

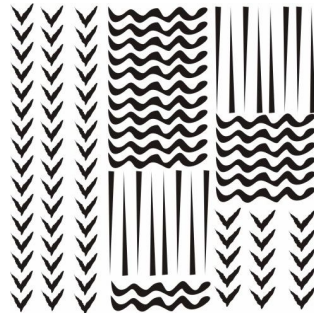
DRAFT PAPER

**ESTIMATION OF RURAL HOUSEHOLD INCOMES IN
INDIA: SELECTED METHODOLOGICAL ISSUES**

Vikas Rawal Jawaharlal Nehru University

**STUDYING VILLAGE ECONOMIES IN INDIA
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ESTIMATION OF RURAL HOUSEHOLD INCOMES IN INDIA: SELECTED METHODOLOGICAL ISSUES

Vikas Rawal, Jawaharlal Nehru University

1. Introduction

In this note, we discuss major conceptual issues and present main features of the methodology used for calculation of household incomes for households in villages surveyed as part of the Project on Agrarian Relations in India of the Foundation for Agrarian Studies (FAS-PARI). The note does not aim to provide a comprehensive discussion of methodology of income calculation used in FAS-PARI.

India does not have any official statistics on rural household incomes (except a recent limited attempt as part of the Situational Assessment Survey conducted by the NSSO). India has detailed official statistics on farm incomes, employment, wages, debts and assets. Concepts used in data collection and estimation of these statistics, most notably for the estimation of farm incomes, provide useful inputs for developing a methodological framework that can be utilised, with some modifications, in calculation of rural household incomes.

There have been some studies of rural incomes in India by independent scholars and groups. These include the ICRISAT studies (Walker and Ryan, 1990, Deb *et. al.* 2002), the NCAER surveys (Lanjouw and Shariff, 2002), Farrington, *et. al.* (2006), Bhaumick (2007), Vatta and Sidhu (2007) and Vatta and Garg (2008). Most of these, however, either do not adequately specify the methodology used for estimating incomes or are fraught with serious methodological problems.¹

Section 2 of this note discusses some definitional issues. Section 3 discusses the classification of sources of income used in FAS-PARI. Section 4 discusses some issues related to data collection for estimation of rural incomes. Section 5 discusses selected issues related to valuation. Section 6, which is yet to be written, will discuss some illustrations of the kinds of insights statistics on rural incomes generated through village studies can provide.

¹ See Rawal, Swaminathan and Dhar (2008) for a discussion of methodological problems in estimates of incomes in some of these studies.

2. Definitional Issues

2.1 Income as a derived variable

A large number of rural households are self-employed, particularly in crop production but also in a variety of non-agricultural occupations. Most such households do not maintain any accounts. Accounting for these activities is very complex particularly because a substantial part of the produce is not marketed and a large part of the inputs used in the process of production are also not purchased from the market. For some of these products and inputs, in fact, either no markets or only very thin markets exist. As a result, because of complexities of valuation, even if, on a rare occasion, a household maintained some rudimentary accounts, such an account is likely to be partial and would not provide a summary estimate of the household's income.

To sum, most rural households are unable to directly report their incomes. As a result, in the context of rural households, it is necessary that income be treated as a derived variable. That is, one cannot directly ask the households what their income over the specified reference period was. Income has to be derived on the basis of a detailed accounting of output and costs in the economic activities that the household was engaged in. To achieve this, detailed data have to be collected on input use and production particularly in activities like crop production and animal husbandry.

2.2 Time period

Given that income is a flow variable, it has to be estimated for a uniformly specified period. In contrast, stock variables – like assets or debt – are valued at a specified instant (for example, at the time of the survey).

For the most important rural economic activities, there tends to be an annual production cycle. It would, therefore, be reasonable to estimate income for a period of one year. Since agriculture is the most important economic activity in rural areas, it is useful to take a full agricultural year as the reference period for estimation of income from crop production.

It may, however, be noted that estimation of income for a period of one year becomes problematic when the production cycle is longer than a year or when the returns from some investment made at a point of time are obtained for more than one year. This happens, for example, for perennial tree crops, ratoon crops, and for other crops whose crop-cycle is longer than a year. There are also corresponding parallels in non-agricultural activities.

2.3 Household as a unit of estimation of incomes

A household has to be considered as the basic unit for estimation of incomes. In the official statistics in India (for example, the Census of India and the NSSO surveys), a household is defined as persons normally residing together (under the same roof) and normally taking food from the same kitchen. In the FAS-PARI surveys, we stick to this definition of household for the sake of comparability with official statistics.

Using household defined thus as the unit for estimation of income poses some challenges.

First, there often are members of a family who are not a part of the household (because they do not live in the same house/eat from the same kitchen as rest of the family) but contribute substantially to the income of this household. In some cases, such contributions can be treated as remittances. However, this can be inaccurate in some other cases. Take the example of a member of a household who worked as a truck driver. This person did not normally live in the same house or normally eat from the same kitchen as he was mostly on the road. But the person was not part of any other household either and, in fact, contributed all the income over and above what he consumed while working towards maintenance of this household. Should such a person be considered as part of this household and his entire earnings as income of this household? Or should such a person not be considered a part of this household, and what he contributed to this household be treated as remittances?

Secondly, there are many cases where more than one household jointly undertakes an economic activity. One often encounters a situation where an extended family is not fully partitioned and, although members of this family normally eat from two or more

different kitchens, their economic activities are carried out together. In such cases, division of income between such households becomes arbitrary.

In FAS-PARI surveys, starting from the 2008 round (Madhya Pradesh), we have decided to treat such households as joint households rather than attempting to divide their assets and income on some pre-determined (and often arbitrary) criteria. A joint household is defined as one “whose members generally belong to the same family, live together in the same building or group of buildings, carry same production tasks together and jointly own a substantial part of their assets. In a joint household, the individual nuclear families do not eat from a common kitchen.”

It may be noted that all data are collected in the survey on single households. In the survey, investigators write detailed notes if the household shares assets with another household or if they cultivate their land jointly. At the stage of data entry, these households are combined into a joint household, and data for it are entered as a single economic unit. For such households, notes are written when some information pertains to a specific nuclear family within the joint household rather than the entire household.

3. Classification of Sources of Incomes

Incomes of households in the FAS-PARI villages are estimated separately for following sources.

1. Crop production
2. Animal resources (including rental income from animals)
3. Wage labour
 - (a) Agricultural labour (casual)
 - (b) Agricultural labour (long-term)
 - (c) Non-agricultural labour (casual)
 - (d) Non-agricultural labour (monthly/long-term)
4. Salaried jobs
 - (a) Government salaried jobs

- (b) Other salaried jobs
- 5. Business and trade
- 6. Money-lending
- 7. Income from savings in financial institutions and equity
- 8. Pensions and scholarships
- 9. Remittances and gifts
- 10. Rental income
 - (a) Rental income from agricultural land
 - (b) Rental income from machinery
 - (c) Rental income from other assets
- 11. Artisanal work and work at traditional caste calling
- 12. Any other sources

4. Data collection

Data for estimation of incomes of rural households can be collected through a survey or through what is called the cost accounting method. In the survey-based method, data on production and input use are recalled by the respondents. In the cost accounting method, an investigator interacts with the household over the entire reference period. The investigator records information as and when costs are incurred, and as and when production is actually obtained.

The cost accounting method, if implemented rigorously, is expected to give more accurate information. Farm Management Studies in India, which collected data using both the survey method and the cost accounting method, found that the cost accounting method gave more accurate data (Surjit 2008, p. 36). Implementation of the cost accounting method is, however, extremely resource intensive. In the survey method, on the other hand, the resource requirements (and level of accuracy) are lower but tend to depend on the frequency of surveys and the level of disaggregation at which data are collected.²

² In fact, it may be argued that the cost accounting method is nothing but a survey in which data are

Data for the Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in India (CCPC Scheme) are designed to be collected through the cost accounting method “under which daily entries of debit/credit for the expenditure/income are made in order to assess the total cost incurred/benefit accrued by/ to each farmer covered under the scheme” (<http://dacnet.nic.in/eands/coc.htm>). It has, however, been reported that, in practice, the investigators visit the households once or twice a fortnight and collect data (Sen and Bhatia 2004, Surjit 2008). This would imply that, in practice, the data are collected through surveys repeated at short intervals. It may be expected that over such short period the recall errors are likely to be either abset or small.

In view of the fact that the cost accounting method requires much greater human and financial resources, the FAS-PARI surveys are designed as annual one-time surveys. Therefore, data on variables that go into calculation of income are based on recall by the respondent. However, to minimise errors and facilitate better recall by the respondents, specfic and appropriately disaggregated information is collected in the FAS-PARI survey.

It has been our experience that respondents give poor and inaccurate answers when the questions are vague and inappropriately formulated. Respondents also find it difficult to provide precise answers if they are required to disaggregate or aggregate information before coming up with the appropriate answer. Let me illustrate this with a few examples.

In FAS-PARI surveys, data on labour use in crop production are collected separately for each individual crop and for each crop operation. Instead, if the respondents were asked how many days of hired labour were used over the whole process of production of a particular crop, they would be required to add extent of labour use for individual operations before answering the question. Such a question gets an inaccurate answer.

Before starting the survey, a list of crop operations is prepared for all the crops grown in the village in consultation with a few key informants. While preparing this list, care is taken to separately list all operations that are usually undertaken separately. If, for example, in a village, ploughing and levelling are usually done together, one after another,

collected repeatedly at very short intervals of time so that there are no recall errors.

they are listed together as “ploughing and levelling”. If, on the other hand, the two operations are usually done separately, either on different days or through different contracts, they are listed separately as two different operations.

In sum, care is taken to neither over-aggregate the operations nor over-dis-aggregate them. During the survey, the investigators ask the nature and extent of labour use for each operation listed for the crop.

Similarly, agricultural workers are not asked how many days of agriculture labour did they do over the last year. They are, instead, asked how many days did they work in each single crop operation. The investigators go through the entire list of crops cultivated in the village and ask, for each crop, details on work done on every single crop operation. It has been our experience that such a disaggregation aids recall by the respondents and usually gets better answers.

5. Valuation issues

5.1 Valuation of own labour and capital

It is important to flag the issue of valuation of family labour and capital (land and other) owned by the household. I will, however, not discuss this in any detail because it has been discussed at length in both the documents of the Farm Management Studies as well as the CCPC Scheme. The two Review committees of the CCPC Scheme have also dealt with these issues at length.³

In the FAS-PARI estimates of income, we do not impute cost of family labour, rental value of owned land, or rental value of owned non-land capital. For estimating income from crop production, we calculate net income over Cost A2.⁴ Similarly, cost of family labour and rental value of own capital are not imputed in estimation of income from

3 See Sen and Bhatia (2004) and Surjit (2008) for a detailed review of discussion of these issues in the context of the Farm Management Studies and the CCPC Scheme.

4 Cost A2 includes cost of hired labour, cost of owned and hired animal labour, cost of owned and hired machinery, value of home produced and purchased seeds, value of plant protection chemicals, value of home produced and purchased manure, value of all fertilisers used, depreciation of fixed capital, irrigation charges, land revenue, interest on working capital, rent paid for leased in land, and any other paid out expenses. See Sen and Bhatia (2004) and Surjit (2008) for details.

other sources either.

5.2 Using appropriate prices

One of the most fundamental and tricky problem in estimation of rural household incomes is that of finding appropriate prices for valuation of inputs and produce. A number of inputs used in the process of production are not purchased from the market, and a number of commodities that are produced are not sold. For some of these commodities, either very thin or no markets exist.

Such problems typically arise for

- A) Main products of crops that are predominantly or entirely subsistence crops.
- B) By products (of crops) used as fodder or fuel
- C) Home produced inputs such as seeds and manure
- D) Kind payments of wages (grain, straw, cooked food)

5.3 Inter-relationships between activities

Another problem to be dealt with in calculation of household income is that different economic activities of households are inter-related. There are two common types of inter-linkages.

5.3.1 Products of one activity used as input in another

The first type of inter-linkage is where products from one economic activity are used as an input in another economic activity. For some of these commodities, only very thin markets exist and prices in such markets do not truly reflect the value that the households assign to such products.

The two most common cases of such inter-linkages are:

- A) Use of crop by products as fodder for maintaining farm animals
- B) Use of dung obtained from animals as manure on land

Table 1 shows that very few households in the FAS-PARI villages purchased dung manure and sold major types of dry fodder used in the villages (Table 1).

Table 1. *Number of households that purchased dung manure and sold straw*

| Village | Number of households that purchased dung manure | Number of households that sold the major types of dry fodder | Number of cultivator households | Total number of households |
|------------------|---|--|---------------------------------|----------------------------|
| Ananthavaram* | 17 | 28 (Paddy) | 94 | 152 |
| Bukkacherla* | 9 | 12 (Groundnut) 2 (Paddy) | 72 | 99 |
| Kothapalle* | 11 | 3 (Paddy) 1 (Maize) | 47 | 101 |
| Warwat Khanderao | 18 | 22 (Jowar) | 183 | 250 |
| Nimshirgaon* | 14 | 3 (Jowar) | 71 | 138 |
| Harevli | 19 | 5 (Wheat), 1 (Paddy) | 72 | 112 |
| Mahatwar | 1 | 11 (Wheat), 3 (Paddy) | 102 | 154 |

Note: * Number of households in the sample

It may be noted that these items enter as output in one economic activity and as cost in the other. In case of households which use all the straw as fodder in the same year, an exactly same amount is entered as value of straw in output of crop production and as value of home produced fodder in the cost accounts of animal husbandry. Similarly, for households that use all the dung as manure within the same year, an exactly equal amount is entered in the value of by products of animal husbandry and in the value of home produced manure in the cost accounts of crop husbandry. For such households, these entries are cancelled out in the overall household income balance and therefore the prices used for these commodities do not affect the overall household income. The prices used, however, do influence income from individual economic activities. For households that do not use these commodities entirely within the same year, the values do not cancel out even across activities. This is common in villages where rabi crops like wheat are the major source of dry straw. In such villages, wheat straw produced from the rabi crop of the previous agricultural year is used as fodder over the next year.

In a situation where market for fodder and dung manure is thin, and most households do not buy these commodities, we have to use a normative price lower than the market price for valuing these commodities. In the 2006 round (Andhra Pradesh and Uttar Pradesh) FAS-PARI villages, the home grown manure was valued at 50 per cent of the market price and straw, when consumed at home, was valued at 50 per cent of the market price.

5.3.2 Common inputs and joint costs

The second type of inter-linkage arises when a particular input is shared by multiple activities.

For example, a farm servant may be used for agricultural tasks as well as for tending cattle. In such a case, wages paid to the farm servant have to be divided between crop and animal husbandry.

Similarly, bullocks and tractors may be used for draught power for agricultural tasks as well as for transporting miscellaneous commodities including fodder.

In the context of farm business incomes, there are two types of joint costs. First, interest and depreciation costs of fixed capital are common to all crops and therefore have to be divided between individual crops. Secondly, almost all items of costs (other than seeds and cost of labour used for a few specific operations) are shared in case of inter-crops and mixed crops (Surjit, 2007).

There are three variables that could be used for apportioning of joint costs between individual activities/crops: time for which the input has been used in different activities, gross value of output of different activities, or (in respect of common costs in crop production) the area under different crops.

In the context of joint costs in crop production, the Special Expert Committee on Cost of Production Estimates (1980) observed that

Joint costs comprise of interest and depreciation on such diverse items like bullocks, farm implements and machinery and farm buildings as well as rent, land revenue, cesses and taxes. The basic principle generally accepted is to allocate these costs on the basis of use. Thus, interest and depreciation of crop-specific fixed capital items should be charged to the concerned crop and, where two or more crops are involved, the allocation should be done in proportion to the use of the equipment..... The allocation of depreciation and interest on farm buildings such as cattle-shed, tractor shed etc. pose no problem as they have identifiable uses. However, farm building used as implements shed, or for storage of fertilisers and other similar inputs may pose problem of allocation based on use. The committee is of the view that, in general, the allocation should be on the basis of use. The final costs are not likely to be affected significantly even if estimation of use-time contains some margin of error. However, if it is not possible to determine the use-time, for that part only, the cost may be allocated on the basis of value of gross produce (GOI, 1980, p.19 cited in Surjit 2007).

In most of these cases, it is almost impossible, at least in a survey, to collect information on the amount of time spent by the worker or the machine in different activities. On the other hand, use of either gross value of output or the area under different crops for inter-division of costs can be problematic because neither truly represents the proportion of time for which long-term workers or machines may have been used in the activity.

Despite recommendations of the Special Expert Committee, the CCPC scheme continues to use area under different crops for apportioning joint costs among individual crops. In case of mixed- and inter-crops, costs are apportioned in terms of gross value of output because of difficulties in measurement of area under individual crops (Surjit, 2007).

The problem of apportioning joint costs becomes even more complex when the objective is to estimate rural household incomes and not merely farm business incomes.

In calculating rural household incomes for FAS-PARI households, we use different methods of apportioning different types of costs. A few examples are provided here for illustration.

13. Cost of long-term labour. Cost of long-term labour has to be apportioned across economic activities in which they are engaged using gross income. The share allocated to crop husbandry has to be further apportioned across crops. Typically, the extent of use of long-term labour (in days) is under-reported in the block on labour use in crop production in the survey schedule. In villages where substantial long-term labour is used, we do case studies to obtain norms on the days of work of long-term workers in different crops. These norms are used to apportion cost of long-term labour across crops. In villages where only a few households hire long-term workers and such norms are not available, we apportion cost of hiring of long-term workers across crops in proportion of the reported days of labour deployment of long-term workers in different crops (as reported in the survey schedule). This is, however, reviewed on a case-to-case basis.

14. Annual expenses related to irrigation (electricity charges, maintenance of irrigation equipment) are apportioned in proportion of the gross value of output of irrigated crops.

15. Annual expenses related to machine labour (maintenance of machinery) are apportioned across different activities (for example, renting and crop production) and then between different crops. Costs are apportioned across different activities in terms of gross value of output. The total expenditure for crop production is further apportioned between different crops in proportion of either use time or area. For example, maintenance cost of threshing machine used in more than one crop is apportioned in terms of the time for which it was used in different crops. On the other hand, if land preparation in a particular season is done simultaneously on the entire land and then different crops are sown on it, the cost of land preparation should be apportioned in proportion of area under different crops and not in proportion of gross value of output.

In the FAS-PARI calculations, cost of cultivation and net income of inter-crops and mixed crops are estimated jointly. However, since gross values of output are available for individual crops, if required, the costs and net income could be divided in that

proportion.

Also, the estimates are made for separate crops (or crop mixes) and there is no marker in the income calculation worksheet for identification of crop sequences in the data. This is because it is not always possible to separately estimate costs and incomes of individual plots. However, we do separately map the crop cycles and, with some limited assumptions, it would be possible to estimate profitability of alternative crop cycles from the FAS-PARI data.

5.4 Calculation of Interest Cost in Crop Production

Since inception of the CCPC scheme, interest payments on all working capital are computed at 12.5 per cent per annum interest rate for half the duration of the crop. It needs to be noted that cost A2 includes interest over entire working capital and not merely over borrowed working capital. It is assumed that the expenditure is distributed evenly over the entire crop duration and, therefore, interest calculated for half of the crop duration gives interest cost valued at the end of the crop season.

The Special Expert Committee on Cost of Production Estimates (1980) had suggested that a weighted average period be calculated for each crop from the survey data on expenditure incurred in different months. The Committee also suggested use of a weighted interest rate calculated on the basis of short-term loans actually taken by sample farmers.

It may be noted that using the weighted average interest rate, unless estimated separately for different classes of households, can be problematic. If there are differences in cost of borrowing across different classes of farmers, using a weighted average interest rate over all sample farmers would introduce a bias in the estimates. Take for example, a village in which rich peasants and landlords predominantly use formal-sector credit while middle and poor peasants predominantly depend on informal sources of credit. Using a weighted average interest rate would result in over-estimating the cost of production of rich peasants and landlords and under-estimating the cost of production among middle and poor peasants. This becomes particularly problematic because interest cost is estimated not only for borrowed capital but also for own capital.

On the other hand, it may be noted that interest on working capital, calculated within the reasonable range of interest rates and over half the duration of crop, constitutes a relatively small share of cost A2 for most crops. Even if one used an interest rate of 3 per cent per month instead of 12.5 per cent per annum used in the CCPC scheme, we will get about 4.5-6 per cent of working capital as the interest cost for short duration crops like paddy and wheat. Given this, use of a uniform interest rate over half the duration of the crop has the advantage of simplicity.

In view of comparability with the methodology used in the CCPC scheme and the relative simplicity of the method, estimates of cost A2 for households in FAS-PARI villages include interest cost valued at 12.5 per cent per annum on entire working capita for half the duration of the crop.

5.5 Calculation of Depreciation Cost

5.5.1 Depreciation of Farm Machinery

For FAS-PARI income calculations, we use the same method for calculation of depreciation of farm machinery as the one used in the CCPC scheme. Table 2 presents rate of depreciation, total life and salvage rate used in the CCPC scheme and the FAS-PARI income calculations. Following formula is used to calculate depreciation.

Annual depreciation = (Present value of the asset - salvage value)/Remaining life

Table 2. *Item wise rate of depreciation, total life and salvage rate used for calculating annual depreciation*

| Item | Rate of depreciation | Total life (in year) | Salvage rate |
|----------------------|----------------------|----------------------|--------------|
| Tractor | 10% | 10 | 10% |
| Iron tools | 20% | 5 | 20% |
| Wooden tools | 50% | 2 | 20% |
| Draught animals | 10% | 10 | 10% |
| Well | 10% | 10 | 10% |
| Pipes for irrigation | 20% | 5 | 20% |

5.5.2 Appreciation and Depreciation in Value of Farm Animals

In estimating of gross value of output from animal resources, we need to incorporate capital gain on account of appreciation of value of young bovines and ovines. Correspondingly, we also need to account for depreciation in value of adult animals. Over the years, as animals age, their value depreciates and the households have to spend on buying new animals. Depreciation in value has to be accounted as part of the cost of maintenance of animals. In case of draught animals, depreciation has to be included in estimates of cost A2 of crop production.

In the CCPC scheme, depreciation of draught animals is estimated using age of animals.

For households in FAS-PARI (Round 2007) villages, appreciation and depreciation in value of different types of calves and adult animals was calculated on the basis of their reported value. We collected information on value of different types of cattle for different years of age from key informants and combined it with data on livestock values collected through household survey to prepare a table of standard values of appreciation and depreciation of different types of animals. These tables have been used for calculation of appreciation and depreciation in value of different types of cattle in FAS-PARI 2007 villages. Table 3 shows illustrative values of appreciation in values of calves and depreciation in values of adult animals in Nimshirgaon (Kolhapur, Maharashtra).

Data on age of animals were collected in 2008 round of FAS-PARI. From this round onwards, we shall use age of animals along with reported value for estimation of appreciation and depreciation of farm animals.

Table 3. Norms used for depreciation and appreciation in value of farm animals, Nimshirgaon

A. Adult female bovines

| Present value of animals (Rs.) | Depreciation in value (Rs.) | | |
|--------------------------------|-----------------------------|------------|--------------|
| | Buffalo | Cow (desi) | Cow (Jersey) |
| 1500-3000 | 500 | | |
| 3001-5000 | 1000 | 500 | |
| 5001-7000 | 1500 | 1000 | |
| 7001-10000 | 1500 | 500 | 1000 |
| 10001-15000 | 2000 | | 2000 |
| 15001-35000 | 1000 | | 1000 |

B. *Male calves*

| Present value of animals (Rs.) | Appreciation in value (Rs.) | | |
|--------------------------------|-----------------------------|------------------|--------------|
| | Cow calf (desi) | Cow calf (Jersy) | Buffalo calf |
| 0-1000 | Reported value | Reported value | 500 |
| 1001-3000 | 1500 | 1000 | 750 |
| 3001-5000 | 2000 | 1500 | |
| 5001-8000 | 3000 | | |

C. *Female buffalo calves and female cow calves (Jersey)*

| Present value of animals (Rs.) | Appreciation in value (Rs.) |
|--------------------------------|-----------------------------|
| 0-2000 | Reported value |
| 2001-5000 | 2000 |
| 5001-8000 | 3000 |
| 8001-10000 | 4000 |
| 10001-12000 | 5000 |
| 12001-15000 | 6000 |

D. *Female cow calves (Desi)*

| Present value of animals (Rs.) | Appreciation in value (Rs.) |
|--------------------------------|-----------------------------|
| 0-1000 | Reported value |
| 1001-2000 | 1000 |
| 2001-4000 | 1500 |
| 4001-6000 | 2000 |

6. Studies of Household Incomes through Village Surveys: Experience of FAS-PARI

7. Concluding remarks

India does not have a system of collection of statistics on rural household incomes. As part of the Project on Agrarian Relations in India, we have attempted to develop a framework for estimation of household incomes. In this note, we have discussed some of the major methodological issues in estimation of household incomes. These, we believe, would be of general interest to scholars interested in studying incomes in different parts of rural India.

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