labour intensity, since the labour intensity and the composition of labour are different in different crops, and these aspects show up in the earners' share figures. A typical example is wheat in which mechanisation has reduced labour use. Since mustard is often inter-cropped with wheat, the pattern of distribution is similar there.

The large gap between the shares of incomes received by the wage earners and cultivators calls for some discussion. The proportion of labour days contributed by the agricultural labourers to total labour days deployed in a crop and the proportion of total income earned by them to the total disposable income (i.e., earners' share) are computed in Table III. There is a notable difference in the absolute magnitudes, and there is a strong correlation (of value 0.84) between the two vectors. It is thus evident that given a 'part externally' determined wage rate, the length of time for which work is available determines the hired workers' income share. High hired labour using crops (in the range 50 to 60 per cent) - paddy, sorghum, cotton, jute, *urad* and groundnut - pay 15 to 25 per cent of the total earnings to labourers. Conversely, low hired labour using crops (in the range 20 to 25 per cent) - maize, gram and mustard - pay less than 10 per cent of the total earnings to them. Bajra and *tur* lie somewhere in between. Three crops, wheat, sugarcane and *moong*, show a somewhat different pattern: the former two pay less than the proportion of wage labour they hire and the latter pays more, when compared to the above laid down typology. An upper ceiling on wage rates in the former case and a lower ceiling in the latter could be the possible causes.

TABLE II. MEAN VALUES OF INCOMES EARNED BY CULTIVATORS
AND AGRICULTURAL LABOURERS (1980-81-1987-88),
PER HECTARE BY CROP, ALL-INDIA
(1980-81 prices) (mean earnings in Rs.)

| Crop (1) | Cultivators' earnings per hectare | | Wage earnings per hectare | |
|-------------|-----------------------------------|------------------------------------|---------------------------|------------------------------------|
| | Mean (2) | Coefficient of variation (3) | Mean (4) | Coefficient of variation (5) |
| Paddy | 1,908.45 | 45.23 | 463.70 | 53.72 |
| Wheat | 2,089.45 | 31.55 | 193.76 | 48.30 |
| Sorghum | 727.79 | 31.34 | 161.64 | 29.76 |
| Maize | 1,376.98 | 42.19 | 106.94 | 68.49 |
| Bajra | 960.46 | 42.88 | 153.48 | 62.44 |
| Cotton | 1,913.00 | 63.29 | 401.07 | 51.71 |
| Sugarcane | 7,484.87 | 38.32 | 1,074.06 | 79.88 |
| Jute | 1,718.60 | 49.70 | 525.26 | 33.30 |
| Moong | 573.47 | 29.32 | 106.60 | 53.12 |
| Tur | 1,801.90 | 79.99 | 166.26 | 29.06 |
| Urad | 878.55 | 44.12 | 170.66 | 51.83 |
| Gram | 1,392.60 | 38.58 | 80.31 | 51.11 |
| Groundnut | 1,453.69 | 31.23 | 311.75 | 31.92 |
| Mustard | 2,193.43 | 42.43 | 94.39 | 35.71 |

TABLE III. SHARE OF WAGE LABOUR TO TOTAL LABOUR AND WAGE EARNINGS TO
TOTAL EARNINGS BY CROP (1980-81-1987-88), PER HECTARE, ALL-INDIA
(per cent)

| Crop (1) | Share of wage labour (2) | Share of wage earnings (3) |
|-------------|-----------------------------|-------------------------------|
| Paddy | 57.88 | 19.55 |
| Wheat | 38.81 | 8.49 |
| Sorghum | 60.45 | 18.17 |
| Maize | 24.35 | 7.21 |
| Bajra | 34.20 | 13.78 |
| Cotton | 57.60 | 17.33 |
| Sugarcane | 57.02 | 12.55 |
| Jute | 53.74 | 23.41 |
| Moong | 43.88 | 15.67 |
| Tur | 39.70 | 8.45 |
| Urad | 51.43 | 16.27 |
| Gram | 25.01 | 5.45 |
| Groundnut | 61.06 | 17.66 |
| Mustard | 24.30 | 4.13 |

There are three major inferences permissible from Tables I, II and III. First, returns to land - rent, profit, etc., - are far higher compared to returns to labour. As Sundaram and Tendulkar (1988) have stated, there is little case for seeking human endowments other than pure physical labour in rural India. Second, the share of labourers' income is influenced by the extent of labour intensity as well as an existing income sharing mechanism, both of which are somewhat unique to each crop. Lastly, the genesis of poverty could be traced to the low returns, low wages, varying labour intensity and composition of the workforce.

Inter-Regional Variation

Next we analyse crop-specific regional differences as well as all crop regional differences. The data on the cultivators' daily earnings and (daily) wage rates of labourers are given by crop and state in Table IV.

TABLE IV. MEAN VALUES OF INCOMES EARNED BY CULTIVATORS AND AGRICULTURAL LABOURERS (1980-81-1987-88), PER PERSON PER DAY BY CROP AND STATE

| Crop/State (1) | (1980-81 prices) (Rs.) | |
|-------------------|--------------------------------------|------------------------------|
| | Cultivators' earnings per day (2) | Wage earnings per day (3) |
| Paddy | | |
| Andhra Pradesh | 57.70 | 5.63 |
| Assam | 18.42 | 6.40 |
| Bihar | 28.66 | 4.66 |
| Haryana | 70.89 | 9.54 |
| Karnataka | 66.91 | 6.40 |
| Madhya Pradesh | 33.30 | 4.81 |
| Orissa | 21.76 | 3.96 |
| Punjab | 74.19 | 9.24 |
| Tamil Nadu | 102.85 | 6.62 |
| Uttar Pradesh | 24.11 | 6.01 |
| West Bengal | 25.47 | 5.42 |
| Wheat | | |
| Bihar | 51.30 | 4.25 |
| Haryana | 63.16 | 9.89 |
| Himachal Pradesh | 26.56 | 5.80 |
| Madhya Pradesh | 49.76 | 5.23 |
| Punjab | 94.02 | 9.83 |
| Rajasthan | 42.40 | 7.38 |
| Uttar Pradesh | 40.06 | 7.00 |
| Sorghum | | |
| Andhra Pradesh | 15.87 | 4.49 |
| Gujarat | 31.09 | 5.58 |
| Karnataka | 35.12 | 4.93 |
| Madhya Pradesh | 20.03 | 4.67 |
| Maharashtra | 18.18 | 4.59 |
| Maize | | |
| Bihar | 27.10 | 4.22 |
| Himachal Pradesh | 18.99 | 5.53 |
| Madhya Pradesh | 17.28 | 4.63 |
| Rajasthan | 21.52 | 6.15 |
| Bajra | | |
| Gujarat | 26.97 | 5.83 |
| Haryana | 20.13 | 7.56 |
| Maharashtra | 2.93 | 4.63 |
| Rajasthan | 25.57 | 6.31 |
| Uttar Pradesh | 24.80 | 7.10 |
| Cotton | | |
| Gujarat | 33.83 | 5.91 |
| Karnataka | 133.42 | 6.47 |
| Madhya Pradesh | 40.18 | 4.22 |
| Maharashtra | 15.24 | 4.15 |
| Punjab | 35.32 | 8.61 |
| Sugarcane | | |
| Andhra Pradesh | 275.46 | 6.48 |
| Bihar | 141.30 | 4.35 |
| Haryana | 60.42 | 8.40 |
| Karnataka | 241.37 | 6.80 |
| Maharashtra | 69.28 | 6.70 |
| Tamil Nadu | 311.82 | 6.88 |
| Uttar Pradesh | 56.47 | 7.02 |

(Contd.)

TABLE IV (Concl.)

| Crop/State (1) | Cultivators' earnings per day (2) | Wage earnings per day (3) |
|-------------------|--------------------------------------|------------------------------|
| <i>Jute</i> | | |
| Assam | 10.90 | 5.79 |
| Bihar | 35.61 | 4.20 |
| Orissa | 16.86 | 4.36 |
| West Bengal | 21.91 | 5.25 |
| <i>Moong</i> | | |
| Andhra Pradesh | 29.33 | 4.52 |
| Madhya Pradesh | 24.66 | 4.70 |
| Maharashtra | 12.97 | 4.48 |
| Orissa | 23.53 | 3.77 |
| Rajasthan | 13.67 | 6.04 |
| <i>Tur</i> | | |
| Karnataka | 45.07 | 5.19 |
| Madhya Pradesh | 31.66 | 6.99 |
| Maharashtra | 7.75 | 4.29 |
| Uttar Pradesh | 60.99 | 6.68 |
| <i>Urad</i> | | |
| Andhra Pradesh | 100.39 | 5.80 |
| Madhya Pradesh | 22.21 | 4.79 |
| Maharashtra | 4.81 | 5.05 |
| Orissa | 37.69 | 3.98 |
| Tamil Nadu | 103.20 | 6.81 |
| Uttar Pradesh | 23.91 | 7.17 |
| West Bengal | 21.23 | 4.41 |
| <i>Gram</i> | | |
| Haryana | 56.15 | 11.98 |
| Madhya Pradesh | 40.49 | 5.24 |
| Rajasthan | 52.71 | 7.39 |
| Uttar Pradesh | 35.82 | 6.73 |
| <i>Groundnut</i> | | |
| Andhra Pradesh | 35.86 | 4.99 |
| Gujarat | 39.23 | 7.13 |
| Karnataka | 51.25 | 5.15 |
| Madhya Pradesh | 42.78 | 3.89 |
| Orissa | 25.57 | 3.95 |
| Tamil Nadu | 56.22 | 5.20 |
| <i>Mustard</i> | | |
| Assam | 14.63 | 5.54 |
| Haryana | 91.63 | 8.87 |
| Punjab | 77.66 | 7.99 |
| Rajasthan | 59.08 | 7.92 |
| Uttar Pradesh | 56.60 | 6.51 |

The cultivators' incomes from paddy, a crop mostly grown in the zones of abundant water supply, vary according to the extent of controlled water availability and adoption of modern variety seeds and fertilisers.⁶ Their earnings are thus medium to high in Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu where there exist systems of irrigation of the canal/well type, and low in Assam, Bihar, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal, which are mostly rainfed.

Wage earnings in paddy, to some extent, follow a similar pattern: the labourers in Haryana, Punjab and Tamil Nadu, are able to fetch a higher wage income, though not necessarily in the same order as the cultivators' incomes. However, Assam, Karnataka and Uttar Pradesh too fetch a relatively high wage. There are two intervening variables which could be discussed here to explain the regional variations in wage incomes. The first is the

dissimilar labour intensity originating from the varying land distribution and labour substitution.⁷ Accordingly, the employment and its composition - between hired and family workers - are dictated: and keeping in view the fact that in most crops the demand for labour is highly time-specific, wages are accordingly fixed. The second is the dynamics of wage determination. Wage rates could vary regionally and seasonally for a variety of reasons relating to the demographic conditions, peak time demands, labour contracts, demands emerging from the non-agricultural sectors, migration, etc., which are beyond the scope of the discussion here (see Acharya and Papanek, 1989).

Wheat shows a much lesser variation in the incomes of both cultivators and labourers compared to paddy if one does not count Himachal Pradesh, a hilly state. Being a *rabi* crop, it is mostly grown in canal/well irrigated areas and hence yields uniform returns. The incomes of labourers are low (except in Haryana and Punjab) though they vary somewhat across states. The main reason is the crop itself which is low labour using, a point mentioned earlier too. In Haryana and Punjab the labour markets, being tight, keep the wages high.

The coarse grains - sorghum, maize and bajra - yield uniformly low earnings to both the cultivators and agricultural labourers, other than high wages in Rajasthan and Haryana. A comparison of the inter-state figures shows that the cultivators' incomes vary greatly between as well as within crops. In the labourers' incomes the variation is low in sorghum but high in maize and bajra. Considering the fact that these crops are grown in semi-arid zones under rainfed conditions almost everywhere, the main causes behind the observed variations could be the crop yields that tend to vary extensively owing to irregular monsoons and climatic uncertainties, and local price variations at the state/sub-state level since these crops mainly lie outside the framework of price protections.

Cash crops too show high inter-regional variation in the incomes of both the categories of workers. The earnings of cotton cultivators are very high in Karnataka, moderate in Gujarat, Madhya Pradesh and Punjab and low in Maharashtra. The ranking of the labourers' earnings is somewhat similar, though the extent of difference is not the same, perhaps due to the locally prevalent market conditions. The main reason for variability in earnings appears to be the extent of development prevalent in a region. Maharashtra grows cotton in Vidarbha which lies on the Deccan plateau where irrigation facilities are virtually nil and rainfall low. In contrast, cotton in Gujarat is grown in the southern parts where the rainfall exceeds 2,000 mm per year. Sugarcane shows higher absolute incomes for both the cultivators and agricultural labourers in Andhra Pradesh, Karnataka and Tamil Nadu. In Bihar, labour incomes are low, irrespective of the cultivators' incomes. The state of agrarian relations there and labour substitution are the possible causes.⁸ Conversely, Haryana and Uttar Pradesh, in spite of low cultivators' incomes, pay more, perhaps due to the labour market conditions. Jute presents a picture of relatively high cultivator incomes in Bihar and low labour income everywhere. Assam shows very low cultivator incomes though slightly raised wages, while Orissa scores low on both. None of the jute growing states are endowed with large scale controlled irrigation facilities.

Cash crops in general have shown a close association between the earnings, use of modern inputs, agro-climatic conditions and availability of controlled irrigation facilities.

Pulses, other than *tur* and *wrad* in some states, do not yield high incomes to both the cultivators and agricultural labourers. Gram in Rajasthan and Haryana, *wrad* in Andhra Pradesh and Tamil Nadu and *tur* in Uttar Pradesh, yield relatively high returns to the

cultivators while *moong* in Rajasthan, *tur* in Madhya Pradesh and *urad* in Tamil Nadu, provide a relatively high income to the labourers. Some gaps observed in the earnings of the cultivators and agricultural labourers could be attributed to the inter-cropping practices, say in gram, while the others to differing labour intensities. This inter-cropping (at times) also permits some good quality land to be allocated to poorly rated pulses and in odd cases the returns are high. Pulses, other than gram, are mainly grown by the small and marginal farmers who seldom hire in labour. Under these circumstances whatever labour is hired is from the residual category; hence the wages are low.

Groundnut, among oilseeds, shows little inter-regional variation other than a low return to the cultivators and labourers in Orissa and a low return to the labourers in Madhya Pradesh. Mustard exhibits uniformity in returns to the cultivators other than in Assam, though the labourers' incomes are very low and disparate among states. The possible reasons: mustard is a *rabi* crop which is often inter-cropped with other cereals.

The overall inter-regional picture suggests that the agriculturally backward states - Assam, Bihar, Madhya Pradesh and Orissa - generally yield low returns to both the categories of workers in all crops. In contrast, the agriculturally developed states usually pay more to all. In some cases there are inter-worker category differences in incomes across states while in others there are intra-state, inter-crop differences. The reasons could be traced to the labour intensity, extant local labour market conditions, heterogeneous agro-climatic conditions prevalent within some states and differential treatment given to some crops.

The two dominant observations evident from these data are the critical role of land ownership: the returns to land are several times higher than the returns to labour, and the observed correlation between the earnings of the two categories of earners.

AN EXPLANATION OF VARIATION IN INCOMES

The Variants

The literature abounds with references on income determination in a single market, notably the labour market. The forces of demand and supply simultaneously determine the number of days of work and the wage rates. It follows that the agricultural labourers' incomes would be governed by forces other than those which determine the cultivators' incomes. The latter would derive their incomes in accordance with the prevalent productivity and product market buoyancy. In the earlier sections, however, a definite link between the earnings of the two categories of workers was observed. Wage rates were found to be high in prosperous states and high rated crops. There is thus need to move away from the conventionally accepted single market theories to ones which advocate joint income determination.

To begin with, the extent of association between the incomes of the two claimants is looked into, by crop, to judge the strength of a possible income sharing mechanism. Column (2) of Table V shows the simple correlation coefficients between the earners' incomes per day derived from crop agriculture. In 11 out of the 14 crops this is positive and significant. Only in jute, *urad* and mustard it is not significant, not being the most important crops any way. The correlation coefficient is high - near to 50 per cent or above - in paddy, wheat, maize, bajra, cotton and *tur*, and relatively low in others. A similar statistic, when computed between the incomes of the cultivators and labourers *per hectare* (i.e., between earners'

shares) (column 3 of Table V), is expected to include the impact of labour intensity. It shows that in 10 out of the 14 crops the relationship is significant, and in nine has the right sign. However, it is important to note that the crops which have significant and high correlation in the two vectors are not exactly the same. It implies that the incomes of labourers are high when the cultivators' incomes are high, *irrespective* of labour intensity.

TABLE V. SIMPLE CORRELATION COEFFICIENTS BETWEEN INCOMES PER DAY AND EARNER'S SHARE PER HECTARE RESPECTIVELY OF THE CULTIVATORS AND HIRED LABOURERS

| Crops (1) | Correlations | |
|--------------|-------------------------|-----------------------|
| | Earnings per day (2) | Earners' share (3) |
| Paddy | 0.52* | 0.55* |
| Wheat | 0.46* | 0.59* |
| Sorghum | 0.19* | 0.36* |
| Maize | 0.54* | -0.43* |
| Bajra | 0.64* | 0.31* |
| Cotton | 0.64* | 0.13 |
| Sugarcane | 0.35* | -0.01 |
| Jute | 0.14 | -0.24* |
| Moong | 0.19* | 0.16 |
| Tur | 0.71* | 0.60* |
| Urad | 0.07 | 0.43* |
| Gram | 0.27* | 0.67* |
| Groundnut | 0.36* | 0.08 |
| Mustard | -0.02 | 0.74* |

* Significant at 5 per cent confidence level.

The question that needs to be addressed is how does this sharing of benefits operate. Is it through an increased demand for labour, is some form of income sharing mechanism operative (through both higher employment and wages), does the reservation wage of workers rise due to an increase in productivity/time specificity of demand, or is some combination of all these forces prevalent? This section intends to describe a possible mechanism by which co-variations in incomes can be explained.

The literature suggests that there is no single labour market even at a local village level; instead the hiring practices are characterised by a variety of arrangements involving land, labour, other physical resources as well as social (human) assets (Bardhan, 1980; Jagannathan, 1987). There is little absolute resourcelessness when it comes to eke out an income even if it is of bare survival level.⁹ Among the small and marginal farmers, who often hire out their labour seasonally, there is extensive resource sharing - that of bullocks and tools - and there are reciprocal labour arrangements (see, for example, Bliss and Stern, 1981). A social asset could be the past record of successfully working with a particular hirer. Wage workers, at times, command a price for an assurance of reliable labour supply during peak periods in a highly seasonal activity like agriculture. Jagannathan cites cases where high wages are paid, sometimes in advance, to retain trustworthy workers. As a result, a reservation wage is formed (Acharya and Papanek, 1989).

The labour income may not be directly commensurate with the marginal productivity principles; instead it may have some association with the average income of the hirers owing to the said reservation wage (Manove and Papanek, 1985). The proportion of such a 'distribution' may vary from one location to another since labour mobility is both limited and

expensive; but the association seems to hold (Acharya, 1989). As noted in the previous section, the wage rates vary across crops in the same state and that there is a correlation observed between wages and productivity in many crops.¹⁰ There is thus evidence of the existence of a so-called 'non-optimising' hiring process. In economic terms the earnings could include a rent component which take the form of a high wage rate and/or more days of work.

The second major variant of labour income is the flexibility in the labour market. In certain geographic regions there is extensive use of family labour, while elsewhere, the use of hired labour is preferred to family members' labour owing to the land holding patterns, caste compulsions and other socio-cultural factors, all of which inhibit use of own labour in manual jobs, particularly by the upper caste landed. In the paddy fields of the east or the sugarcane plantations of the south, such phenomena are extensively observed (Beteille, 1979). The advent of the green revolution in Punjab was accompanied by extensive use of hired labour rather than a rise in the (rather low) labour force participation in that state. The fact that the basic social equations are scarcely altering in response to agricultural modernisation and that new non-agricultural jobs of high 'social acceptability' are far from adequate, a backward bending labour supply curve (among resource owners and dominant castes) still prevails. The impact of this rigidity on the wage workers is evident: their number of days of work increases, pushing up the wage rate due to the increased demand. Their share in the incomes also rises.¹¹ Hired workers would thus earn more under conditions where family labour is used infrequently.

Thirdly, agricultural modernisation - which in the Indian context refers to the introduction of biochemical technology and mechanical energy - affects wage incomes.¹² Biochemical inputs, on the one hand, raise the demand for labour owing to the sheer large number of operations to be performed, and on the other, promotes income sharing emerging from highly time-specific labour demands. Both these forces tend to push up labour incomes. Mechanical energy, specially when provided by bullocks, are expected to have labour augmenting effects. Extensive use of bullock power is land-enriching and usually raises labour use for reasons pertaining to field operations as well as tending animals. Under normal conditions bullock and human labour use are complementary and help to raise labour incomes.

The incomes of cultivators, it is maintained here, are governed by a set of factors that relate to productivity and product market conditions. Under the assumption of positive returns to individual factors of production, if there is high material input use, of say, fertilisers, manure, irrigation, improved seeds, etc., the rates of return to the cultivators should be high. This would particularly be true for India where much of the land is rainfed and soil nutrient application low in most areas compared to many advanced countries.

Next is the argument of subsidies and prices. It is often voiced that Indian agriculture is highly subsidised through both output price protection and input price concessions (Gulati, 1988; 1989). Levy prices are now operative for high quality cereals, cash crops and oilseeds. They not only act as cushion against market collapse, but also as effective incentives for the farmers to raise output (Gulati and Sharma, 1990). Intervention in the output market is successfully achieved by the said procurement operation. Input subsidies - mainly on fertilisers, irrigation, credit and electricity - had been as high as 10-15 per cent of the agricultural gross domestic product in the eighties. Elsewhere (Acharya, 1992), it is found that these subsidies have been responsible for enhancing 10-50 per cent of the incomes of the cultivators

in different states. Thus both these are effective variants of the cultivators' incomes.

Lastly, since each crop is unique in its operations and seasonality, it is found imperative to make explicit these individualities.

In sum, it is argued that the incomes of the two categories of workers are dependent upon each other, on the nature of technology application, the composition of the labour force, the structure of incentives and the individual characteristics of each crop and region.

Empirical Evidence

The model is tested at two levels: to explain the determinants of individual incomes (per person per day) obtained by the two claimants and the incomes obtained by them per hectare, i.e., *their share*. The specification of an econometric model at the macro level always leaves out many sensitivities observed in the field or described in theory. Nevertheless, there is scope for testing the broad features of a techno-economic process. In this section the incomes of the two types of workers and their variants are jointly specified in a two-equation system.

The first equation is set up to explain the labourers' income. There are two variants of the model; the first one has its dependent variable as income per person per day, and the second as income per hectare (i.e., the share). The first independent variable is the cultivators' income which reflects the income sharing mechanism referred to earlier. The variable depicts agricultural modernisation as well since higher modernisation results in higher incomes. The extent of hired labour intensity, which essentially would capture the impact of the quantum of hired labour (in the earners' share specification model), is measured by the share of hired labour in the total labour use. The variable is not used in the per worker equation.

The dependent variable in the second equation is the per day cultivator income (the other variant is the cultivator income per hectare, depicting the earner share). The first independent variable here is the value of material inputs - fertilisers, manure, pesticides, etc., - to represent agricultural modernisation. Output price support is measured by the ratio of the farm gate price received for each crop in each region to a composite of input prices, the index of which is constructed by weighing each input price by the extent of its use. Price subsidisation is expected to be reflected in this variable.

Intercept dummies have been introduced for each crop to reflect upon its unique feature. Variables other than the ratios have been subject to log transformation. All money value variables are measured at 1980-81 prices using state-specific price deflators. The two-equation system in its two variations can be written as:

Variation 1

(1) labour income per worker per day = f (cultivator income per worker per day, state dummies).

(2) cultivator income per worker per day = f (material intensity, relative prices, state dummies).

Variation 2

(1) labour income per hectare = f (cultivator income per hectare, hired labour intensity,

state dummies).

(2) cultivator income per hectare = f (material intensity, relative prices, state dummies).

The systems are recursive and can therefore be estimated by ordinary least squares under the assumption that the variance-covariance matrix is diagonal. The results, as presented in Table VI, show that the equations are good fits in both variations. The total explanation too is satisfactory in them. All the real explanatory variables are significant at 5 per cent confidence and have the right signs. Most dummies too are significant. The latter implies that crop specificities cannot be ignored.

TABLE VI. REGRESSION RESULTS OF THE DETERMINANTS OF INCOMES OF WAGE EARNERS AND CULTIVATORS: POOLED SAMPLE FOR 16 CROPS

| Dependent variable (1) | Labour income | | Cultivators' income | |
|-----------------------------|---|------------------------------------|---|------------------------------------|
| | Income per worker per day (Variant 1) (2) | Income per hectare (Variant 2) (3) | Income per worker per day (Variant 1) (4) | Income per hectare (Variant 2) (5) |
| Independent variables | | | | |
| Cultivators' income per day | 0.13* (5.99) | - | | |
| Cultivators' income per ha | - | 0.63* (26.97) | | |
| Hired labour input | - | 2.40* (19.25) | | |
| Material input | - | - | 0.38* (5.76) | 0.41* (4.49) |
| Relative price | | | 17.41* (8.47) | 24.30* (8.52) |
| Dummy (Paddy) | - | - | - | - |
| Dummy (Wheat) | 0.16* (2.87) | -0.35* (4.18) | 0.28* (2.18) | 0.25 (1.43) |
| Dummy (Sorghum) | -0.13* (2.03) | -0.15 (1.49) | 0.17 (1.01) | 0.12 (0.49) |
| Dummy (Maize) | -0.08 (1.09) | -0.34* (2.89) | -0.21 (1.16) | 0.43* (1.71) |
| Dummy (Bajra) | 0.20* (3.01) | 0.009 (0.09) | 0.31* (1.65) | 1.06* (4.11) |
| Dummy (Cotton) | -0.01 (0.17) | 0.01* (5.51) | 0.51* (3.31) | 0.90* (4.19) |
| Dummy (Sugarcane) | -0.002 (0.40) | -0.23* (2.53) | 1.17* (7.26) | 1.82* (8.13) |
| Dummy (Jute) | -0.08 (1.23) | 0.24* (2.55) | 0.16 (0.95) | 0.40* (1.68) |
| Dummy (Moong) | -0.19 (2.97) | -0.32* (3.30) | 0.24 (1.28) | -0.19 (0.73) |
| Dummy (Tur) | -0.002 (0.32) | -0.15 (1.25) | 0.31 (1.52) | 0.78* (2.74) |
| Dummy (Urad) | -0.06 (0.96) | -0.19* (1.93) | 0.51* (2.82) | 0.38 (1.52) |
| Dummy (Gram) | 0.21 (3.56) | -0.53* (5.51) | 0.48* (2.90) | 0.67* (2.92) |
| Dummy (Groundnut) | -0.12 (1.84) | -0.20* (2.07) | 0.19 (1.22) | 0.04 (0.20) |
| Dummy (Mustard) | 0.15 (2.31) | -0.46* (4.42) | 0.67* (3.91) | 0.85* (3.57) |
| R ² | 0.32 | 0.86 | 0.53 | 0.50 |

* Significant at 5 per cent confidence level.
Figures in parentheses are 't' values.

THE IMPLICATIONS

To appreciate the explanation of the estimated equations, it is imperative to look at the elasticity values. Some are the coefficients themselves - those which have been subject to log transformation - while for others point elasticities at means have been worked out.

Individual variables in the first equation show that, a 100 per cent rise in a cultivator's daily income would increase the wage by 13 per cent. There is some sharing of benefits. A higher elasticity is observed in the equation for variant 2: the share of hired labourers' incomes increases by 63 per cent. The elasticity of labour intensity too is high at 1.98. It implies that as the cultivators' share of incomes rises, the wage earners' share and wage employment rise.

The second set of equations shows that both material inputs and input incentives have a definite impact on the cultivators' incomes. Judged in absolute terms though, the effect of material inputs is not very high; incomes respond by about 40 per cent by doubling all the modern inputs. The possible reasons: part of the surplus is shared with wage workers because of increase in the demand for labour, and the overall costs also rise. The elasticity values with respect to relative price are moderate; their values are 0.33 and 0.47 respectively.

From the stand-point of poverty reduction, which to a great extent is synonymous with a rise in the labourers' incomes; the reduced form of these equations suggests that the extent of employment generation, particularly of hired labourers, agricultural modernisation and incentives, hold the key in the agricultural sector. The two sets of equations suggest that the earners' share tends to respond more compared to individual incomes. *There is lateral dispersion of benefits rather than visible rise in wages - a condition typical in surplus labour economies.*

The whole analysis makes it evident that while the gains do accrue to the weaker sections of the society (agricultural labourers) by agricultural development, there are evident limits to seeking lasting solutions to poverty in the agricultural sector itself. However, the linkage effects of agricultural growth, which are not examined here, could be high.

CONCLUSION

The absolute incomes derived from crop agriculture are not impressive when compared to the subsistence needs of the people. There is wide fluctuation in the incomes derived from different crops in different states. High value cereals, cash crops and oilseeds yield a higher income compared to coarse cereals and some pulses. States with better controlled irrigation facilities yield higher incomes compared to rainfed ones. Inter-crop variation in incomes is higher than inter-state variation. The gap between the incomes of the cultivators and agricultural labourers is as high as 7 to 10 times.

As estimation of the incomes of the cultivators and agricultural labourers suggests that there is complementarity between their incomes. An income sharing is suggested at the crop activity level. The elasticity values suggest that agricultural labourers' incomes vary with the extent of the cultivators' incomes which in turn depend upon agricultural modernisation and the incentives structure.

Lastly, the earners' share equation (and earlier data) suggest that dispersion of incomes across earners is more rapid compared to rise in individual incomes.

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NOTES

1. Some estimates for selected crops and for 2-3 states are available in Haque *et al.* (1983) and George *et al.* (1983). Their aim is to understand the technical rate of substitution rather than to measure income distribution.
2. Part of the reason why this is so defined is the difficulty in obtaining information by more categories since many of them are unstable. For instance, not only is it difficult to identify how many people are pure rentiers, they may not be rentiers in the next season. Also, there are several types of renting arrangements and aggregation across them is not practical. Moreover, the way workers are assigned status categories (see Government of India, 1988), almost all agricultural workers are covered.
3. The terms cultivators and agricultural labourers are often interchangeably used with 'different/two categories of workers'. However, at all places this refers to the two earners' categories mentioned in the text.
4. The choice of crops grown in an area is not an economic decision alone. Agro-ecological factors constrain farmers from growing crops of their choice in most areas. Hence, there is the relative homogeneity across states for the same crops.
5. Very often there is a class dimension too here. The large and medium farmers usually have access to indivisible inputs as well as markets. They are able to grow high value crops and market them. The small farmers often grow low value crops for subsistence. Conventional wisdom suggests that the small farmers are more efficient but this is only true as far as other things are given as constant, which usually is not the case.
6. Tables showing crop-specific input application are not presented here to save on space.
7. Labour use, particularly by hired hands, appears prominently in the determination of income distribution. This aspect is discussed at length in the literature on labour use.
8. There appears to be a distinct divide in the distribution of income between the northern and the southern states. The former, mostly in the erstwhile zamindari area, pay less to hired hands than the latter.
9. This may sound presumptuous but the fact remains that in spite of visible landlessness there are no cases of starvation deaths or famine conditions.
10. Kalpana Bardhan too found higher wages to prevail in relatively more prosperous areas. She concluded that this would happen because of higher bargaining capacities of workers in these areas (see Bardhan, 1977). The model presented here includes the notion of bargaining along with other factors.
11. A class-based labour allocation strategy which ascertains a rise in hired labour days is itself, in a way, an income sharing mechanism.
12. Modernisation aimed at raising allocative efficiency is not discussed here since researches since the sixties have shown the Indian farmers to be efficient resource allocators.

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APPENDIX

STATES AND CROPS ON WHICH COST OF CULTIVATION DATA ARE AVAILABLE

| State/Crop (1) | Years (2) |
|-------------------|--------------------------------------|
| Andhra Pradesh | |
| Paddy | 1981-82-1983-84 |
| Sorghum | 1985-86-1986-87 |
| Sugarcane | 1980-81, 1982-83-1984-85 and 1986-87 |
| Moong | 1981-82-1984-85 |
| Urad | 1981-82-1984-85 |
| Groundnut | 1981-82-1983-84 |
| Assam | |
| Paddy | 1981-82-1986-87 |
| Jute | 1981-82-1986-87 |
| Mustard | 1981-82-1986-87 |
| Bihar | |
| Paddy | 1980-81-1983-84 |
| Wheat | 1981-82-1983-84 |
| Maize | 1981-82-1983-84 |
| Sugarcane | 1981-82-1983-84 |
| Jute | 1981-82-1983-84 |
| Gujarat | |
| Sorghum | 1981-82-1983-84 |
| Bajra | 1981-82-1983-84 and 1986-87 |
| Cotton | 1981-82-1983-84 |
| Groundnut | 1980-81-1983-84 |
| Haryana | |
| Paddy | 1984-85-1986-87 |
| Wheat | 1981-82-1987-88 |
| Bajra | 1981-82-1986-87 |
| Sugarcane | 1981-82-1986-87 |
| Gram | 1981-82-1987-88 |
| Mustard | 1980-81, 1984-85-1987-88 |
| Himachal Pradesh | |
| Wheat | 1981-82-1983-84 |
| Maize | 1981-82-1983-84 |
| Karnataka | |
| Paddy | 1981-82-1986-87 |
| Sorghum | 1980-81-1983-84 |
| Cotton | 1981-82-1983-84 and 1985-86 |
| Sugarcane | 1981-82-1985-86 |
| Tur | 1981-82-1983-84 |
| Groundnut | 1981-82-1983-84, 1985-86-1986-87 |

(Contd.)

APPENDIX (Concl.)

| State/Crop (1) | Years (2) |
|-----------------------|-------------------------------------|
| Madhya Pradesh | |
| Paddy | 1981-82-1986-87 |
| Wheat | 1981-82-1986-87 |
| Sorghum | 1981-82-1986-87 |
| Maize | 1981-82,1983-84,1985-86-1986-87 |
| Cotton | 1981-82-1986-87 |
| Moong | 1981-82-1986-87 |
| Tur | 1981-82,1984-85-1985-86 |
| Urad | 1981-82-1986-87 |
| Gram | 1981-82-1986-87 |
| Groundnut | 1980-81 |
| Maharashtra | |
| Sorghum | 1981-82-1983-84 and 1986-87 |
| Bajra | 1981-82-1982-83 |
| Cotton | 1980-81-1983-84 |
| Sugarcane | 1982-83-1983-84 |
| Moong | 1981-82-1982-83 |
| Tur | 1981-82-1982-83 |
| Urad | 1981-82-1982-83 |
| Orissa | |
| Paddy | 1981-82-1984-85 and 1986-87 |
| Jute | 1981-82-1983-84 and 1985-86-1986-87 |
| Moong | 1981-82-1986-87 |
| Urad | 1984-1985-1985-86 |
| Groundnut | 1984-85-1986-87 |
| Punjab | |
| Paddy | 1981-82,1984-85-1986-87 |
| Wheat | 1982-83-1987-88 |
| Cotton | 1980-81-1986-87 |
| Mustard | 1987-88 |
| Rajasthan | |
| Wheat | 1982-83-1987-88 |
| Maize | 1982-83-1983-84 and 1985-86 |
| Bajra | 1981-82-1983-84 |
| Moong | 1981-82-1983-84 |
| Gram | 1981-82-1986-87 |
| Mustard | 1981-82,1983-84-1986-87 |
| Tamil Nadu | |
| Paddy | 1980-81-1981-82 |
| Sugarcane | 1981-82-1983-84 |
| Urad | 1981-82-1982-83 |
| Groundnut | 1981-82-1983-84 |
| Uttar Pradesh | |
| Paddy | 1981-82-1983-84 |
| Wheat | 1981-82-1983-84 and 1985-86 |
| Bajra | 1981-82-1986-87 |
| Sugarcane | 1980-81-1982-83 |
| Tur | 1984-85-1986-87 |
| Urad | 1984-85-1986-87 |
| Gram | 1981-82-1984-85 |
| Mustard | 1982-83-1986-87 |
| West Bengal | |
| Paddy | 1981-82-1984-85 |
| Jute | 1980-81-1986-87 |
| Urad | 1984-85 |