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AGRICULTURAL INCOMES AND RURAL POVERTY: AN ANALYSIS AT CROP - STATE LEVEL IN INDIA

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INTRODUCTION

Income distribution and levels of living in rural India have been areas of concern to both, policy makers and academics in the recent times. This is justified to the extent that there are more poor people there than elsewhere and also that there is a standing commitment to redress poverty by successive governments for the last two decades. The major thrust on this subject in the literature is to measure the levels of living and inequalities, analyze trends and identify their correlates, (usually) based on large scale consumption expenditure surveys conducted from time to time by the National Sample Survey (NSS) authorities[1]. While several important conclusions have emerged from these analyses[2], they are restricted to the aggregate level at which causal factors underlying the levels of living are only indirectly established[3].

A somewhat different way of viewing the problem of rural poverty and income distribution is through an analysis of incomes derived by its different claimants at the level of crop operations in agriculture. Farming being the dominant activity in rural India, this approach would help in an assessment of (agricultural) income generation and its distribution without making (restrictive) assumptions about the agrarian structure and the associated inequality in it. Moreover since the non-agricultural activities are closely linked to crop agriculture, the exercise may permit a larger generalization than for agriculture alone (Papanek 1988). The purpose of this paper is to make a direct measurement of agricultural incomes and develop an explanation

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[1] Tata Institute of Social Sciences, Bombay. This paper was written when I was visiting The Institute of Social Studies (ISS), The Hague. I am grateful to the ISS for financial assistance.

of its variation, by region, crop and claimant category. The aim here is not to measure poverty perse but to assess it in light of the farm incomes and their distribution. In this regard, this paper is probably the first attempt at estimating factor shares in Indian agriculture at the macro level[4].

The specific contributions of this research are to provide estimates of incomes emerged from agriculture and their distribution at a level of disaggregation not attempted before, as also to highlight upon the role of different crop regimes in distributing incomes at different settings. Additionally, in the process of evolving an explanation of the generation and distribution incomes, it would be possible to place the role of elements such as agricultural modernization, labour intensity, incentive structure and the like, in influencing incomes. It may further be permissible 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 which are, at best, conjectural in aggregate time-series.

The paper is written in 5 sections. The next section details the various income measurement procedures, and section 3 explains the profiles. Section 4 elaborates upon and estimates a model. A short conclusion is presented in section 5. The main data used are those collected by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, under its Comprehensive Scheme of Cost of Cultivation Surveys (COC)[5]. The data used here pertain to the eighties. The analysis is primarily cross-sectional, across crops, regions and worker categories.

THE APPROACH AND DATA

A comprehensive scheme to collect data on the cost of cultivation of different crops was initiated in 1971-72 to obtain crop and state-wise representative profiles on inputs and outputs. These data permit to derive rates of return and factor shares for each crop, and hence the incomes of those who work on farming operations. Data for the seventies were not adequate for detailed regional representation but in the eighties they were collected from a (full) sample (of over 9500 farms) annually for over 19 crops spaced across 15 states. However since the sample is not very large, only state level averages are representative. Farm-size specific disaggregation too is not advisable for the same reason.

The data are not collected from the same farms or sub-regions each year. Instead, the regions are rotated so as to obtain highly systematic cross-sectional profiles from one year to another. This procedure however denies construction of panels of data profiles and time-series analysis is therefore not permissible. Details on the states, crops and years covered in this study can be seen in the appendix. These crops cover over 80-90 percent of the total area sown in most states and thus present a fairly representative (cross- sectional) picture of Indian agriculture.

A major shortcoming with using COC data for study of incomes is that they pertain to crop agriculture only. Analysis is thereby curtailed to agricultural workers alone. Further, the non-agricultural incomes of those whose primary vocation is agriculture are also not counted, causing a downward bias in the absolute values of incomes. A redeeming feature, though, is the fact that there is a high degree of association between agricultural production/ incomes and the levels of living (Ahluwalia 1986; Sundram and Tendulkar 1988; Jose 1988). This is not only borne out by the existing

literature, it is a common observation otherwise too. Agriculturally prosperous states (Punjab, Haryana) show a lower proportion of people below the poverty line compared to agriculturally backward ones (Bihar, Orissa) (see for data, World Bank 1989)[6].

To ascertain the strength of the relationship between agricultural incomes derived from these data and rural poverty, a simple function was fitted here using state level cross-sectional aggregates. The percentage of people below poverty line, as obtained from the NSS 43rd round pertaining to 1987-88, was regressed on the mean income per worker, as calculated from the COC data[7]. The relationship is as follows:

Poverty = 45.58 - 0.001 Income.
(3.60)

R2 = 0.50 F = 12.98 n = 15 (figure in the parenthesis is the t value)

This equation is a good fit in which a single variable explains half the variation in poverty even when the data are drawn from entirely different sources. The relationship holds equally well when the poverty variable is separately regressed on the incomes of the two main categories of workers, namely, cultivators and agricultural labourers (details on this break-up are discussed below)[8]. It is implied from this (negative) association that the COC data are consistent for inter-regional comparisons.

There are several claimants of incomes from agriculture in peasant societies. Some typical ones are, the pure cultivators, pure hired labourers, share-croppers, renteers, money lenders and the like. The Indian Statistical System (SS) 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)[9]. 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[10].

The incomes calculated by this method are factor shares and not total incomes of the defined categories of workers. In fact, many small farmers earn their incomes from their own land as well by hiring out labour. But since these data are collected from farms and not households, the incomes should mainly be interpreted as returns to factors from agricultural operations rather than as total earnings and income differentials between workers[11].

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

A caveat needs address here. The per hectare incomes do not directly reflect upon the extant poverty. They reflect upon the incomes derived from land and the variations in them, by region/ crop/ worker type. Indirectly though, some deductions can be made in view of the existing (low) land to labour ratio in India. Only the figures on incomes per-worker have a direct relationship with poverty. Each of these figures however has a unique information content regarding the source of income (or lack of it).

REGIONAL AND INTER-CROP VARIATIONS IN INCOME

Inter-Crop Comparisons

This section compares inter-crop differences in incomes at all India level. Data on mean values of incomes received by the two categories of workers from 14 major crops are presented in table 1. These are computed at

1980-81 prices and averaged over 1980-81 to 1987-88. The aggregate picture painted by these data suggests a rather modest return 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 equally true for the shares of cultivators and agricultural labourers.

Cultivators receive a relatively high return from paddy and wheat, in the range of Rs 2000 per hectare. In contrast, coarse cereals -- sorghum and bajra -- yield less than Rs 1000 per hectare to them. Maize, again a coarse cereal, is somewhere mid-way. Cultivators' incomes from cash crops are uniformly high; sugarcane tops the list with almost Rs 7500 realized profit per hectare. Cotton and jute show figures comparable to those of paddy and wheat. Pulses other than tur present a uniformly low 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 cash crops, and others as low quality ones, coarse grains and pulses[12].

The reasons for the inter-crop variation originate in the prices paid to different crops including the State administered prices and the natural productivity of a crop. It needs mention that the Government introduced a system of supporting prices of agricultural commodities in mid-sixties, which has gained strength overtime. In the initial periods only selected cereals were protected as they were required to have marketed surplus for urban consumption. This was later extended to cash crops and oilseeds. A system of input price subsidies was also introduced through the seventies and eighties which increased the productivity of some crops without raising the costs proportionately (Mruthyunjaya and Kumar 1989). Rich farmers' lobbies have come up which exert pressure on the Government to keep up 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 1 exhibits the standard deviation of cultivators' incomes across different cross-sections. In 12 out of the 14 crops the variation is small -- not statistically significant -- suggesting that the same crop does not yield very dissimilar results in different areas[13]. The inter-crop variation is greater than intra-crop variation[14]. High value crops, mostly grown under well endowed conditions, reap rich harvests. In contrast, low value crops are usually grown in poor quality soils under scanty rain-fed conditions and provide low returns. Unlike the former crops, the latter ones neither have 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[15].

The per-hectare income derived by agricultural labourers in different crops is a fraction of the income of cultivators. In no crop other than sugarcane this exceeds Rs 1000. These income levels classify all agricultural labourers as uniformly poor. A crop specific classification shows that paddy and cash crops yield a relatively high income in the range Rs 400 to 500 or above, other cereals, pulses and mustard yield very low incomes in the range Rs 100 to 200 and groundnut falls somewhere in between. The hierarchy in the incomes is very similar to that observed earlier, at least ordinally, though a finer classification shows some differences. Wheat and mustard behave differently for reasons relating to the low labour intensity of these crops. Wheat crop operations have has been mechanized extensively and mustard -- being a rabi (winter) crop -- is often inter-cropped with other crops (typically wheat).

The values of standard deviations are low in the labourers' incomes too. In 10 out of the 14 crops variation is small. This indicates that inter-

crop variation in these incomes too across states is not very high. Both, the wage rate and number of days of work, have a crop-specificity, implying that the techno-economics of a crop appears no less important than regional labour markets.

The differences in wage rates across crops point towards possibility of a seasonal concentration in the demand for labour in some crops, but there appears some variation originating from an 'income sharing ' mechanism as well, ie. the high profit crops paying more to labourers. This aspect is discussed further in the next section.

The large gap between the 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 income earned by them to the total disposable income (ie. income earned by both the categories of workers) are computed in table 2 for this purpose. While on the one hand there is a notable gap in the absolute magnitudes, on the other 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 hired workers' incomes. High hired labour using crops (in the range 50 to 60 percent) -- paddy, sorghum, cotton, jute, urad and groundnut -- pay 15 to 25 percent of the total earnings to labourers. On the converse, low hired labour using crops (in the range 20 to 25 percent) -- maize, gram, and mustard -- pay less than ten percent 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.

There are three major inferences permissible from tables 1 and 2. First, returns to land -- rent, profit etc. -- are far higher compared to returns to labour. As Sundram and Tendulkar (1988) have stated, there is little case for seeking human endowments other than pure physical labour in rural India. Second, labour incomes are influenced by the extent of labour intensity as well as an existing income sharing mechanism, both of which are somewhat unique to each crop. Last, the genesis of poverty could be traced to the low returns, the low wages, varying labour intensity and the composition of the work force.

Inter-Regional Variation

In this section, crop specific regional differences as well as all crop regional differences are analyzed. Figures on realized profits, wage earnings and daily wage rates of workers are given by crop and state in table 3. Since all crops are not grown in all states the comparison is accordingly restricted.

Cultivators' incomes from paddy, a crop mostly grown in zones of abundant water supply, vary according to the extent of controlled water availability and adoption of modern variety seeds and fertilizers[16]. Their earnings are thus high in Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu and low in Assam, Madhya Pradesh, Orissa, Utter Pradesh and West Bengal. The former states have sufficiently well developed irrigation systems of the well/ canal type, at least in areas where paddy is grown, while the latter are mostly rain-fed.

Wage earnings in paddy to some extent follow a similar pattern: labourers in Andhra Pradesh, Haryana, Punjab and Tamil Nadu are able to fetch a higher wage income, though not necessarily in the same order as profits. Karnataka is an exception; its cultivators earn the highest while its

labourers earn relatively less. There are two intervening variables which could be discussed here to explain the regional variations in the wage incomes. The first is the dissimilar labour intensity originating from the varying land distribution and labour substitution[17]. Accordingly the employment and its composition -- between hired and family workers -- are dictated. 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 non-agricultural sectors, migration etc. which do not figure in the discussion here (see Acharya and Papanek 1989).

Wheat shows lesser variation in 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 (other than in Madhya Pradesh where farmers try growing it under rain-fed conditions) and hence yields uniform returns. The incomes of labourers are low though they vary somewhat across states. The main reason is the crop itself which is low labour using. Moreover wheat is mainly grown in the northern states which have undergone high levels of mechanization since the sixties. As a result the returns to this factor are low.

The coarse grains -- sorghum, maize and bajra -- yield uniformly low earnings to both cultivators and agricultural labourers, other than a high return to maize cultivators of Bihar. A comparison of inter-state figures shows that cultivators' incomes vary greatly between as well as within crops. In 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 rain-fed 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 they mainly lie outside the framework of 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, high in Gujarat, Madhya Pradesh and Punjab and low in Maharashtra. The ranking of labourers' earnings is similar, though the extent of difference between the two categories is not the same in each state owing to differential labour intensities. The main reason for variability in returns appears to be the extent of development prevalent in a region. Maharashtra grows cotton in the Vidharba which lies on the Deccan plateau where irrigation facilities are virtually nil and rainfall is low. In contrast, cotton in Gujarat is grown in the southern parts where the rainfall exceeds 2000 mm per year. Sugarcane shows a higher absolute income of both cultivators and agricultural labourers in Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu. In Bihar, Haryana and Utter Pradesh labour incomes are low irrespective of cultivators' incomes. Since wage rates are not low in states other than Bihar, labour substitution is a possible cause[18]. Jute presents a picture of relatively high profitability in Orissa and West Bengal and high labour income everywhere other than in Bihar. Assam shows low profitability while Bihar scores low on both. Cash crops in general have shown a close association between earnings, use of modern inputs, agro-climatic conditions and availability of controlled irrigation facilities.

Pulses other than tur, urad and gram in some states, yield low returns to both, cultivators and agricultural labourers. Gram in Rajasthan and Utter Pradesh, urad in Tamil Nadu and Utter Pradesh and tur in Madhya Pradesh yield relatively high returns to cultivators while urad in Tamil Nadu provides a relatively high income to labourers. Some gaps observed in the earnings of cultivators and agricultural labourers could be attributed to the inter-

cropping practised, 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 pulses and in odd cases the returns are high. It is of use to note that pulses other than gram are mainly grown by small and marginal farmers who seldom hire-in labour; hence the skewed distribution of income.

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

The overall inter-regional picture suggests that the agriculturally backward states -- Assam, Bihar, Madhya Pradesh and Orissa -- generally yield low returns to both 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 of these could be traced to the labour intensity, extant local labour market conditions, heterogeneous agro-climatic conditions within some states and differential treatment given to some crops.

Differences in Earnings Per Worker

Incomes per worker have been calculated by juxtaposing the COC data, the NSS data (on workers by categories for 1987-88) and the Area Under Major Crops data[19]. The procedure involves calculating the aggregate incomes per state by each category of worker, using the area under each crop as the weight. These figures are then divided by the number of workers in each

category. The mean values of these, calculated at 1980-81 prices, are given in table 4.

The magnitudes of these incomes are not different from those observed in the earlier tables since the land to labour ratio is not favourable in India. Wide differences in population densities and labour force participation ratios across states have however altered the rankings of states[20]. While Punjab and Haryana, the green revolution states, top the list in the earnings of both, cultivators and agricultural labourers, many states like Bihar, Madhya Pradesh and Orissa, which are otherwise agriculturally backward, show a relatively high figure of earnings -- particularly of cultivators -- than their land yields.

A number of states, typically Haryana, Gujarat, Karnataka, Madhya Pradesh, Orissa, Punjab, Utter Pradesh and West Bengal, exhibit some distribution of gains: incomes of both categories of workers are high. Assam, Himachal and Maharashtra have low incomes of both categories of workers. Only Andhra Pradesh, Bihar, Rajasthan and Tamil Nadu are different from the typology: the first and last show better distribution while the second and third show large gaps. This observation falls in line with the 'north-south contrast' referred to in end-note 17. Overall, there is a sharing of gains observed.

There is a large gap between the earnings of cultivators and agricultural labourers, a point noted in the earlier too. The former earn 3-4 times the latter. A little arithmetic relating to poverty is revealing here. If the labour participation ratio per household is taken to be 2.5, a figure seen from the NSS data, the mean income of an average cultivator from crop agriculture in states other than Assam, Himachal and Maharashtra would be near or above the prevalent poverty line of Rs 3600 per household per annum at 1980-81 prices. These incomes, though under-estimates since not all crops are

not counted and non-agricultural incomes are not included, indicate that not many states show an average income much above poverty line. An average agricultural labourer, by the same calculation, is above poverty line only in Punjab. Even if it is assumed that only half the income of an agricultural labourer originates from crop agriculture -- a very liberal assumption -- they, only in Punjab, Haryana Utter Pradesh and West Bengal qualify to be above the poverty line[21]. It is no co-incidence that land fetches such premiums.

The wage rate data (column 4) show that while there is correlation between them and the wage incomes, it is not very high. There is, instead, a stronger association between the total agricultural incomes of the two categories of workers. It is evident that agricultural labourers' incomes are jointly linked to cultivators' incomes, employment and wages.

The dominant observation evident from these data is the critical role of land ownership. Returns to land are several times higher than returns to land. It follows that poverty would be high in areas which have high landlessness. The data also suggest that, given the present level of endowments and demographic pressure on land, the agricultural sector does not produce enough disposable income to envisage possibilities of major poverty reduction by redistributive measures.

AN EXPLANATION OF VARIATION IN INCOMES

The Variants

Literature is abound with references of income determination in a single market, notably the labour market. Forces of demand and supply simultaneously determine the number of days of work and wage rates. It follows that agricultural labourers' incomes would be governed by forces other than those

which determine cultivators' incomes. The latter would derive their incomes in accordance with the prevalent productivity and product market buoyancy. In the past sections however, it was observed that there is a definite link between the earnings of the two categories of workers. Wage rates too -- though to a lesser extent -- were found to be high in prosperous states where the productivity and profitability were high. There is thus need to move away from the conventionally accepted single market theories to ones which advocate joint income determination.

The question that needs address 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, a higher employment and wages), does the reservation wage of workers rise due to increase in productivity, or some combination of all these forces is relevant? This section intends to describe a possible mechanism by which variations in incomes can be explained.

It is by now agreed upon by most that there is no single labour as such even at a local village level; instead the hiring practices are characterized by a variety of arrangements involving land, labour, other physical resources as well social (human) assets (Bardhan 1980; Jagannathan 1987). There is little absolute resourcelessness when it comes to eke an income even if it is of bare survival level[22]. Among 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 1980). 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 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). The previous section showed that wage rates vary across crops in the same state and that there is a correlation observed between wage and productivity in many crops. There is thus evidence of the existence of a so called 'non-optimizing' hiring process. In economic terms the earnings could include a rent component which may 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, use of hired labour is preferred to family members owing to the land holding patterns, caste compulsions and other socio-cultural factors which inhibit use of own labour in manual jobs, particularly by the upper caste landed. In paddy fields of the east or sugarcane plantations of the south such phenomena are extensively observed (Beteille 1979). The coming of the green revolution in Punjab was accompanied by extensive use of hired labour rather than raising the (rather low) labour force participation in that state. The fact that the basic social equations are scarcely altering in response to agricultural modernization 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 bargaining strength rises and earnings increase[23]. Hired workers would thus earn more under conditions where family labour is used infrequently.

Third, agricultural modernization -- which in the Indian context refers to introduction of bio-chemical technology and mechanical energy -- affect wage incomes[24]. Bio-chemical 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 promote income sharing emerging from highly time-specific labour demands. Both these forces tend to push up labour incomes. Mechanical energy provided by bullocks and tractors (and harvesters) are expected to have different effects. Extensive use of bullock power is land-enriching and it 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 raise labour incomes[25]. Tractors too are expected to have an overall effect on land similar to that of bullocks; the difference though is that a tractor displaces a large number of individual jobs. This is particularly so in India where the tractors produced and sold are often of more than 35 horse power, which replace jobs on land, in irrigation as well as transport (NCAER 1980; Binswanger 1977).

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 of say, fertilizers, manures, irrigation, improved seeds etc., the rates of return to cultivators should be high. This would particularly be true for India where much of the land is rain-fed and soil nutrient application low in most areas compared to many advanced countries.

Next is the argument of subsidies and incentives. It is often voiced that Indian agriculture is highly subsidized through both, output price protection and input price concessions (Gulati 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

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 fertilizers, irrigation, credit and electricity -- have been as high as 10-15 percent of the agricultural GDP during the eighties. Elsewhere Acharya (1990) has found that these subsidies have been responsible for enhancing 10-50 percent of the incomes of cultivators in different states. Both these thus are effective variants of cultivators' incomes.

Lastly, since each crop is unique in its operations and seasonality and each state unique in its agro-climatic and demographic characteristics, it is found imperative to explicit these individualities.

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

Empirical Evidence

The specification of an econometric model at 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 dependent variable in the first equation, ie. of labourers' income, is the per hectare payment made to agricultural labour, in each crop, state and year. The first independent variable is the cultivators' income. This variable corresponds to the income sharing mechanism referred to earlier, though the impact of income sharing is reflected elsewhere too. Next, flexibility in the labour market (also depicting the extent of employment created) is measured by the proportion (percentage) of hired workers to total

work force deployed. There could be a bit of trivial relationship between this and the dependent variable since employment and incomes are expected to be close associates any way. But since both are complex variables, ie. constructed by combining more than one variable, spurious correlation is expected to be minimal. Third is agricultural modernization measured in two components, one representing the bio-chemical impact and the other the mechanical impact[26]. The value of fertilizers and manures applied is chosen to represent the former. The latter is again divided into two parts; the extent of bullock and machine labour used respectively, measured in rupee equivalents. Like the dependent variable, the independent ones too are per hectare figures at current prices. The exception is the proportion of hired labourers deployed which may cause some statistical irregularity, but in cross-sectional analysis this is unlikely to matter.

The first independent variable of the first equation is the dependent variable of the second. The first independent variable is the value of fertilizers and manures, to represent agricultural modernization, as before. Output price support is measured as the farm gate price received by each crop in each region. Input price subsidization is proxied by the value of total subsidies received each year by each state. Crop specific data on subsidies are not available. All figures are as per hectare other than price which is as per quintal.

Intercept dummies have been introduced for every state and crop to reflect upon the unique feature of each.

Data on all the above variables other than subsidies are obtained from the COC surveys. There are in all 327 observations for 14 crops and 15 states. Subsidies data, not being available from these surveys, are computed from the series prepared by Gulati (1989).

The system is recursive and can therefore be estimated by ordinary least squares if the variance-covariance matrix can be assumed to be diagonal. However since this cannot be assumed to be so apriori, a two stage least squares (2SLS) procedure has been adopted to estimate the system.

According to the procedures followed in 2SLS estimation, the second equation is estimated first and the predicted value of the cultivators' income is then used for estimating equation 1. The results, as presented in table 5, show that the system is a good fit; the total explanation being 87 and 80 percent in the two equations respectively. All the real explanatory variables are significant at 5 percent confidence limit and have the right signs. Not all dummies are significant though; only about a third are, roughly equally distributed between crops and states in the two equations. It of interest to note that the dummies which are significant in one equation are not so in the other, and the vice-versa. It implies that crop and location specificities cannot be ignored[27].

To conclude, this section discusses the procedures in the specification and fitting of the econometric model. The equations fitted by using a 2SLS method provides satisfactory results.

The Implications

To appreciate the explanation of the estimated equations, elasticities at means have been calculated. These are given in table 6. None of the elasticities are of value greater than unity, implying that incomes respond in lesser than the same proportion to movements in any of the independent variables. This is true for both equations.

Individual variables in the first equation show that, a 100 percent rise in the fertilizer application would raise labour earnings by 48 percent. In a similar contrast, a same rise in profits would increase the wage incomes

by 40 percent. There is some sharing of benefits. The other forms of modernization, ie. raising mechanical energy, do not have a large impact. Labour income rises 18 percent and falls by 7 percent by a 100 percent increase in bullock labour and machine labour, respectively. At the present levels of modernization thus, the positive of effects of modernization on labour outweigh the negative ones. A high elasticity is observed for the proportion of hired labour employed; it being close to unity. This variable, which captures the impact of both, the bargaining capacity of labourers (income sharing) as well as the extent of employment created, shows the importance of these in labour income determination.

The second equation shows that incentives have an important impact on profitability. The elasticity values of output price and input subsidy are 0.58 and 0.43 respectively. While, based on these numbers, it would be difficult to judge the relative merits of the two incentives, one inference that can be drawn is that at present, output price protection is more effective in influencing incomes than input subsidies, probably because it is more encompassing. The effect of modernization is relatively small; incomes respond by less than 15 percent by doubling the chemical/biological inputs. The possible reasons: part of the surplus is shared with wage workers because of increase in demand for labour and overall costs also rise.

From the stand point of poverty reduction, which to a great extent is synonymous with rise in labourers' incomes, the reduced form of these equations suggests that the extent of employment generation, agricultural modernization and incentives hold the key in the agricultural sector, in that order[28]. Nevertheless the absolute quantity of incomes earned by the labourers and the values of elasticities suggest that even if the total employment, fertilizer (and mechanical energy) use and the incentives, all <u>double</u>, not many are likely to cross the poverty line, as the average income of a labour

household from agriculture is likely to rise about three times from about Rs 1000 at present to about Rs 3000; a value still short of the poverty line. It can be argued that along with some non-agricultural income most may cross this line, but again this may not be easy since with increase in agricultural jobs, some of the time for non-agricultural jobs would proportionately reduce owing to seasonality of casual labour jobs. Further, the assumption of doubling all the variants is a rather tall one.

The proposition of expanding employment in agriculture has been examined time and again in the Indian context and an unavoidable comparison with east Asian countries suggests that this is possible if irrigation and other forms of modernization and reforms are introduced (Ishikawa 1981). Recent studies by Bhalla (1987) and Mishra (1989) and the logic of incomparability of east and south Asia however both point towards the fact that the scope for doing so is not very large (see also, Vaidyanathan and Jose 1978).

Bio-chemical technology perse could raise the incomes of farmers in the short run. But is it possible to sustain it without an impending mechanization as also a break down in the income sharing mechanism? Again, recent studies from Punjab and Haryana have pointed out that capital-labour substitution is rapidly occurring in these states and while the wages are not falling, they are not rising either (Jose 1988).

Incentives are important for both growth and distribution but difficult to sustain in view of the rising budget deficits.

Incomes of cultivators, also associated to poverty, are critically linked to the incentive structure and modernization process. While it may be possible to raise the cultivators' incomes using scientific techniques extensively, the impact on poverty, as discussed earlier, may again be dependent on the same set of variables which are reaching their limits.

The whole analysis makes it evident that while 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.

CONCLUSION

This paper attempts to put together a so far sparsely used data set from the cost of cultivation surveys, to estimate workers' incomes from agriculture. A summary of the findings can be listed as below:

(i) The absolute incomes derived from crop agriculture are not impressive when compared to subsistence needs of people. While agriculture is not the only source of income in most rural households, it is the main basis of sustenance for about 70-75 percent of rural Indian people.

(ii) 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 pulses. States with better controlled irrigation facilities yield higher incomes compared to rain-fed ones. Inter-crop variation in incomes is higher than inter-state variation.

(iii) The gap between the incomes of cultivators and agricultural labourers is as high as 3-4 times. Wage incomes are high in crops and states which provide more employment. The wage rate does not necessarily correspond closely with the wage income.

(iv) The variants of incomes are found to be, the extent of modernization, the incentive structure, and the employment created. A joint estimation of the incomes of cultivators and agricultural labourers suggests

that there is a complementarity in the incomes of these. An income sharing is thus suggested at the crop activity level.

(v) The values of elasticities suggest that agricultural labours' incomes, which are closely linked to poverty, vary with the extent of employment, agricultural modernization and the incentives structure. Since options other than modernization are have limited scope, and modernization is expensive and slow, there is not much scope for enhancing wage incomes for poverty redressal.

TABLE 1

Mean Values of Incomes Earned by Cultivators and Agricultural Labourers and Wage Rates (1980/81-87/88), Per Hectare by Crop, All India (1980/81 Prices).

CROP	REALIZED PROFIT PER HECTARE (Rs)		WAGE EARNINGS PER HECTARE (Rs)		DAILY WAGE RATE PER PERSON (Rs)
	Mean	Std Dev	Mean	Std Dev	Mean
(1)	(2)	(3)	(4)	(5)	(6)
Paddy	1908.45	863.21	463.70	249.08	5.03
Wheat	2089.45	659.16	193.76	93.58	7.12
Sorghum	727.79	228.28	161.64	48.10	4.71
Maize	1376.98	580.90	106.94	73.24	5.11
Bajra	960.46	411.89	153.48	95.84	6.79
Cotton	1913.00	1210.83	401.07	207.38	5.35
Sgrcane	7484.87	2868.48	1074.06	857.95	6.88
Jute	1718.60	854.15	525.26	174.89	5.05
Moong	573.47	168.16	106.60	56.63	4.50
Tur	1801.90	1441.26	166.26	48.32	5.60
Urad	878.55	387.65	170.66	88.46	5.12
Gram	1392.60	537.32	80.31	41.05	6.89
Gr.nut	1453.69	454.00	311.75	99.52	5.68
Mustard	2193.43	930.66	94.39	33.71	7.31

TABLE 2

Share of Wage Labour to Total Labour and Wage Earnings to Total Earnings, by Crop (1980/81-1987/88) Per Hectare, All India (percentages).

CROP	SHARE OF WAGE LABOUR	SHARE OF WAGE EARNINGS
(1)	(2)	(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
Sgrcane	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
Gr.nut	61.06	17.66
Mustard	24.30	4.13

TABLE 3

Mean Values of Incomes Earned by Cultivators and Agricultural Labourers and Wage Rates (1980/81-87/88) Per Hectare by Crop and State (at 1980/81 Prices).

CROP/STATE	REALIZED PROFIT PER HECTARE (Rs)	WAGE EARNINGS PER HECTARE (Rs)	DAILY WAGE PER WORKER (Rs)
(1)	(2)	(3)	(4)
Paddy			
A.Pradesh	1742.26	807.47	5.63
Assam	1207.98	186.28	6.40
Bihar	1578.92	321.02	4.66
Haryana	2403.19	612.87	9.54
Karnataka	3508.31	544.06	6.40
M.Pradesh	1217.36	212.08	4.81
Orissa	1191.96	351.05	3.96
Punjab	2797.87	749.99	9.24
Tamil Nadu	1952.78	1060.66	6.62
U.Pradesh	1682.48	337.30	6.01
W.Bengal	1733.73	526.31	5.42
Wheat			
Bihar	2868.68	206.44	4.25
Haryana	2106.53	214.54	9.36
H.Pradesh	1131.36	36.89	5.80
M.Pradesh	1385.84	121.67	5.23
Punjab	2247.58	344.27	9.84
Rajasthan	2741.68	119.56	7.38
U.Pradesh	2175.68	231.29	7.00
Sorghum			
A.Pradesh	299.08	174.55	4.49
Gujarat	1039.28	186.54	4.58
Karnataka	866.26	175.07	4.93
M.Pradesh	632.39	108.65	4.67
Maharashtra	713.18	202.55	4.59
Maize			
Bihar	2080.90	255.06	4.22
H.Pradesh	1238.64	29.28	5.53
M.Pradesh	762.81	99.73	4.63
Rajasthan	1630.28	76.10	6.15
Bajra			
Gujarat	1337.60	253.15	5.83
Haryana	803.92	64.70	7.56
Maharashtra	188.62	174.93	4.63
Rajasthan	675.91	43.76	6.31
U.Pradesh	1265.14	223.52	7.10

Cotton			
Gujarat	1875.58	539.20	5.91
Karnataka	3097.63	652.34	6.47
M.Pradesh	1580.07	178.70	4.22
M.Pradesh	641.93	264.30	4.15
Punjab	2263.81	467.02	8.61
Sgrcane			
A.Pradesh	7946.92	2003.89	6.48
Bihar	5931.03	410.32	4.35
Haryana	5319.62	415.25	8.40
Karnataka	11715.29	1219.41	6.80
Maharashtra	5328.97	2251.27	6.70
Tamil Nadu	8909.10	2398.94	6.88
U.Pradesh	6600.20	268.89	7.02
Jute			
Assam	1115.16	591.51	5.79
Bihar	1316.00	352.09	4.20
Orissa	2070.85	450.06	4.36
W.Bengal	2214.27	621.14	5.25
Moong			
A.Pradesh	490.19	201.49	4.52
M.Pradesh	687.60	85.87	4.70
Maharashtra	310.07	129.70	4.48
Orissa	635.00	91.25	3.77
Rajasthan	508.77	36.85	6.04
Tur			
Karnataka	1035.12	165.33	5.19
M.Pradesh	1393.41	120.50	7.00
Maharashtra	435.32	154.84	4.29
U.Pradesh	3888.23	220.58	6.68
Urad			
A.Pradesh	780.24	224.70	5.80
M.Pradesh	781.23	101.51	4.79
Maharashtra	170.40	248.51	5.05
Orissa	891.88	105.81	3.98
Tamil Nadu	1280.11	341.23	6.81
U.Pradesh	1307.54	117.50	7.17
W.Bengal	1094.83	161.67	4.46
Gram			
Haryana	1148.27	39.38	11.98
M.Pradesh	1024.20	109.47	5.24
Rajasthan	1496.73	49.27	7.39
U.Pradesh	1941.90	129.93	6.73
Gr.nut			
A.Pradesh	784.29	379.57	4.99
Gujarat	1371.02	249.94	7.13
Karnataka	1469.78	270.60	5.15

M.Pradesh	1741.34	125.47	3.89
Orissa	2008.63	311.40	3.95
Tamil Nadu	1583.26	477.97	5.20
Mustard			
Assam	959.00	93.60	5.55
Haryana	2804.77	71.59	8.87
Punjab	2419.50	131.00	7.99
Rajasthan	2596.27	60.93	7.92
U.Pradesh	2737.65	139.70	6.51

TABLE 4

Mean Values of Incomes Earned Per Cultivator and Agricultural Labourer and Wage Rates (1980/81-87/88) Per Person by State (1980/81 prices).

STATE	REALIZED PROFIT PER CULTIVATOR (Rs)	WAGE EARNINGS PER AGR.LAB. (Rs)	DAILY WAGE RATE (Rs)
(1)	(2)	(3)	(4)
A.Pradesh	1279.85	483.79	4.99
Assam	1239.22	318.16	7.76
Bihar	2002.91	246.62	4.18
Gujarat	2669.73	457.32	6.18
Haryana	4732.06	1196.34	9.42
H.Pradesh	722.29	90.88	5.68
Karnataka	2591.02	398.48	5.86
M.Pradesh	1677.61	399.33	4.93
Maharashtra	1179.13	300.80	4.70
Orissa	1619.42	491.04	3.96
Punjab	7008.02	1965.60	9.36
Rajasthan	2095.66	261.82	6.89
Tamil Nadu	1470.00	503.20	6.29
U.Pradesh	2004.14	662.00	6.62
W.Bengal	1948.44	588.60	5.40

TABLE 5

Two Stage Least Squares Estimation of the Earnings of Cultivators and Agricultural Labourers.

VARIANTS	EQUATION 2 dep var=profit/ha		EQUATION 1 dep var=wage earnings/ha	
	coeff.	t-value	coeff.	t-value
- (1)	(2)	(3)	(4)	(5)
Constant	-454.13	0.65	-376.04*	2.95
Fertlizer/ha	1.15*	4.39	0.61*	11.92
Crop Price	5.07*	4.59	x	x
Subsidy/ha	1.52*	3.79	x	x
Profit/ha	x	x	0.06*	3.01
Wage Lab.Share	x	x	8.66*	6.65
Bullock Lab/ha	x	x	0.26*	1.69
Machine Lab/ha	x	x	-0.32*	1.66
Crop Dummies				
Paddy	572.52	1.26	37.15	0.59
Wheat	754.80*	1.69	-87.22	1.33
Sorghum	-549.58	1.09	-106.89	1.35
Maize	303.75	0.57	38.19	0.51
Bajra	-15.29	0.11	198.06*	2.85
Cotton	-1063.40*	2.60	62.67	0.91
Sgrcane	6953.30*	11.21	-24.82	0.20
Jute	471.85	1.03	294.74*	4.27
Moong	-1569.00*	3.87	57.83	0.77
Tur	-394.28	0.83	154.32*	2.04
Urad	-1212.80*	2.96	43.84	0.60
Gram	-343.69	0.91	134.56*	2.18
Gr.nut	-1279.10*	3.01	37.07	0.49
State Dummies				
A.Pradesh	-399.13	0.82	-27.64	0.31
Assam	-38.67	0.08	-157.99*	1.95
Bihar	-201.49	0.43	-179.14*	2.27
Gujarat	-216.76	0.40	-222.37*	2.58
Haryana	-1950.50*	3.49	-53.17	0.56
Himachal	-68.79	0.10	40.50	0.56
Karnataka	1510.70*	3.11	-359.66*	4.13
M.Pradesh	62.76	0.14	-108.86	1.41
Maharashtra	-932.34*	1.74	-118.57	1.29
Orissa	-146.03	0.33	-39.74	0.52
Punjab	-1662.80*	2.34	-3.17	0.03
Rajasthan	9.82	0.02	34.76	0.38
Tamil Nadu	-39.00	0.07	151.24	1.51
U.Pradesh	-546.66	1.19	-138.68*	1.80
R2		0.80		0.87
N		327		327

* refers to asymptotic significance at 5 percent confidence.

TABLE 6

Elasticities at Means as Derived From Estimates in Table 5.

VARIABLES	EQUATION 1	EQUATION 2
(1)	(2)	(3)
Fertilizer Use/ha.	0.48	0.14
Crop Price	x	0.58
Subsidy/ha.	x	0.43
Profit/ha.	0.40	x
Wage Lab Share	0.99	x
Bullock Lab/ha.	0.18	x
Machine Lab/ha.	-0.07	x

END-NOTES

1. Detailed surveys of research on poverty and income distribution can be seen in Mellor and Desai (1986), Srinivasan and Bardhan (1988) and Hirway (1990). It is not that all research is based on the NSS data; dominant thoughts, though, emerge from them.

2. Literature survey on poverty and income distribution is not presented here. Instead only that aspect which is dealt with here is mentioned.

3. Several views have emerged on this subject. There are those whose find that the benefits of development trickle down to all, while others feel that the composition of growth need not always permit distribution of gains. The earlier view is mainly propagated by Ahluwalia (1978) while Griffen and Ghose (1979) and Saith (1981) find the latter to be equally important.

4. Some estimates for selected crops and 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 measure income distribution.

5. The COC data are primarily collected to fix procurement prices of agricultural commodities in India. They are highly representative of different regions and farm sizes in India.

6. Any reference to poverty or poverty line will hereafter refer to a nutritional norm of 2250 calories per adult per day. This is also the usually accepted definition of poverty in India.

7. The method of calculating incomes per person is described in section 3 later.

8. The equations estimating the relationship between the incomes of cultivators and agricultural labourers are as follows:

(i) Poverty = 44.18-0.02 Wage Income R2 = 0.46 F = 11.18 n = 15
(3.34)

(ii) Poverty = 46.18 - 0.005 Cultivator Income R2 = 0.49 F = 14.49 n = 15
(3.39)

9. 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 renteers, they may not be renteers the in 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 note 10 below and GOI (1988)), almost all agricultural workers are covered.

10. The terms cultivators and agricultural labourers are often interchangeably used with 'different/ two categories of workers'. However at all places this categorization refers to the two factors mentioned in the text.

11. Given the fact that the SS categorizes workers according to a 'principal time disposition' criterion, it is unlikely that the actual income distribution and the factor shares would be very far apart.

12. Some exceptions such maize and tur in some states exist because of sampling as well as non-sampling errors and unusually high prices of some crops in some regions in specific years.

13. The notion of small is derived from the size of the standard deviation. No tests have however been presented here since statistical distributions of variables are apriori unknown.

14. 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 the relative homogeneity across states for the same crops.

15. Very often there is a class dimension too here. 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. Small farmers often grow low value crops for subsistence. Conventional wisdom suggests that small farmers are more efficient but this is only true as far as other things are given as constant, which usually not the case.

16. Tables showing crop-specific input application are not presented here for saving on space. These are available in Acharya (1990).

17. Labour use, particularly by hired hands, appears prominently in the determination of income distribution. This aspect is discussed at length elsewhere by the author (Acharya 1991).

18. There appears to be a distinct divide the incomes of the two categories of workers between the northern and southern states. The former, mostly in the erstwhile zamindari areas, pay less than the latter.

19. The area under major crops is published by the Ministry of Agriculture annually. A triennium average has been calculated here for the years 1983-86.

20. Labour participation rates can range from 20 to 40 percent across states. The main reasons are, the differences in work participation by females and the age pyramid.

21. In some cases of-course, this is not a liberal assumption since there are farmers who hire their labour for wage most of time but their kith and kin work on family owned farms, receive proceeds from animal husbandry and take up a number of self provision activities. The household proceedings are shared by all.

22. This may sound presumptuous but the fact stays that inspite of visible landlessness there are no cases of starvation deaths or famine conditions.

23. A class based labour allocation strategy which ascertains a rise in hired labour days is itself, in a way, an income sharing mechanism.

24. Modernization aimed at raising allocative efficiency is not discussed here since researches since the sixties have shown Indian farmers to be efficient resource allocators.

25. There is a lively debate on whether human and bullock labour are competing or complementary (Vaidyanathan 1978). It is argued here that they would be competing only in those cases where a crop or an area are on the same production function. Since this is unlikely across the country, it is believed that they would be complementary.

26. Logically, irrigation should figure prominently here. However the COC data provide the actual cost incurred on irrigation only. This is a poor representative of irrigation because not only are water requirements different in each crop and region, pricing by source and region too vary extensively.

27. Attempt was made to club similar crops and areas into clusters of 5 crop groups and 5 region groups to reduce dummy variables. The results were essentially unchanged but the R2 value fell by about 10 percent in the second equation. This was deemed undesirable since the 2SLS method requires high values of R2 in equations from which predicted values of variables are generated.

28. The reduced form equation is not presented here to save space. It could however readily be deduced from table 5.

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APPENDIX

States and Crops on which COC Data are Available.

State/Crop	Years
A.Pradesh	
Paddy	81/2-83/4
Sorghum	84/5 & 86/7
Sgrcane	80/1, 82/3-84/4 & 86/7
Moong	81/2-84/5
Urad	81/2-84/5
Gr.nut	81/2-83/4
Assam	
Paddy	81/2-86/7
Jute	81/2-86/7
Mustard	81/2-86/7
Bihar	
Paddy	80/1-83/4
Wheat	81/2-83/4
Maize	81/2-83/4
Sgrcane	81/2-83/4
Jute	81/2-83/4
Gujarat	
Sorghum	81/2-83/4
Bajra	81/2-83/4 & 86/7
Cotton	81/2-83/4
G.nut	80/1-83/4
Haryana	
Paddy	84/5-86/7
Wheat	81/2-87/8
Bajra	81/2-86/7
Sgrcane	81/2-86/7
Gram	81/2-87/8
Mustard	80/1 & 84/5-87/8
H.Pradesh	
Wheat	81/2-83/4
Maize	81/2-83/4
Karnataka	
Paddy	81/2-86/7
Sorghum	80/1-83/4
Cotton	81/2-83/4 & 85/6
Sgrcane	81/2-85/6
Tur	81/2-83/4
G.nut	81/2-83/4 & 85/6-86/7
M.Pradesh	
Paddy	81/2-86/7
Wheat	81/2-86/7
Sorghum	81/2-86/7
Maize	81/2, 83/4, 85/6-86/7
U.Pradesh (continued)	
Gram	81/2-84/5
Mustard	82/3-86/7
W.Bengal	
Paddy	81/2-84/5
Jute	80/1-86/7
Urad	84/5

State/Crop	Years
Cotton	81/2-86/7
Moong	81/2-86/7
Tur	81/2 & 84/5-85/6
Urad	81/2-86/7
Gram	81/2-86/7
G.nut	80/1
Maharashtra	
Sorghum	81/2-83/4 & 86/7
Bajra	81/2-82/3
Cotton	80/1-83/4
Sgrcane	82/3-83/4
Moong	81/2-82/3
Tur	81/2-82/3
Urad	81/2-82/3
Orissa	
Paddy	81/2-84/5 &86/7
Jute	81/2-83/4 & 85/6-86/7
Moong	81/2-86/7
Urad	84/5-85/6
Gr.nut	84/5-86/7
Punjab	
Paddy	81/2 & 84/5-86/7
Wheat	82/3-87/8
Cotton	80/1-86/7
Mustard	87/8
Rajasthan	
Wheat	82/3-87/8
Maize	82/3-83/4 & 85/6
Bajra	81/2-83/4
Moong	81/2-83/4
Gram	81/2-86/7
Mustard	81/2 & 83/4-86/7
Tamil Nadu	
Paddy	80/1-81/2
Sgrcane	81/2-83/4
Urad	81/2-82/3
Gr.nut	81/2-83/4
U.Pradesh	
Paddy	81/2-83/4
Wheat	81/2-83/4 & 85/6-86/7
Bajra	81/2-86/7
Sgrcane	80/1-82/3 & 84/5-86/7
Tur	84/5-86/7
Urad	84/5-86/7