RESEARCH ARTICLE

The Evolution of Farm Income Statistics in India: A Review

V. Surjit*

Abstract: This article reviews studies on farm business incomes in India from the colonial period to the present with a focus on the evolution of methodology and process of estimation of farm incomes, and classifies the development of such studies into four phases. Concepts and definitions of costs of cultivation are investigated as these have significant implications for the study of crop incomes, and determine the suitability of data sources for studying the economics of household farming.

Keywords: Farm Management Studies, crop incomes, farm income, India, cost of cultivation surveys, Cost of Cultivation of Principal Crops, village studies, Settlement Reports.

Introduction

A large majority of the population in India is directly or indirectly dependent on agriculture and allied activities for its livelihood. Transforming the agricultural sector would help to achieve the targets set out for poverty reduction in the Sustainable Development Goals of the United Nations. Such a transformation requires the development and implementation of appropriate strategies, and an in-depth analysis of the nature and characteristics of the conditions of agricultural production. A well-designed and robust statistical system that provides data and information on aspects of agricultural production systems and analyses input-use patterns and returns from cultivation is also critical. Such a system should also reflect the socio-economic and agro-ecological diversity of agricultural production systems in the country. Further, it is important to have detailed estimates of costs, returns realised, and net incomes from farming in order to formulate appropriate farm policies and study the impact of various policy measures on cultivators.

This article reviews the evolution of methods to study the costs of cultivation of crops and farm incomes in India from the colonial period. It focuses on crop

* Scientist (Economics), International Crops Research Institute for the Semi-Arid Tropics, vsurjit@gmail.com

production, and does not include statistics on animal resources or horticultural production systems.

Phases in the Study of Cost of Cultivation

In a study on pre-Independence research in agricultural economics, Rath (1960) identified four phases, from the setting up of the East India Company up to the 1940s.[1] In the first of these four phases, which lasted until 1858, information was mainly gathered from travelogues and documents relating to Survey and Settlement Reports. In the second phase, lasting from 1859 to 1880, reports were prepared on enquiries into famines and the Deccan riots. The third phase covered the period from 1880 to 1912–16, and included several District Gazetteers, Irrigation Commission Reports, and Voelcker's study on the problems of Indian agriculture (Voelcker 1893). During the final phase, extending from 1912–16 to 1939–40, village studies were carried out to study specific problems pertaining to different regions.

In this article, we identify four historical phases in the study of the economics of farm management in India, corresponding to four types of studies with regard to methodology followed, cost concepts used, geographical extent, representation of different farm systems across regions, and comparability across space and time (Surjit 2008).[2]

The first phase lasted till the first decade of the twentieth century, when information on costs and returns were mainly available in Settlement Reports for different regions of the country. The second phase began in the 1910s and continued till the early 1950s, when various aspects of the cultivation of crops were studied as part of village studies conducted in different parts of the country. The third phase, from early 1950 to 1970–71, saw the beginning of large-scale surveys, particularly the Farm Management Studies, spread across different regions at different points of time. The fourth phase, from 1970–71 onwards, began with the Comprehensive Scheme for the Study of Cost of Cultivation of Crops, which collected in-depth data on various aspects of the farm economy across major States in India on an annual basis.

In the early 2000s, the NSSO undertook a nationwide survey to study the returns from farming and the income levels of cultivators, in order to understand the welfare status of cultivators. The NSSO has conducted two rounds of these surveys: the Situation Assessment Survey of Farmers (59th round) in 2003 and the Situation Assessment Survey of Agricultural Households (70th round) in 2013. These surveys are not discussed here (see Sarkar 2017).

[1] Rath (1960), cited in Shah (1971), p. 2.

[2] Although we have classified the different types of studies into four broad historical phases, there is no rigid demarcation between these phases, as studies in one phase often carry over into the next one. For example, in some regions, Survey and Settlement Reports continued till 1940. Village studies in different parts of the country continue to make substantial contributions to the study of the farm economy.

In addition to large-scale surveys, some scholarly studies of this period have addressed issues related to levels of and trends in farm incomes (Madalgi 1970; Chand, Saxena, and Rana 2015). These studies have adopted methodologies that try to overcome constraints on the availability of data on relevant variables at desired levels of disaggregation. In a recent study, Chand, Saxena, and Rana (2015) estimated farmers' incomes from agriculture over three decades, from 1983–84 to 2011–12, at the national level. They use a methodology for estimation of farm income at the national level that combines data from national accounts statistics, published and unit-level data from various rounds of the NSSO on employment and unemployment, and Rural Labour Enquiry Reports. Farm income is derived by deducting the wage bill for hired labour (agriculture and allied sectors) from the net domestic product (NDP) of agriculture and allied sectors. Trends in the incomes of cultivators, agricultural labourers, and non-agricultural workers over this period, and disparities between the agriculture and non-agriculture sectors, were calculated from the estimates.

The First Phase: Settlement Surveys

The main source of information on farm management until the first decade of the twentieth century was the cost of cultivation estimates that were made as part of the Settlement Records maintained by British administrators. In order to make settlements, the British collected information on land value, yields of crops, gross produce from cultivation, and costs and expenses incurred in cultivating land. The objective of collecting such information was to calculate the "net asset" (in *zamindari* areas) or "net produce" (in *ryotwari* areas) from various types of land, with a certain proportion of this "net asset" or "net produce" being fixed as the revenue to be paid to the government (Ray 1915). The method and year of settlement varied, of course, across different regions of the country. Bengal Presidency came under a permanent settlement, while other parts of British India were under different types of temporary and permanent settlements.[3]

One of the earliest efforts to study the economics of farming as a part of the settlements was made by Colonel Read, who investigated the systems of cropping and costs of cultivation of crops in Baramahal in 1792–1800 (Thomas and Sastry 1939, p. 2; Thomas and Ramakrishnan 1940, p. xi).[4] The settlement surveys started with a topographical survey of the territory, followed by a demographic and economic survey. The surveys yielded information on production from different types of land,

[3] Although a large part of the Madras Presidency was under the *ryotwari* system, some areas, where land was in the possession of *zamindars*, were permanently settled. Ray (1915, p. 60) noted that under the permanent settlement, "the assessment [was] fixed at two-thirds of half the gross produce estimated on an average of the previous thirteen years. That is to say, half the produce was left to the cultivator, one-sixth was to be the *zamindar's* share, and the remainder, two-sixths, was the Government revenue."

[4] Baramahal covers roughly the present district of Dharmapuri in Tamil Nadu.

prices of produce, average expenditure on cultivation of crops, wages of labour in cash and kind, and accounts by the families of cultivators in the region.[5] General rules were framed for the conduct of these surveys and sent to District Collectors for approval. However, "although the rules and instructions framed by Munro were transmitted to each Collector for his guidance, no two Collectors executed the survey in the same manner."[6] Mukherjee (1962, p. 143) noted:

> From the study of the methods of Ryotwari survey, as it was executed in different districts before the temporary breakdown of the system, the fact remains that it was not done on a uniform principle. The details of the Ryotwari survey varied from district to district according to the views and capacity of the Collectors . . . Every change of Collector was followed by a change of methods.

Assessing the revenue to be collected from *ryotwari* areas meant carrying out detailed surveys of individual fields, which were then classified on the basis of soil and grain produced (Ray 1915). The grain output from each field was converted into value terms, using the average price for an extended period of time (*ibid.*).[7] From this gross value of produce, the cost of cultivation was deducted to calculate the net produce from individual plots (*ibid.*). Describing the methods followed in calculating the cost of cultivation, Ray observed:

> The items of cost of cultivation included in the estimate are (1) ploughing cattle, (2) agricultural implements, (3) seed, (4) manure, and (5) labour required for ploughing, sowing, reaping, etc. . . . The method of calculation varies according to the description of crops grown, the method of cultivation, as well as according to the mode in which these items are paid in each district. . . . The payments made in grain [for the inputs used] are converted into money at the commutation price adopted for settlement. The cost of bullocks and of the implements of husbandry is distributed over the number of years during which they are estimated to be serviceable, and the other items are calculated for each year. (Ray 1915, p. 74)

On further analysis of the estimation of cost of cultivation, Ray pointed out certain problems with the methodology for calculating the cost of cultivation. According to him:

> Calculations are first made for the area which can be cultivated with one plough and one pair of bullocks, and the required calculations for an acre are deduced from them. The usual practice is to work out the expenses for the best soil, and then to diminish this standard proportionately according to the quality of the soil. This method is open to objection on the ground that the cost of cultivating poor soils is greater if a maximum yield is sought there than from superior soils. (*Ibid.*)

[5] Captain Read to Lord Cornwallis: Baramahal Records, July 1, 1793, cited in Mukherjee (1962), p. 127.
[6] Minute of Cochrane, December 8, 1820: General Reports of the Board, January 4, 1821, cited in Mukherjee (1962, pp. 148–9).
[7] Generally, the average price was the average of prices that prevailed in the 20 years (excluding famine years) preceding the settlement year.

In Bombay, too, land settlements were based on estimates of profits from agriculture, as estimated by Robert Keith Pringle, a civil servant, in 1828.[8] For the settlement surveys carried out in Bombay, Pringle calculated the net produce from different classes of soil by deducting the cost of cultivation from the gross produce (Gordon 1917). According to Gordon:

> The cost of cultivation was calculated in the most extraordinary detail, including not only the expenses of the labour, seed, bullock, etc., but also such items as insurance against loss of cattle, fees to artificers and even the cost of propitiating the local deity at harvest time. So minute in fact were these enquiries that some of the *kaifiats* as they were called, ran into rolls of paper 30 yards in length. The average gross produce was then converted to money at an average of prices for past years, and the net produce found by deducting the cost of cultivation. (Gordon 1917, p. 29)

Although a detailed calculation for estimating the gross value of produce, cost of cultivation, and the net produce was followed by Pringle, the system did not work well. As Gordon pointed out:[9]

> The assessments could never be collected and the old system of annual remissions with all their attendant evils came into force. Further, the survey itself was found very defective and vitiated by fraud; in fact, several of Mr Pringle's subordinates were criminally prosecuted and convicted. (*Ibid.*)

In regions under permanent settlement, information was gathered to assess "net assets" by deducting the cost of cultivation, making allowances for regional characteristics, and taking into account seasonal variations from gross produce.[10] Surveys carried out as a part of settlement operations in the permanently settled regions also enquired into the economic and material conditions of people in these regions (GoB 1916). In selected regions, the Settlement Reports provided estimates of cost of cultivation and income among various sections of the rural population. For example, the Settlement Report of Pabna and Bogra districts prepared by MacPherson contained household budgets that gave estimates of costs and returns from cultivation for an "average cultivator," "poor cultivator," and "well-to-do cultivator" (classified according to the extent and nature of tenure of cultivated land) in two different blocks in Pabna district (GoB 1930). These estimates were based entirely on statements given by the people. MacPherson observed:

[8] Ray noted that Pringle's settlement tried to fix 50 per cent of the net produce as the government demand, and this required that information be obtained on yields and cost of cultivation of various crops in different soil conditions (Ray 1915, p. 80).

[9] Ray also observed that "the execution of Mr Pringle's survey was entrusted to a native agency without either the experience or integrity needed for the task, and at a subsequent period the results obtained were found to be nearly worthless. The preliminary work of measurement was grossly faulty, and the estimates of produce, which formed such an important element in the determination of the assessment and which had been prepared in the most elaborate manner, were so erroneous as to be worse than worthless." (Ray 1915, p. 90)

[10] Baden-Powell remarked, "the amount [revenue] was not determined, not with reference to any area survey, any consideration, that is, of the number, various fertility, or productive power, of the acres held in each case, or of the influence of proximity to market and facility of communication, on the value of produce." (Baden-Powell 1892, p. 287)

> The Assistant Settlement Officers in each block were instructed to choose four families of cultivators whose material condition they considered, after seeing them and their houses, to be typical of the average condition of the people in their area: then two of the very poorest families, one family below average, one family above average, and one family considered by local standards to be well off. (GoB 1930, p. 35)

The selection of households and methods of collecting data and estimating various items of costs and returns in the settlement surveys were subjective and varied across regions and the personnel who conducted the studies. The estimates derived could not, therefore, be taken as representative of the respective regions.

These enquiries into the profitability of cultivation were meant to assist administrators in assessing the material conditions of the people and accordingly fix revenue. The information collected as a part of these surveys focused mainly on assessing the extent of cultivated land and gross produce from the land, and not the cost of cultivation. Although these settlements were based on computing the profit from cultivation, the data collected were neither based on a uniform method nor specifically aimed at improving the efficiency of farms (ISAE 1953, p. 31). Commenting on the nature of information in the Settlement Reports, Thomas and Ramakrishnan (1940, p. ix) wrote:

> Generally speaking, in resettlement enquiries the villages were chosen haphazardly, the work of enquiry and report was entrusted to an overworked subordinate staff, the data were not published, and the methods were such as to give room for the allegation that the enquiries were designed to justify enhancement of revenue. There was no detailed enquiry into the economic life of the villagers. It was not an objective economic study that was aimed at.

Despite these shortcomings, the Settlement Reports were the first of their kind to provide information about the cost of cultivation and returns from cultivation in selected regions of the country, and helped in better understanding the economic problems of the agricultural sector (Dantwala 1958, p. 317).

The Second Phase: Early Village Studies

In the first decade of the twentieth century, individual scholars began to conduct village studies in different parts of the country to better understand the village economy. The first organised effort in this direction was made by Gilbert Slater, Professor of Economics at the University of Madras. In 1916, Slater began a study of 11 villages in Madras Presidency and Cochin State (Slater 1918), with the aim of understanding the economic conditions of rural areas in Madras Presidency. He selected villages that were accessible for his students and visited two villages himself to design questions for the survey. Based on these visits, he prepared an elaborate questionnaire that would guide his students in conducting enquiries in the villages they studied. In addition to this questionnaire-based study of the villages, Slater instructed his students to collect, wherever possible, "detailed accounts of the

occupations, income, expenditure, and the general condition of a few typical families" (*ibid.*, p. 28). Slater's was the first extensive study aimed at understanding the village economy in different parts of the province, and gave a comparative perspective of the costs of cultivation and returns from agriculture in some of the study villages. Spread over 11 villages, the studies collected information on the expenses involved in cultivation, marking an improvement over the earlier settlement surveys, and were an important milestone in farm management studies. The studies, however, were limited by the fact that no uniform methodology was followed in analysing costs of and returns from cultivation in the villages, and there was no detailed classification of expenses incurred on various components of the cost of cultivation, especially family labour and irrigation.

Similar efforts were made in other regions as well. Harold Mann ([1918] 1967) studied the Deccan region in 1916 and provided estimates of profits from farming for different types of farms. He listed estimates of profits derived from the cultivation of crops such as sorghum, pearl millet, pigeon pea, carrot, peas, wheat, gram, niger seed, and groundnut in Pimpala Saudagar, an unirrigated village in the western Deccan region. Net returns were calculated for two different scales of cultivation: a capitalist cultivator using hired labour, and a cultivator using family labour for cultivation (*ibid.*, p. 101). Only estimates of net returns from cultivation were provided in this study, and not any detailed classification of expenditure on various inputs used. Another effort in the region, which studied the farm economy in greater detail, was carried out by the Department of Agriculture in Bombay. In 1928, under the leadership of P. C. Patil, the Department initiated an attempt to compile an exhaustive study of farm costs in which opportunity costs were calculated using principles of cost accounting (ISAE 1953, p. 32). According to Shah (1971), Patil's study was a breakthrough in understanding the concept of gross income from farming as it included the part of the produce consumed by the family, whereas previous studies had computed gross income as equal to the quantity sold by the producer.

In eastern India, Jack (1927) studied Faridpur district of Bengal Presidency, and provided estimates of net value per acre (by deducting the cost of cultivation from the gross value of produce) in the cultivation of rice, oilseeds, jute, betel-leaf, sugarcane, grasses, fruit, and garden produce (*ibid.*, p. 88). Neither the total cost of cultivation nor the methodology used for calculating the cost of cultivation to derive net value was specified in this study. In another study, Huque (1939) gave estimates of the cost of cultivation of crops in different districts of Bengal Presidency.

In southern India, in 1937, Thomas and Ramakrishnan resurveyed the villages studied by Slater in Madras Presidency and Cochin State (Thomas and Ramakrishnan 1940). The resurveys of the "Slater villages" provided detailed estimates of the farm accounts of cultivators operating different farm sizes in terms of operational holdings, costs of cultivation, and net returns from different crops.

In a study of the problems of Madras Presidency, Sayana (1949) recorded estimates of various items of costs incurred in cultivation and net incomes from wet paddy in Bhimavaram sub-district (taluk) in West Godavari district, and from tobacco in Guntur taluk. While discussing the limitations in estimating the production costs and returns, he wrote:

> The accuracy of the estimates of production costs may be vitiated for various reasons. In the first place, the agriculturists, illiterate as they are, do not keep accounts and even the few who do, do not keep detailed costs for all items. Contribution of one's own labour and the help rendered by and to neighbours are seldom recorded. . . . Even where some kinds of accounts are kept, no account is kept between the family and the field. The farm is not debited with the value of the family labour, nor is it credited with the value of farm products consumed by the family. (Sayana 1949, p. 218)

This points to the difficulties of gathering data on cultivation, and valuation of various items of costs and returns in a traditional agrarian economy, where the differences between inputs that are owned or home-produced and purchased, and output that is used for own consumption and marketed, are not clearly marked. In a study of the Mysore region, Jambunathan (1950) provided details of cost of cultivation and incomes from farming based on data collected from a cultivator (*ryot*) owning 5 acres of wet land and 0.25 acre of garden land in Dodda Ganni village. Writing about the method by which these data were collected, he stated: "[W]hen a farmer is asked about the amount spent per acre on certain inputs, he will vaguely give a figure which he ought to spend rather than the actual amount spent." Such biases affected the accuracy of estimates of costs and profits from farming (*ibid.*, p. 26).

A major breakthrough occurred in 1923–24, when the Board of Economic Enquiry in Punjab began conducting farm surveys, covering 29 villages with different socio-economic characteristics in different districts of Punjab province (Singh 1940). These surveys were aimed at collecting basic data on farming, rather than a "scientific interpretation of the financial position of farming business as a whole in the area" (ISAE 1953, p. 31). It is important to note that till 1923, there had been no organised effort to study the financial aspects of the farming business in India (*ibid.*). The surveys continued for five years, and the results were published by the Board of Economic Enquiry in Punjab in 1929. Information on various aspects of the farm economy was collected through the case-study method. From this information, estimates of expenses on inputs used in cultivation and net profits were calculated. These village studies used an almost uniform methodology and classification of costs and returns to analyse the farm economy across villages.

In 1935–36, the Imperial Council of Agricultural Research, on the request of the Indian Sugar Committee and Central Cotton Committee, conducted an enquiry into the costs of cultivation of cotton, sugarcane, and other crops grown in rotation. The study was

conducted in Lyallpur, Jalandhar, and Gurdaspur districts of Punjab using cost accounting methods (Singh 1940, p. 103).[11]

In 1936, a study undertaken by the Gokhale Institute of Politics and Economics applied survey methods to farm business studies in selected villages of Wai taluk in Satara district, Maharshtra. This was aimed at developing a methodology to examine the economic aspects of cultivation of crops and the farm economy, similar to methods and techniques adopted in western countries (Gadgil and Gadgil 1940a). Out of 39 villages in the taluk, 23 villages were selected for detailed study, a range that was considered representative of the diversity of the region and the crops grown there. From these selected villages, cultivators owning farms of various sizes (in terms of area operated) were selected. In order to evaluate the performance of farms in the study area, scholars estimated "farm income" per farm by deducting all farm expenses from farm receipts. The study defined farm income as "the difference between receipts and expenses, that is, what the operator received for his own and his family's labour for the year and for the use of the capital invested by him" (Gadgil and Gadgil 1940b). Farm expenses and farm receipts were calculated by attributing money values to all expenses, whether paid in cash or kind, retained or sold, or used for own consumption or farm production (*ibid.*; Thorner 1980). The main achievement of this study was that it provided estimates of labour utilised, total expenditure, gross value of output, and net profits, for farms of different sizes and different tenurial arrangements.

In a critical analysis of the methodology and concepts used in this study, Thorner (1980) observed that out of total farm receipts, less than 25 per cent was from actual sales and over 50 per cent of the expenditure incurred was on inputs available at home. Thus, average farm income was composed of "food stuffs drawn and consumed by the members of the farm household" (*ibid.*, p. 300). In this context, Thorner observed:

> From Gadgil's own description it would appear that these are peasant households which "sell" their services primarily to themselves and "buy" their products from themselves. They obtain on the average very little from any "factor market" and sell very little, on the average, to any product market. Thus they are almost completely insignificant as a link between the two types of market. . . . Hence it is unsuitable and illegitimate to apply to them the economics of enterprise, the theory of the firm. . . . They should not be treated as such, nor should they be approached with business concepts or business terminology. Essentially they are peasant households which are trying to grow and to retain enough food stuffs to sustain the family. When applied to these households the notions of wages for unpaid family labour and "net profits" of enterprise produce nothing but confusion. (*Ibid.*, p. 301)

The critique of the use of concepts used in farm management studies in western countries (where the nature and operation of farms are entirely different) to study the farm economy in India is relevant even today. Large inequalities in the

[11] The districts were selected based on levels of irrigation.

distribution of landholdings, and the predominance of small and marginal holdings, have meant that production conditions in many sectors of Indian agriculture remain subsistence-oriented. This is despite the fact that technological changes and the penetration of markets as part of agricultural commercialisation have changed the nature of input use and increased the monetisation of inputs. Thorner emphasised the necessity of a methodology and concepts to study the farm economy that would be sensitive to the specificities of production conditions in Indian agriculture.

Village studies conducted in different parts of the country constituted a step forward in developing a methodology for studying the farm economy. Their main contribution was to bring out the specificities of the conditions of production in Indian agriculture with respect to region, scale of cultivation, nature of tenure, linkages between various markets, and other parameters. The major limitation of these studies was the variation in the methodology followed in different villages, which limited the scope of comparability of estimates from different studies. Further, the estimates of costs of cultivation and returns in village studies were, in most cases, based on the records of farm accounts maintained by landlords or those with large operational holdings. Small cultivators, who were mostly illiterate, did not keep written accounts of cultivation details. The cost of cultivation and profitability estimates derived were biased towards those who operated large land holdings, and did not reflect the specificities of small farms.

The Third Phase: Large-Scale Surveys

The period from 1951 to 1971 marks the third phase in the study of farm economies. At the time of the First Five Year Plan, while formulating policies and programmes for agricultural development, the Government of India took notice of the poor quality of statistics in the agricultural sector. This is evident in the observations of the National Income Committee in 1951:

> . . . the problems of estimating the gross value of agricultural output is complicated by the fact that there is no census of agricultural production as such nor are there authoritative and comprehensive studies of agricultural costs covering the entire country and all the crops. Information on seed, wastage, market charges, manures, repair, and depreciation and feed of livestock used on the farm have been obtained either from the Ministry of Agriculture or from standard text books or from marketing reports or other miscellaneous published and unpublished material. (GoI 1951, pp. 20–1)

Data on various items needed to estimate agricultural output (particularly inputs used for cultivation) were derived from various sources whose objectives and methodologies were different from each other.[12] That this severely affected the reliability of the estimates is reflected in the remarks of the Committee.

[12] The final report of the National Income Committee points to the fact that there were no estimates of cost of cultivation of crops available at an all-India level at the time (GoI 1954, p. 37).

> It may be of interest of the reader to know that the total cost of production deducted by us comes to 21 per cent of the gross value of agricultural output. To the net value thus arrived at, we have added an arbitrary figure to cover non-reporting areas. (*Ibid.*)

The Committee acknowledged the necessity of reliable data on costs of cultivation and returns from various crops in different regions, in order to make reasonable estimates of income from agriculture. This led to a national-level survey on costs of cultivation of important crops, conducted by the National Sample Survey Office (NSSO). The survey, spread over the fifth, sixth, and seventh rounds, was conducted in 1951–52 and 1952–53 (GoI 1960a; 1960b; 1960c), and was the first of its kind in India that covered estimates of costs of cultivation of selected major crops at an all-India level. Some of its remarkable features were the adoption of a sampling frame (three-stage stratified sampling) for the selection of samples, the calculation of margins of error in the estimates, and comparisons with estimates from other sources wherever possible. This was the first time in the country that levels of use of various inputs and of output realised were estimated at the national level as well as for four regions, i.e. north India, east India, south India, and central India. However, the "balance of value of production" in the study was estimated without including expenses on human labour. This lacuna was particularly problematic with respect to crops for which labour constituted a major share of the total cost of cultivation, such as rice and wheat, as the surveys considered only seed, manure, water, and animal labour as "major items of inputs" in computing the "balance of value of production," leading to a serious overestimation of the profitability of crops.[13]

Farm Management Studies (FMS), sponsored by the Ministry of Agriculture, Government of India, and coordinated by the Directorate of Economics and Statistics under the Ministry, were initiated in 1954–55 in five out of six selected regions of the country representing different agroclimatic zones, namely, Madras, West Bengal, Bombay, Uttar Pradesh, and Punjab.[14] These studies were carried out in each region either by agricultural universities or by Agro-Economic Research Centres, and were later extended to cover more regions. The FMS programme of the government continued up to 1971. The objective of the programme was to collect farm management data from different farming regions of the country in order to evolve an appropriate methodology for farm management investigations suitable to Indian conditions (Gadgil 1954, p. iii). As Shah pointed out:

> An organised effort with a view of evolving agreed terminology, methodology and approach for the study of problems of farm management and costs were made for the first time through Farm Management Surveys initiated by the government in the early fifties. (Shah 1971)

[13] The report, while analysing regional variations in the balance of value of production between different regions, noted that the estimates were higher for paddy in south India, and attributed this to the non-inclusion of human labour (GoI 1960a, p. 49).

[14] Due to technical reasons the study could begin in Madhya Pradesh only in 1955–56.

The design of the study and the methodology to determine the sample and its distribution were prepared in consultation with the statistical branch of the Indian Council of Agricultural Research (ICAR), now known as the Indian Agricultural Statistics Research Institute, New Delhi. The sampling methodology adopted was a multi-stage sampling framework with the village as the primary unit and individual holding as the ultimate unit.

Once the sample was selected, data were collected from sample households on various aspects of costs of cultivation and production using the survey method and the cost accounting method. In the survey method, the investigator would meet the cultivator after a crop was harvested, and conduct an interview regarding the costs the cultivator had incurred and the production in the previous season or previous agricultural year. The cultivator would have to recall all details of expenditure and production, which would be recorded by the investigator. In the cost accounting method, the investigator would meet the cultivator before crop cultivation began. The investigator would then visit the cultivator at regular intervals, and record payments and expenditure as they were made, as well as the returns from crop production. Unlike the resort to recall in the survey method, the cost accounting method is concurrent with cultivation. Data for Farm Management Studies in all the regions except Madhya Pradesh were initially collected by both methods, in order to determine the most appropriate and accurate method. As the cost accounting method was found to be more accurate, it was followed thereafter (GoI 1954).

Saini (1976) pointed out that there were differences in the sampling methodologies adopted by Farm Management Studies in the 1950s and 1960s. After deciding on the district to be studied, the district was divided into two zones. From each zone, an equal number of villages were selected for study. Among the selected villages, a complete enumeration was carried out to identify the cultivating holdings. After arranging the holdings in ascending order of size, they were divided into five groups. In the 1950s, these five groups were constituted such that each group had the same number of holdings. In the 1960s, the groups were formed such that each group had an equal proportion of area cultivated (*ibid.*, p. 1805). Saini used National Sample Survey data from the 16th and 17th rounds to demonstrate that this difference in sampling procedures would impose a bias on the sample selected. He stated: "[I]t is at once clear that given the distribution of holdings and area cultivated, the sample in the 1950s will be biased in favour of small holdings, whereas in the 1960s it will weigh in favour of the big holdings" (*ibid.*, p. 1805).

The foundations of the conceptual framework that underlies collection of data on cost of cultivation in India were laid in the Farm Management Studies. The data gathered and estimates calculated according to various parameters in the Farm Management Studies led to several debates related to the agricultural sector in the country.

Prominent among these was the size–productivity debate initiated by Sen (1962).[15] There were discussions about the advantages and weaknesses of the concepts of cost used in these studies.[16] Nonetheless, the Farm Management Studies were the first set of organised studies in which a well-defined methodology and cost concepts were used. They also succeeded in collecting data from farms with varying types of irrigation, tenure, and size-classes of operational holdings.

The studies, however, were limited in their reach. Initially confined to six regions, the data collected could not be taken to represent the country as a whole.[17] Although the studies were later extended to other regions, they were not conducted at a uniform point of time in all the regions. Further, except in a few repeat surveys, the same regions were not re-surveyed. This has been a constraint in using the estimates from the Farm Management Studies for comparisons across time.

The Fourth Phase: Comprehensive Scheme for Study of Cost of Cultivation of Principal Crops in India

The fourth phase in the study of costs of cultivation of crops began in 1970–71 when the Government of India, on the recommendation of the Standing Technical Committee on Indices of Input Costs, initiated the Comprehensive Scheme for Study of Cost of Cultivation of Production of Principal Crops (CCPC). The scheme was meant to collect data on the use of inputs and outputs, both in physical and monetary terms, and to estimate the cost of cultivation per hectare and cost of production per quintal of various crops (GoI 1980). The design and technical details of the scheme were prepared by the Indian Agricultural Statistics Research Institute, New Delhi. In 1970–71, the scheme was initiated in four States: Punjab, Haryana, Madhya Pradesh, and Rajasthan, and was extended the next year to cover 15 States. In 1973–74, Himachal Pradesh was included and thereafter the scheme covered sixteen States altogether.[18]

The sampling design of the scheme involved a three-stage stratified random sampling with the sub-district (tehsil) as the first-stage sampling unit, followed by a cluster of three villages as the second-stage sampling unit, and the operational holdings in the cluster as the third-stage sampling unit.[19] The scheme followed a single-crop

[15] For a detailed discussion of various studies examining the hypothesis advanced by Sen at different points of time, and a summary of the debate, see Roy (1980) and Bharadwaj (1974).

[16] In 1961, the Indian Society of Agricultural Economics conducted a seminar titled "Cost Studies in Agriculture," to discuss the design, various cost concepts, methods of valuation, calculation of depreciation, and methods of apportionment of costs used in the Farm Management Studies (ISAE 1961).

[17] During the phase of Farm Management Studies, repeat surveys were carried out in only three places: Muzaffarnagar in Uttar Pradesh (1954–55 to 1956–57, and 1966–67 to 1968–69), Ferozepur in Punjab (1954–55 to 1956–57, and 1967–68 to 1969–70), and Coimbatore in Tamil Nadu (1954–55 to 1956–57, and 1970–71 to 1972–73).

[18] The sixteen States covered by the CCPC scheme are Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal.

[19] This section draws extensively from GoI (1980).

approach in which one major crop was studied in a year, and other crops were studied in rotation. In order to select the sample, each State was divided into several agroclimatic zones based on rainfall, soil type, cropping pattern, and irrigation. This zonal classification was retained in all subsequent studies. The number of tehsils to be selected in each zone was allocated proportionally in terms of the area under the principal crop in each zone to the total area under the crop in the State. In each zone, the first-stage sampling units, the tehsils, were selected randomly with replacement and with a probability proportional to the area under the principal crop. In each tehsil, the second-stage sampling units, the clusters of villages, were selected from the list of villages in the selected tehsils with replacement and probability proportional to the area under the principal crop. Among the selected clusters (groups of villages), a preliminary survey was conducted to identify the cultivators and the extent of operational holdings. The operational holdings were listed in ascending order of size and stratified into five size-classes. The stratification was done such that the total operated area in different size-classes was almost equal. Two holdings were selected from each size-class and these holdings constituted the sample for estimating cost of cultivation and production. Data on cost of cultivation and production were collected from these sample operational holdings using the cost accounting method.

In the CCPC scheme, sampling units at three levels – tehsils, villages, and operational holdings – were selected randomly with a probability proportionate to the area under the crop studied. This marked a difference from the earlier Farm Management Studies, where selection was based on the proportion of cultivators at each level (GoI 1958a). The CCPC scheme followed almost the same cost concepts as used in the Farm Management Studies, but the methods of valuation of various inputs were revised on the basis of the experience of the Farm Management Studies.[20]

There were three major changes that occurred with the initiation of the CCPC scheme. First, Farm Management Studies were institutionalised under the Commission for Agricultural Costs and Prices (CACP) in order to continuously study the farm economy, and their reach was expanded with respect to both regions and crops. Secondly, the design of the study was converted into a three-stage stratified sampling rather than the two-stage stratified sampling adopted in the Farm Management Studies. The procedure of selection of samples in the Farm Management Studies, based on the proportion of the population of cultivators, was modified to one based on the proportion of cultivated area under the crops in the CCPC scheme. Thirdly, changes were made in the methods of valuation of some inputs.

[20] For a detailed discussion of the methods of valuation and modifications in the methods of and rates used for valuation, see GoI (1980), and Sen and Bhatia (2004).

Review of the CCPC Scheme

The CCPC scheme has been reviewed twice since its inception.[21] The first review was carried out in 1979–80 by a Special Expert Committee on Cost of Production Estimates (hereafter referred to as the First Review Committee). Its major recommendation, accepted and implemented in 1981–82, was a shift from a single-crop approach to a crop-complex approach, that is, an approach in which all crops in the selected sample holdings would be studied instead of only the principal crop.

In 1990, the Government of India constituted the Second Review Committee under the chairmanship of C. H. Hanumantha Rao (GoI 1990). The major recommendations of this Committee were as follows:

a. that the crop-complex approach be supplemented with a single-crop approach to ensure that aspects of the cultivation of minor crops are also studied;
b. that family labour be valued on the basis of actual wages paid to casual labourers rather than on the basis of wage rates of attached farm servants; and
c. that management costs be calculated by taking 10 per cent of the paid-out cost (Cost A2).

The Government of India accepted these recommendations with some modifications. Sen and Bhatia (2004) have pointed out that many of the methodological shortcomings of the CCPC scheme persist because other recommendations of the Review Committees remain unimplemented.

The Current State of the CCPC Scheme

Shortcomings of the CCPC scheme at present are on account of: (a) problems related to the reach and methodology of the scheme; (b) problems related to collection, processing, analysis, and quality of data; and (c) problems related to the disaggregation of published data by the extent of operational holding only and not any other variable.

Problems Regarding Methodology and Reach of the Scheme

The scheme operates in only 19 States in the country; the North-Eastern States (other than Assam) and Jammu and Kashmir are excluded from its purview. The scheme studies mainly seasonal crops (the exceptions being coconut and sugarcane); it does not study major plantation crops and vegetables, which contribute significantly in value terms to total agricultural production. Tenant farmers are often under-represented in the sample, as the survey population is based

[21] This section draws extensively on Sen and Bhatia (2004). There were two review committees in the 2000s that studied certain aspects of the CCPC scheme, primarily the methodology and process of fixing minimum support prices (MSP). These were: (a) Expert Committee to Examine Methodological Issues in Fixing MSP (chaired by Y. K. Alagh), 2005, (GoI 2005) and (b) Expert Committee to Examine Methodological Issues in Fixing Minimum Support Prices (chaired by Ramesh Chand), 2015 (GoI 2015).

on official data on land ownership from the local village office, and this source may not record all tenancy arrangements.

There are also problems in the methods used to impute costs, such as the rental value of owned land, and interest rates charged for fixed capital and working capital. In the case of rental value of owned land, the First Special Expert Committee had recommended that it be calculated on the basis of market rents, and in places where renting out of land was uncommon, that actual rents paid by the sample cultivators be used to calculate the rental value (GoI 1980b, p. 51). This recommendation was never implemented. The Second Review Committee had recommended that information on rents for irrigated and unirrigated land, and the value of gross output from these lands, be collected by a complete enumeration of the study villages. The ratio of rent paid to the gross value of output for each crop, irrigated and unirrigated, was to be calculated from these data, which in turn would be used for imputing the rental value of owned land of sample cultivators (GoI 1990, p. 6). These recommendations too have not been implemented, and the rental value of owned land is calculated at present on the basis of the share of rent in the gross value of output (Sen and Bhatia 2004).[22]

Despite the recommendations of the Review Committees that the interest rate be computed as a weighted average of loans taken from institutional and non-institutional sources, the interest rate charged for owned fixed capital continues to be calculated at 10 per cent per annum (GoI 2000, p. 256). As a majority of cultivators depend heavily on non-institutional sources for credit, which is obtained at high rates of interest, the present system of valuation of interest underestimates the cost of working capital incurred by the cultivators.

Problems Related to Collection, Processing, Analysis, and Quality of Data

Serious questions have been raised regarding the quality of the data collected by the scheme and the supervision of the process of data collection at the field level (GoI 1980b, p. 23; GoI 1990, p. 10). With the support of and help from the Tamil Nadu Agricultural University, I was able to gain access to and work with unit-level data from the CCPC scheme in Tamil Nadu (Surjit 2008). We list below some of the specific problems with these data.

Errors in classifying farms into different size-classes

In Tamil Nadu, the CCPC scheme adopts a five-fold classification of sample operational holdings. While estimating various parameters from the data, we found several cases in a year in which a single farm was classified as belonging to different size-classes. The number of such farms ranged from 5 per cent to 25 per cent of the total number of holdings across different years between 1971–72 and 2000–1 (Appendix 1). Data on

[22] According to Sen and Bhatia (2004, p. 97), the imputed value of rental value of own land constitutes about 25 to 30 per cent of the total cost of cultivation.

various aspects of cultivation, such as size of land holdings and inputs used, are recorded in different record types (RT) in the database. We found that some farms are classified under different size categories in different RTs (Appendix 1). When data are extracted using the computer programme used by the CCPC to make various statistical estimates, a single farm often appears repeatedly and under different size categories. Such an error affects the values of the estimates derived from the dataset.

Errors due to incorrect coding

Unit-level data on various items in the cost of cultivation are stored using a large number of codes. We noticed several mistakes in the specification of correct codes for various items of input use. The largest number of such incorrect code specifications were in the record type that provides data on operation-wise labour use for different crops. For rice cultivation, where expenditure on labour constitutes nearly 50 per cent of the total cost of cultivation, we found that for various years, the entries that were assigned an incorrect operation code accounted for between 10 and 50 eight-hour person-days per hectare. This can significantly affect the estimation of cost of cultivation of crops, as well as estimates of total labour use. Further, gross cropped area (GCA) and net sown area (NSA) under different crops were entered in four different record types (RTs 11, 12, 41, 42). When we estimated GCA from different record types, we found significant differences between these GCAs. Wrong estimation of GCA leads to wrong estimates of per hectare costs of various inputs and per hectare values of output. Finally, in certain years and for individual crops, the NSA estimated was higher than the GCA.[23]

Errors in data on credit for sample cultivators

In the CCPC data, information on credit transactions is collected in record types RT 111 and 112 in the OLD FARMAP, and RT 511 and RT 512 in the NEW FARMAP.[24] On analysing the unit-level data of sample cultivators for the period 1971–71 to 2000–1, we observed that data or records pertaining to credit transactions are available for only a few sample households. On an average, less than 20 per cent of the sample households had data for this particular record type during this period (Appendix 2). This is likely to seriously underestimate the levels of indebtedness among cultivator households.

Lack of disaggregated data in published reports

Lastly, published reports do not give estimates for various types of production environments (with respect to levels of irrigation, technology, scale of operation,

[23] In a preliminary report on the analysis of cost of cultivation data collected by the CCPC scheme for the States of Andhra Pradesh, Maharashtra, Kerala, Rajasthan, and Tamil Nadu, Vaidyanathan (2005) identified similar problems with estimates of cropping intensities, holding size, and irrigation ratios.

[24] The CACP uses FARMAP software designed by the Food and Agricultural Organisation (FAO) to store and process data collected under the scheme. The format of the software as well as the method of storing and processing the data changed in 1993–94. The older version, used from 1971–72 to 1992–93, is OLD FARMAP, and the version used since then is NEW FARMAP.

and nature of tenure), which is a major constraint in formulating policies for agricultural development (Sen and Bhatia 2004).

Conclusions

This article reviews studies on farm business incomes in India from the colonial period to the present with a focus on the evolution of methodology and process of estimation of farm incomes, and classifies the development of such studies into four phases. The first phase started with colonial land and revenue settlements in the late eighteenth century, and continued till the beginning of the twentieth century. In this period, information on cost of cultivation and revenue from agriculture came mainly from revenue and settlement documents. These documents provided broad descriptions of method and types of cultivation; they were also the only available records of average costs of cultivation in this period. They are limited by the lack of a uniform method of data collection, and an absence of uniformity in the method by which administrators valued inputs or classified various elements of cost.

The second phase saw the emergence of a new and distinct source of information, namely, village studies, which is significant even today. From the beginning of the twentieth century to the early 1950s, village studies in different parts of the country became a significant source of information for costs incurred, returns realised, and profits earned from farming. Village studies introduced the first attempt to classify the various components of costs of cultivation. Although different studies used different methods of classifying and valuing inputs, thus limiting comparability, these studies provided the first examples of estimates of disaggregated costs of cultivation and returns from different agricultural regimes.

The third phase began in the 1950s, with the initiation of large-scale surveys on the costs of cultivation of major crops by the National Sample Survey and the Farm Management Studies programme. The main purpose of Farm Management Studies was to evolve a scientifically designed methodology, and formulate detailed and accurate cost concepts to be employed for studying the farm economy. In this period, scientifically designed cost concepts were used for the first time to study the economics of farming in different parts of the country.

The establishment of the CCPC scheme under the CACP in 1971–72 marked the beginning of the fourth phase. The methodology of data collection, and the concepts and valuation methods of this scheme have been reviewed and revised over time. The CCPC database represents what is arguably one of the largest institutional systems in the world for the collection of farm-level data on crop-wise farm business incomes. Nevertheless, there are limitations to the methodology followed in respect of the valuation of various inputs used for cultivation, and data collection and processing. These have been discussed in an important review by Sen and Bhatia (2004). Our work on unit-level data collected as part of the CCPC scheme in

Tamil Nadu pointed to the problem of classifying households into different size categories of land holdings (sample households were placed in more than one size-class), substantial inaccuracies in the estimation of gross cropped area and net sown area in different record types, incorrect coding, and exclusion with regard to credit borrowed by cultivators. Addressing these requires improvement in data collection mechanisms, methods of standardisation, and verification of collected data at all levels of the scheme.

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Appendix 1 *Sample details in the CCPC scheme, Tamil Nadu, 1971–72 to 2000–1* in number

Year	Number of sample households	Households assigned to more than one size-class of operational holding	Column 3 as a percentage of column 2
1	2	3	4
1971	368	15	4
1972	333	53	16
1973	443	23	5
1974	444	35	8
1975	400	19	5
1976	399	20	5
1977	398	26	7
1978	381	13	3
1979	299	28	9
1980	380	25	7
1981	399	25	6
1982	399	15	4
1983	574	34	6
1984	599	39	7
1985	600	39	7
1986	595	36	6
1987	497	51	10
1988	580	46	8
1989	569	51	9
1990	560	39	7
1991	546	56	10
1992	600	30	5
1993	589	140	24
1994	600	98	16
1995	600	29	5
1996	596	42	7
1997	590	40	7
1998	596	49	8
1999	NA	NA	NA
2000	600	41	7

Note: NA = not available.
Source: Calculated from unit-level data of the Comprehensive Scheme for the Study of Cultivation of Principal Crops Scheme in Tamil Nadu, 1971–72 to 2000–1 (Surjit 2008).

Appendix 2 *Credit data details of sample households in the CCPC scheme, Tamil Nadu, 1971–72 to 2000–1* in number

Year	Number of sample households	Number of households for which credit details were collected (RT 111/RT 511)	Share of households for which credit details were collected (in per cent)
1971	368	164	45
1972	333	147	44
1973	443	185	42
1974	444	153	34
1975	400	96	24
1976	399	104	26
1977	398	127	32
1978	381	148	39
1979	299	98	33
1980	380	122	32
1981	399	68	17
1982	399	71	18
1983	574	67	12
1984	599	65	11
1985	600	77	13
1986	595	62	10
1987	497	30	6
1988	580	50	9
1989	569	24	4
1990	560	44	8
1991	546	52	10
1992	600	55	9
1993	589	38	6
1994	600	23	4
1995	600	2	0
1996	596	15	3
1997	590	21	4
1998	596	16	3
1999	NA	NA	NA
2000	600	23	4

Note: RT 111 and RT 511 are the record types in which data on credit details of the household are collected.
NA = not available.
Source: Calculated from unit-level data of the Comprehensive Scheme for the Study of Cultivation of Principal Crops Scheme in Tamil Nadu, 1971–72 to 2000–1 (Surjit 2008).