

Chapter 3

Methodology for Estimation of Value of Agriculture Sector in the District Income

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3.1 Introduction

This chapter provides a brief understanding of the concepts and methodology that are used to estimate the value of agriculture sector in the district product and income. First of all we will discuss a few alternative approaches that can be used to calculate the Gross District Domestic Product (GDDP). Each approach has some strength and weaknesses. One particular method of estimation of district income is not suitable for all sectors and sub-sectors of the economy, therefore sector and sub-sector wise analysis of methodology used has been explained in this chapter. Also the importance of GDDP at constant and current prices is explained along with the detailed process of estimating net contribution of crop husbandry sector derived from deducting input cost from gross revenue of a particular crop.

At the end of this chapter, we have attempted to place the before you about the computer software (Indical) which is specially designed to estimate the district income in India and the limitations of the district income estimation in India.

The methodology explained in this chapter has been taken from the CSO's methodology used for preparation of estimates of district domestic product, prepared by the Directorates of Economics and Statistics, Karnataka and Uttar Pradesh (Nayyar Rohini, Rajeev Meenakshi, Vyasula Vinod, 2003). The corresponding methodology has been exhaustively explained in the book and has been applied for Belgaum and Uttara Kannada districts of Karnataka state.

The main focus of this particular study is to estimate the net contribution of sugar crop in the district income, therefore the methodology for estimating district income from agriculture sector in general and crop husbandry sector in particular is discussed in this chapter. The detailed methodology for remaining two sectors (viz. Secondary and Tertiary Sector) is available in the above mentioned reference and also on CSO's web site.

3.2 Definition

GDDP is one of the most important indicators to measure the economic development of the district. It measures in a monetary term and may be defined as,

“The value of all final goods and services those are produced in a specific period of time (generally 1 year) within the geographical boundaries of the district”.

3.3 Importance of District Income Statistics

District income database is of vital importance for the economy of a district. These days, the district income data are regarded as the accounts of the district economy.

The following points indicate the importance of district income data:

- a. Since the district income data represents the monetary measure of the value of production in a district in a year, they provide us an idea of the average production in concerned district.
- b. District income data gives an idea of the role of growth of the district economy. An increasing district income is a symptom of growing economic progress. A decreasing district income on the contrary is a symptom of economic deterioration of the concerned district.
- c. The economic welfare of a district, as we know, is closely connected with the magnitude of its district income. An increase in the district income of a particular district, other things remaining the same, also implies that increase in the economic welfare of the community.
- d. The district income data focuses on the contribution of the various sectors of the district economy to the gross district product of the concerned district.
- e. The district income data also shows how the district income of a particular district is distributed among the various sections of the population. An increase in the share of labour (i.e. Wages) out of the district income is a clear indication that the economic inequalities are lessening in the concerned district.
- f. The district income data also focuses on the volume of consumption, saving and investment in the district economy. The level of consumption shows the level of economic welfare in society, while saving and investment determine the rate of growth of district economy.
- g. By comparing district income data of different districts in particular or different State or nation, we can compare their standard of level and the level of economic welfare achieved by them.
- h. District income data plays an important role in the formulation of economic policy of any level of Government. No government can formulate a correct, realistic and well balanced economic policy without

having at its disposal correct and reliable data about the volume and distribution of district income of concerned district.

- i. Decentralization of planning and governance after the 73rd and 74th Amendment of Indian Constitution has a provision for District Planning Committee which will also give an impetus to local planning and thereby call for an appropriate database to address the regional problems. No economic plan can, indeed, be formulated without adequate district income data. Further, the evaluation of the working of the economic plans is also not possible without reliable district income database.
- j. The district income data are of great importance for the research scholars particularly of economics. They make use of district income data in their field studies.

3.4 Methods of Estimation of District Income

There are three alternative methods for measuring GDDP, namely Production, Income and Expenditure method. Ideally, each method must give the same value, which rarely happens in the real world.

3.4.1 Production Method

This method accounts the value of all goods and services produced, calculated without duplication. This call for ascertaining what is known as Value Added by the production of a product.

The sum of Value Added of all the products produced within the geographical boundaries of the district is the GDDP.

The formula for determining the Value Added of a particular product according to this method is as given below.

$$\text{Value Added} = \text{Total Revenue of Product} - \text{The Cost of Input or Intermediate goods}$$

$$\text{Total Revenue of Product} = (\text{Production of main product} * \text{Price}) + (\text{Production of Bi-products} * \text{Price})$$

More precisely,

$$\text{Gross Value Added} = \text{Value of gross output evaluated at producer's price} \\ - \text{Value to intermediate input at purchaser's price}$$

Precautions should be taken while estimating GDDP by production method

Following are some of the precautions should be taken while measuring district income by production method.

- a. Only final goods should be considered to avoid the double counting problem.
- b. Sale and purchase of second-hand goods should not be included in measuring value of output. Of course, commission or brokerage earn in their transaction has to be included.
- c. If some goods and services produced for social consumption then it should be included in the district income.
- d. Amount of indirect taxes must be deducted.

3.4.2 Income Method

In this method GDDP, is obtained from the income side by determining the income generated from economic activity in a given economy. Therefore, Domestic Income is equal to all variables that comprise the total income generated. This is also known as GDDP at factor cost.

The formula for determining GDDP according to the income method is given below.

$$\text{District's Total Income Generated} = \text{Gross District Domestic Product} \\ \text{GDDP} = \text{Wage income} + \text{Profit income} + \text{Interest earning} + \text{Tax income (indirect)} \\ \text{Gross Value Added (GVA)} = \text{Operational Surplus} + \text{Salaries and Wages}$$

Factor	Operational Surplus
Land	Rent
Capital	Interest
Entrepreneur	Profit
Labour	Salaries and Wages

Precautions should be taken while estimating GDDP by income method

- a. Transfer payments should not be included in the district income.
- b. Imputed rent of self-occupied housed should be included in district income.
- c. Illegal money such as fake (havala) money, money earned through smuggling etc. should not be considered as they can not be easily estimated.
- d. Windfall gains such as prizes own, lotteries are also should not include.

3.4.3 Expenditure Method

The third approach is to arrive at the same through the expenditure side. In this method, one must consider all the expenditures in a given economy. Estimating the GDP by using this approach is difficult as pertinent data is typically not available in the field.

The formula for ascertaining GDP through this approach is as follows:

$$\begin{aligned} \text{Total Expenditure} &= \text{Gross Domestic Product (GDP)} \\ \text{GDP} &= \text{Consumption Expenditure} + \text{Investment Expenditure} + \\ &\quad \text{Government Expenditure} + \text{Net Foreign Earnings (Export – Import)} \end{aligned}$$

Gross Value Added (GVA) by Expenditure Method:

- a. Government final consumption expenditure
- b. Private final consumption expenditure
- c. Increase in stocks
- d. Domestic fixed capital formation
- e. Export goods and services
- f. Indirect taxes over subsidies

$$\text{GVA} = \text{Item No. 1 to 5} - \text{Item No. 6 \& 7}$$

Precautions should be taken while estimating GDDP by expenditure method

- a. The expenditure made on purchase of second-hand goods should not be included in district income, because this does not contribute to the current year production.

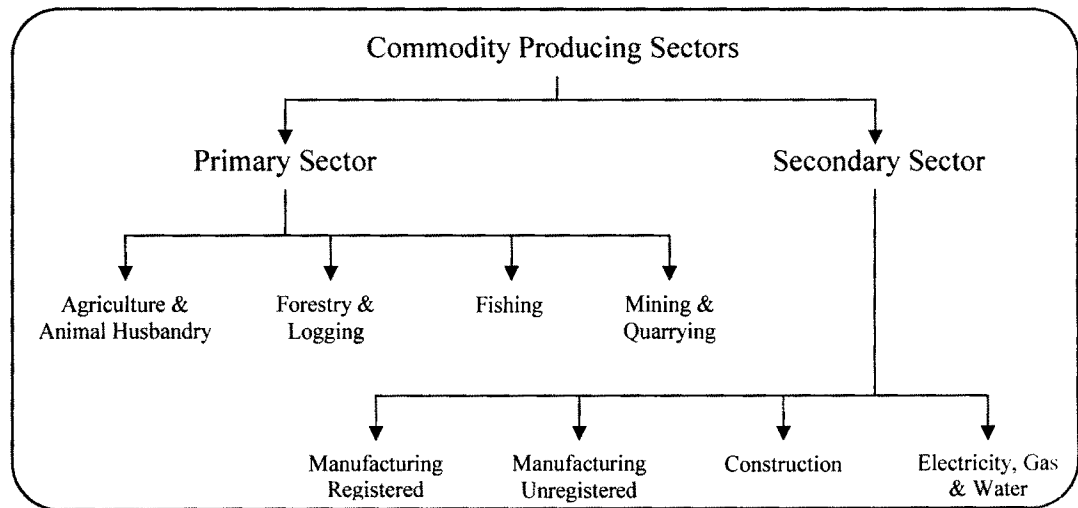
- b. Expenditure on purchase of old shares and bonds from other people or firm business enterprises should not be included because it is just transformation of ownership from one to another.
- c. Expenditure on transfer payments by government such as unemployment benefits, old-age pension should not be included because no goods or services produce in exchange by the recipients of these payments.
- d. Expenditure on intermediate goods such as fertilisers and seeds by the farmers and wool, cotton and yarn by manufacturers of garments should also be excluded to avoid double counting of it.

3.5 Sectors of the District Economy

The sectors of the district economy may be classified into two broad sectors, viz. commodity producing sector and non-commodity producing sector. Each of these sectors may be further classified into sub-sectors as shown in the following figure.

Figure 3.1

Sectors of the District Economy



The non-commodity producing sector includes various services. These services are trade, hotel, transport, storage, communication, banking and insurance and other services like education, research and scientific services, medical and healthcare services, legal and sanitary services. etc.

Sectors of the district economy have been classified into three broad groups.

A nation's economy can be divided into various sectors to define the proportion of the population engaged in the activity sector. This categorization is seen as a continuum of distance from the natural environment. The continuum starts with the primary sector, which concerns itself with the utilization of raw materials from the earth such as agriculture and mining. From there, the distance from the raw materials of the earth increases.

3.5.1 Primary Sector

The primary sector of the economy extracts or harvests products from the earth. The primary sector includes the production of raw material and the basic food items. Activities associated with the primary sector include agriculture (both subsistence and commercial), mining, forestry, farming, grazing, hunting and gathering, fishing, and quarrying. The packaging and processing of the raw material associated with this sector is also considered as a part of this sector.

In developed and developing countries, a decreasing proportion of workers is involved in the primary sector.

3.5.2 Secondary Sector

The secondary sector of the economy is the manufacturing of finished goods. All of manufacturing, processing, and construction lies within the secondary sector. Activities associated with the secondary sector include metal working and smelting, automobile production, textile production, chemical and engineering industries, aerospace manufacturing, energy utilities, engineering, breweries and bottlers, construction, and shipbuilding.

3.5.3 Tertiary Sector

The tertiary sector of the economy is the service industry. This sector provides services to the general population and to businesses. Activities associated with this sector include retail and wholesale sales, transportation and distribution, communication, entertainment (movies, television, radio, music, theater, etc.), restaurants, clerical services, media, tourism, insurance, banking, healthcare, and law.

3.6 Sectors and Methods for Estimation of GDDP

Different methods of the estimation of district domestic product is used for different sectors of the district economy. Following table shows the details regarding this.

Table No. 3.1
Sectors and Methods of Estimation of GDDP

Sr. No.	Sector	Method
1	Agriculture	Production Method
1.1	Allied Activities	Income Method
2	Forestry	Production Method
3	Fisheries	Production Method
4	Mining and Quarrying	Production Method
5	Manufacturing – Registered	Production Method
6	Manufacturing – Un-registered	Income Method
7	Construction	Expenditure Method
8	Electricity, Gas and Water Supply	Income Method
9	Transport and Storage	Income Method
10	Trade, Hotels and Restaurant	Income Method
11	Real Estate, OWD. B/S & L.S.	Income Method
12	Public Administration	Income Method
13	Other Services	Income Method

Source: Workshop on Estimating District Income in India, CBPS, Bangalore & Shivaji University, Kolhapur

3.7 District Income Estimates at Current and Constant Prices

There are two types of concepts.

a. Estimates at Current Prices

If the domestic product of a particular district is estimated on the basis of the prevailing prices, it is called GDDP at current prices.

In this approach the GDDP is calculated by considering the current prices of various goods and services produced in a year inside the geographical boundaries of district.

The formula for estimating the GDDP at current price is as given below.

$$\text{GDDP at current price} = \text{Current year production} * \text{Current year prices}$$

There is always urge to make comparisons of district income over time. When the estimates of district income are obtained by evaluating goods and services at prevailing prices, the district income is said to be estimated at current prices. The series of district income at current price does not show real economic growth; because over and above the movement in the value of goods and services, the change in prices is also reflected in such a series. Thus, if a district produces 500 M.T. of cane in a given year, its value at the price of Rs. 1000 per M.T. would be Rs. 5,00,000. If the district process same quantity in the next year but the price increase to Rs. 1200 per M.T. the value will increase to Rs. 6,00,000, even though the physical quantity has remained the same.

From the above discussion, we may say that estimations of district income at current prices are influenced by changes in prices which vitiate real comparison over time.

b. Estimates at Constant Prices

For elimination of the price effect and to workout the real growth of sector of the district economy the GDDP at constant prices is calculated.

If GDDP is measured on the basis of some fixed prices, that is prices prevailing at a point of time or in some base year, it is known as GDDP at constant prices or real gross domestic product of a district.

The following formula is used to estimate GDDP at constant prices.

$$\text{GDDP at constant prices} = \text{Current year production} * \text{Base year prices}$$

Different authorities have used different methods of estimating district income at constant price. Broadly, there are five procedures.

- a. District income estimates are converted into estimates at constant price by deflating the corresponding estimates at current prices by a price index as consumer or wholesale price index.
- b. Instead of deflating the entire district income total by a single price index, at times income in different sectors is deflated separately by making use of different indices approximating the movement of price of commodities in the corresponding sectors.

- c. District income total can also be obtained as the sum of the final expenditure and different components of expenditure like household consumption expenditure, government consumption expenditure and capital formation are deflected by different price indices.
- d. District income at constant price obtained by combining indices of production or indicators showing changes in physical output in different sectors. These indices or indicators are generally combined by using the net value added by various industries during the base year weights.
- e. District income at constant prices is estimated by evaluating the net output of goods services from various sectors at base year prices.

The last method is widely used in estimating GDDP at constant price because of its more accurate estimates.

3.8 Process of Estimation

In this part we have attempted to describe the detail process of estimation of district income from agricultural sector in general and crop husbandry sector in particular.

3.8.1 Collection of Required Data

The basic data required for the estimate of income at district level in respect of primary sector is fairly available, whereas, in respect of other sectors, it is scanty.

Detailed data on production yield and area under different crop figures was collected from the sources like fully revised estimates of principal crop, Socio-Economic Survey Report of Kolhapur District, Directorate of Economics and Statistics, Directorate of Agriculture, Agricultural Record office, Agricultural Department, Zilla Parishad, Kolhapur.

Apart from this, other sources like Annual Season and Crop Report, other reports from the respected State Agricultural Department. There may be separate studies of the independent bodies (e.g., Agricultural Universities or Institutions) which also produces data while estimating these output values.

In regard of prices of agricultural products and by-products it is collect from Agricultural Produced Marketing Centres (APMC), Kolhapur and

Government procured prices and quantity from Divisional Office of Food Corporation of India.

Methodology for estimation of district income as suggested needs an independent survey to derive the data on price and quantity of agricultural by-products. In the absence of such survey data existing CSO norms are used.

3.8.2 State Level Methodology

The method and process followed in the estimation of the District Domestic Product of Maharashtra at current and constant prices is briefly given below.

The Net State Domestic Product (NSDP) is estimated by following income-originating approach, because of certain difficulties at the state level in regard of income-accounting approach. The difficulties get more pronounced if similar approach is followed in the computation of Net Domestic Product at the district level. Hence, an attempt is made to estimate district domestic product by adopting income-originating approach as at the state level.

The production which can thus be considered to have originated in district can be classified into two-categories:

- a. The product which can be estimated by using actually forthcoming at the district level.
- b. The product which cannot be computed for want of requisite district data, but which can be assigned to the district data, by allocating NSDP on the basis of a proxy indicator or by adopting a state level norm uniformly for all districts.

The NDDP is estimated at current and constant prices by deducting Consumption of Fixed Capital (CFC) from GDDP at current and constant prices respectively.

3.8.3 Agriculture including Animal Husbandry

Agriculture is usually the largest commodity producing sector of a district economy. Animal husbandry is closely interwoven with agriculture and plays an important complementary role in the rural economy. It provides nutritional food (milk, meat and eggs), wool, fibre and manure, in addition employment and thereby supplementary income to a vast majority of the rural population.

This section includes all agricultural products like crop, vegetable and horticulture and floriculture output and their by-products plus all products from the animal husbandry sector.

Farmer usually do not keep a separate account of the output of agricultural crop and the part that goes at input for feeding the animal. Therefore, the estimates of inputs cannot be prepared separately. Thus, the value added estimates may be prepared for the overall economic activity of agricultural plus animal husbandry in the district called the crop husbandry sector.

The estimates of value of output of agricultural and animal husbandry may be prepared separately. Also, within each group, value of output may be calculated for each crop and animal husbandry product separately and then added up to get a total figure.

Thus, using the following formula,

$$\text{Value Added}_{CH} = (\text{Value of Output}_A + \text{Value of Output}_{AH}) - \text{Value of Input}_{CH}$$

In the formula, the suffix 'CH' stands for crop husbandry (i.e. agriculture and animal husbandry combined), 'A' stands for agriculture sector (crop and by-product combined) and 'AH' stands for animal husbandry sector.

3.8.3.1 Value of Output of Crop Husbandry

The methodology for determining value for crop husbandry is described below.

The formula for determining value of crop husbandry uses the price of a given crop multiplied by the output produced from that crop. It is expressed as,

$$\text{Value of Output for a particular crop} = \text{Price} * \text{Output produced}$$

Prices used for agricultural products in this context are post-harvest prices. The prices method to arrive at an average post harvest price is described in Box 1. An illustration of this method is given in Box 2.

As far output (or crop production), total production figures for different crops during different seasons may be taken separately (Rabi, Kharif and Summer).

Box 1

Average Peak Period Prices

- The first task is to identify the peak period for each crop. This can be done by the district statistical officer as s/he has first hand knowledge about the local crops and the corresponding peak period.
- Then find the simple average value of prices over the peak period methods and across marketing centres in concerned district.
- Some DESs Collect data directly from farmers which is fine.

(Nayyar Rohini, Rajeev Meenkshi, Vyasulu Vinod, 2003)

Box 2

Suppose we want to find peak period price for crop maize for District

- For maize crop, peak period is identified as December and January.
- Then we have to identify all the APMCs that belong to district and consider price of maize for the month of December across these marketing centres.
- A simple average is then calculated and we arrive at figure say Rs. 600 per quantal.
- Similarly, taking the average for the month of January we arrive at say Rs. 650 per quantal.
- Simple average over these two prices $(600+650)/2 = \text{Rs. } 625$ per quantal is the required price for our calculation.

(Source: As above)

Division of Crops According to Data Availability and the Corresponding

Methodology:

As stated earlier, district level data on production and prices are generally not available uniformly for all the crops. Hence, for estimation purpose, crops may be classified in the following four categories.

Category – I: Crops for which district-wise data on production and prices (primary market or farmer harvest peak period prices) are available. In such cases, estimation of value of output for each crop may be worked out by following

standard methodology, since there is no problem. Price data, however, need not come in the right format. One then has to arrive (illustration is given in box 2) at average peak-period post-harvest prices to estimate the value of output.

Category – II: Crops for which district-wise production figures are available but corresponding district-wise prices are not available. For this category of crops, district-wise value of output may be estimated by using production data of district and price data from neighbouring district. In case neighbouring district prices are also not available regional or finally state prices may be used.

Category – III: Crops for which district-wise data, both on production and price are not available but the crop area figures are available and state level total value of crop is available. In such cases, district-wise value of output of these crops may be worked out by allocating the state level value of output on the basis of district wise crop data. This should be a temporary measure till appropriate data arrives. Illustration regarding this is described in box 3.

Box 3

Suppose Area figures are available but Production data is not Available

Let us consider a situation where district level production figures are not available for Jowar crop, we however have the following information:

State (Maharashtra) data for Agriculture for year 2005-06

Crop	Area Under (in ha)	Production (in tonnes)
Jowar	1472400	1764100

Note that while finding the yield we have to consider actual area under the crop. The convention here is to subtract 5% of the area under cultivation to take into account area used for foot tracks, bounds and water channel.

In this case area actually shown then equals = Area – 5% of the area

This is $1472400 - 5\% \text{ of } 1472400 = 1398780$ hectare

Now, estimated yield = production / total area sown

Hence, Yield = $1764100 \text{ tonnes} / 1398780 \text{ hectare} = 1261 \text{ kg/ha}$.

Now, 1261 becomes the yield (in Kg.) as proxy for district which could be used to estimate production figure.

Estimation of yield in Kgs for State

Crop	Area under (in ha)	Actual area under cultivation	Production (in tonnes)	Yield in Kg/ha (Col.3/Col.4) * 1000
1	2	3	4	5
Jowar	1472400	1398780	1764100	1261

In continuation with the above example, let us suppose we have only area under crop figures and no production data.

Now, by adopting above method we can obtain the estimated figure on production.

Estimation of production for district

Crop	Area Under (in ha.)	Actual Area @ under cultivation	State yield (in Kg/ha) (estimated)	Production (in tonnes) Col.3 * Col.4
1	2	3	4	5
Jowar	8000	7600	1261	9583.600

@ Actual area sown is 8000 – 5 % of 8000 = 7600 hectares.

Using the state yield rate as proxy (as district yield rate is not available), we get total production as 7600 * 1261 = 9583.600 tones. It is first approximation.

(Source: As above)

Category – III: Miscellaneous and unspecified crops for which district-wise data on production, prices and area are not available and state level total value of crop is not available.

In such case, district-wise value of output of these crops may be worked out by using methodology provided by CSO which is based on various reports of National Sample Survey and National Income Committee.

3.8.3.2 Government Procurement

Farmers can sell their products directly in the market. They can also sell their products to government. The government in such cases announces a price, which is known as procurement price, which is known as procurement price. Such procurement is usually done through Food Corporation of India (FCI). The

regional offices of FCI go directly to farmers and procure crops at a previously announced procurement price.

Apart from the Central Government, State Government can also procure crop from farmers and price may vary. Thus, for the quantity of foodgrains procured on government account, the prices are different from the prevailing market price. The quantity procured by the government as such may be evaluated at procurement prices and the rest of the produce at the primary market / farm harvest price as discuss above. Government procurement needs to be separated period to calculating the total value of agricultural output. The methodology to be followed in this respect is described in Box 4.

Box 4

- First list the crops that are produced by the government, say crop A, B, C, etc.
- Consider the estimated total output of each of those crops separately: Output of crop A, B, C...
- Then calculate the following: Marketed output of crop A = Total output of crop A – quantity of crop A that is procured by Government.
- Finally, total value of production of crop A = (marketed output of crop A * Post harvest price of crop A estimated) + (quantity of crop A procured by government * respective procurement price)
- Repeat the exercise for other crops that are procured by the government.

Data Sheet format

Crops Procured by Govt	Total Output Of Crop (in tonnes)	Total Quantity Procured By Govt	Marketed Output (Col.2 – Col.3)	Estimated Market Price of Crop	Procurement Price	Total Value (Col.4 *Col.5) +(Col.3 *Col.6)
1	2	3	4	5	6	7
A						
B						
C						

(Source: As above)

3.8.3.3 Valuation of By-products

We can not neglect the bi-products of agriculture who contributes to a district economy. It includes straw, fenni, molasses, baggasse, husk, oilcake, etc. At present CSO proves a comprehensive list of all by-products which may be used.

The current state of data relating to district-wise production and prices of by-products is incomplete for most states. Crop-wise estimate of by-product is available for some crops with the Directorate of Extension within the Agricultural Department. These estimates give the amount of a by-product produced as a percentage of the production of the main crop.

For example, how much by-product of straw can be derived from the production of rice crop per tonnes? Once, this ratio is known, production of total by-products can be calculated from total rice production data in the district. This has to be done for each crop at the district level.

- **CSO Methodology**

As stated earlier, CSO identified several by-product and their percentage to main crop based on certain studies. CSO also supplies at the state level, value of by-product produced per hector of main crop. This figure multiplied by area of main crop for the district gives the total value of the by-product for the district. This exercise has to repeat for all by-products relevant for the district.

Ideally, total production of each of the by-products has to be multiplied by the district level prices of the respective by-product. In the absence of district level prices, state level prices of by-products may be used.

Illustration regarding the value of by-product is shown in the Box 5.

Box 5					
Datasheet format for estimating the by-product value					
Crop	Total Prod. (in tonnes)	Estimated % Of by-product obtained per tonnes	Total output of by-product (in tonnes) (Col.3* Col.2)	Price of bi-product per tonnes (in Rs.)	Total value of the by-product (in Rs.) (Col.4 * Col.5)
1	2	3	4	5	6
Rice					(Source: As above)

3.8.3.4 Value of Inputs

To arrive at district-wise Gross Value Added (GVA) from agriculture sector, value of various input items has to be first deducted from the gross value of output of these sector. The deductible inputs are: Seed, Organic Manure (cattle and buffalo dung), Chemical fertilisers, Feed of livestock, Pesticides and insecticides, Diesel oil consumption, Electricity, Irrigation charges, Market charges, Repair and maintenance of fixed assets and other operational cost and Financial Intermediary Services Indirectly Measured (FISIM).

Ideally, the value of each input used should be estimated at the district level. However, district level figures do not exist for many of the inputs. In such cases, state level estimates may be allocated to the district in proportion to relevant indicators.

‘The Report on Region-wise Cost of Cultivation of Crops’, compiled by the Farm Management Division, Directorate of Agriculture, can be used to estimate the cost of production for agriculture. This report in some states, however, publishes cost figures according to the agro-climatic zones which are usually not conterminous with the district boundaries.

Let us now consider each of the inputs separately and examine how the cost of input can be estimated to arrive at district level value added figures.

a. Seed

Seed rates and area sown for each of the important crop at the district level are generally available with the District Agricultural Department. These data should be collected and quantity of seed for each of the crop may be worked out as a product of seed rate and area under each crop. This may be multiplied by the respective prices at the district level to arrive at the value of seed input. Other crops for which seed rates are not available at the district level, the input of seed for each of the crop may be worked out by allocating the value of state level in proportion to the area under each crop at the district level. Box 6 shows the data sheet format for calculating the estimate value of seed for district.

Box 6

Data sheet format for calculating the estimated value of seed of district

Crop	GCA (in ha)	Seed rate (State level may be used)	Quantity Of seed (Col.2. * Col.3)	Cost of Seed	Value of seed (in Rs.) (Col.4 * Col.5)
1	2	3	4	5	6
A					
B					
C					

(Source: As above)

b. Organic Manure

District-wise estimates of value of output of dung manure and worked out in the Animal Husbandry sector should be taken as value of input for the concerned district.

Using the norms of per day, per animal dung produced and dung used for manure, district-wise dung produced is estimated. In the absence of district level data on yield rate and price, the state level prices and yield rates of organic manure may be used. Box 7 is an example of the data sheet format for calculating estimate value of organic manure for particular district.

Box 7

Data sheet format for calculating the value of organic manure of district level

Animal	Pop. Size	Yield of dung per animal (State level yield may be used)	Total prod. Of dung (Col.2 * Col.3)	% of dung as organic manure * Col.4	Price of Organic manure (State level Price may be used)	Total value of organic manure (Col.5 * Col.6)
1	2	3	4	5	6	7
A						
B						
C						
					Total	

(Source: As above)

c. Chemical Fertilizers

State level value may be distributed to districts in proportion to total quantity of chemical fertilizers distributed as obtained from the Agricultural Department. District-wise and material-wise consumption of chemical fertilizers and their state level prices should be collected from Fertilizers Association of India, Western Region, Mumbai.

An alternative direct methodology is described in Box.8. Application of this methodology however would depend on availability of district level data.

Box 8

Data sheet format for calculating value of chemical fertilizers for district

Crop	Area under cultivation	Proportion of fertilizer used per/ha (State level data can be used)				Total consumption of the fertilizer (Col.2 * Col.3)				Price of The Fertilizer (in Rs.)				Total value of each fertilizer (Col.4 * Col.5)			
		N	P	K	O	N	P	K	O	N	P	K	O	N	P	K	O
1	2	3				4				5				6			
A																	
B																	
C																	
D																	

Total value of fertilizers = Sum total value of Nitrogen + Phosphate + Potassium of each crop

N = Nitrogen, P=Phosphate, K=Potassium, O=Other (Source: As above)

d. Fed of Livestock

District-wise value of roughage may be estimated by adopting the same methodology as followed for estimating the roughage (which includes fodder, cane trash, grass and straws) in the case of State and also in District Domestic Product. In order to estimate the quantity of concentrates consumed, the rates of concentrates as adopted for state level estimates for different types of animal and poultry may be used for working out district level estimates also. Independent studies from agricultural universities / institutions may be found useful.

e. Pesticides and Insecticides

In the absence of district level data, state level value of pesticides and insecticides may be allocated to the districts in proportion to area treated by chemical pesticides in different districts. Efforts may be made to obtain the results of Cost of Cultivation Survey (CCS) in the state of the district level and the value of pesticides and insecticides district-wise may be worked.

An alternative direct methodology is also presented in Box. 9. Application of this methodology would however depend on the availability of data.

Box 9

Data sheet format for calculating the value of pesticides for district

Crop	Area under cultivation (in ha)	Proportion of cultivated land treated with Pesticides (in ha)	Quantity of chemical pesticides used (per ha)	Total Consum. of the chemical pesticides (Col.2 * Col.3 * Col.4)	Cost of pesticides (State value may be used)	Total Value Of the Chem. Pesticides (Col. 5 * Col. 6)
1	2	3	4	5	6	7
A						
B						
C						

(Source: As above)

f. Diesel Oil Consumption

State level value of consumption of diesel oil by tractors and oil engines may be distributed to districts in proportion to the district weighted total of number of tractors and oil engines/oil engines pumps used for irrigation as per latest livestock census. Weights being the per unit consumption of diesel oil based on the data collected from the schedules of CCS. If district level consumption of diesel per unit is available, then state level norms may be adopted.

g. Electricity

State level value may be distributed on the basis of district-wise number of private and government electric tube wells and energised pump sets.

h. Irrigation Charges

District wise irrigation charges as collected from the district administration may be used for this purpose. In the absence of such data, the state level value may be distributed to the districts in proportion to the area irrigated by the government canals.

i. Market Charges

State level norms in respect of the crop husbandry sector may be used for district product estimation also. Usually the norm is 1.29 per cent of the gross value of output.

j. Repair and Maintenance of Fixed Assets and Operational Costs

District-wise data on fixed assets as available from the latest All India Debt and Investment Survey (AIDIS) or livestock census may be used to allocate to the districts. Alternatively, the district-wise value of output may be multiplied by the state level ratios of repairs and maintenance costs, etc. to the value of output.

k. Financial Intermediation Services Indirectly Measured (FISIM)

Banking enterprises render services to their customers in the form of maintaining their accounts and providing them with banking services. In return for these services customers are charged a nominal amount which is substantially smaller than the expenses of the banking enterprises. On the other hand, the banks provide loans and advances and returns on such transactions are usually much higher than the interest payments made to the depositors. This net return accruing to banks is large enough to meet their expenses and to earn a profit. If financial enterprises are treated like any other productive enterprise, their income in the productive account would only be limited to the charges made on customers. This would mean that banks would have a negative operating surplus and most likely negative value added.

In order to circumvent this difficulty, an imputed income equivalent to interest and dividend receipts of banking and financial enterprises net of interest paid to depositors is calculated and is defined as FISIM and is entered as a receipt item in the output of financial enterprises. The output of the financial enterprises thus includes interest received which was paid by the producing industry which as

accounted in GVA of the respective industry, its inclusion in the GCA of the baking industry amounts to duplication. To avoid this duplication FISIM is allocated to the user industries as an intermediate input. State level value of FISIM may be distributed on the basis of total value of output of the district.

3.9 Computer Software for Estimation of District Income

Indical (India District Income Calculator) is a user friendly and interactive computer software to calculate the district income, store the data, generate reports, and carry out spatial analysis. Indical software is based on the Methodology mentioned in the Book “Estimating District Income In India” by Rohini Nayyar, Meenakshi Rajeev, Vinod Vyasulu, Published by MacMillan Publishers. This pioneering software was conceived and developed by Spatial Data Pvt. Ltd, in close collaboration with the Centre for Budget and Policy Studies, Bangalore.

The four main modules of the software are District Product, District Income, Reports, and Map. A summary on each module is given below.

a. District product

This module will start the step by step methodology for calculating value added by commodity producing sectors. Gross value added by both primary and secondary sectors is estimated.

b. District income

This module is utilised to calculate the total income generated by a district. District Income is the sum of value added by the commodity producing sector (District Product) and the district share of the service sector or non-commodity producing sectors. Calculation of District Product precedes the calculation of District Income.

c. Map

This module launches the district map of India to spatially analyze district product and district income for various districts. Estimation of annual district income is a prerequisite for doing map based analysis and reports.

d. Reports

This module helps to generate customized district level reports. Consolidated and detailed reports can be generated.

3.10 Limitations of District Income Estimation

The calculation of district-income is a task of difficulties and complexities.

District income is the single comprehensive indicator of economic growth of the country. However, it has its own limitations. Although, district income is defined as the value of all goods and services, in practice, all useful goods and services cannot be evaluated. The domestic services of housewives, driving of own's car, gardening or carpentry done in own's house during spare time etc. are difficult to monetize with any degree of precision and such activities are left out from the scope of district income concept. Hence, the estimates of district income during two periods may not be strictly comparable as the non-monetized domestic services in one period may be replaced by the paid services in another with the result that district income may show rise even though there may not be increase in service rendered.

The existence of a large non-monetized sector in underdeveloped countries also makes the estimation of national & state income but also district income difficult. As we know, quite a substantial part of the agricultural output in the underdeveloped countries does not reach the market at all. Either it is consumed at home by the farmers themselves or is exchanged for other goods and services in the villages. This presents several difficulties in the estimation of district income.

The overwhelming majority of the small producers in the underdeveloped countries are illiterate and ignorant, and are not in a position to keep any account of their production activities, which further creates a problem in estimation of district income.

Because of underdevelopment, occupational specialisation is still incomplete, so that there is a lack of differentiation in economic functioning. An individual may receive income partially from farm ownership and partially from manual work in industry in the slack season, etc. makes the income estimation task difficult.

These are some of the general limitations of district income estimates. Since, the statistical system in India with regard to gross-root level data are not fully developed, the district income estimates prepared presently in India suffer from certain deficiencies. In what follows broad deficiencies are brought out.

a. Gaps in Statistical Data

The major deficiencies in the estimation of district income prepared in India arise from the dearth of the requisite statistical material. Since, the district income envelopes the entire economic activities in the district, it is but desirable that the statistical information utilised for estimation of district income is reliable, exhaustive and comprehensive. Unfortunately, statistical material available at present has rarely been collected for the purpose of district income estimation with the result that the statistical data used for the purpose are adjusted to suit somehow the requirements of the district income estimates and such adjustment result in error in the estimates.

For the purpose of estimation of district income comprehensive data on working force, production, prices, earnings and cost of production are required.

b. Problem of Netting Out

At a sub-national level, the concept of income becomes fuzzy as the economic and political boundaries differ. A state is an area within a defined economic boundary that co-exists with other states within the nation, within a national framework; it may have its own elected government that enjoys considerable freedom. There are some difference in laws, tax rates and the like in various states that relevant to the estimation of income. Calculating a district income is much more complex than calculating a national income because economic boundaries are not restricted to the district's and even state's political boundaries. Technically, this is the problem of 'Netting Out' transfer problem.

c. Accounting Period

The estimates of district income generally refer to a year. In India, the reference period is taken as a fiscal year which covers the period from 1st April to 31st March. The economy of district is mainly agrarian in character and agriculture contributes nearly one third of the district income. Income from agriculture sector relates to the agricultural year (from July to June) even though the estimates of district income are said to refer to a financial year.

d. Working Force

Working force statistics are indispensable for income estimation. The major source of working force statistics in India is the decennial population census. Besides, the Director General of Employment and Training (DGET) collects data on employment in the public sector through the National Employment Services and data on employment in the private sector through the Employment Market Information Service.

The data collected by DGET on public sector employment is likely to go a long way in filling the gap in employment statistics once they achieve the desired level of reliability. In case of private sector data obtained by DGET suffers from incomplete coverage.

e. Production Statistics

Nearly, one-half of the district income originated in the commodity producing sectors which includes agriculture, animal husbandry, fishery and forestry. The production statistics have therefore important bearing upon the accuracy of the district income estimates.

a. Agriculture: Among the commodity producing sectors, the agriculture sector has significant contribution in the district income. Even though the statistical network in agricultural sector in India is vairy wide, all the estimates of production are not yet based on the objective method viz. crop cutting experiments. The production estimates of most of the major and minor crops are based on the traditional method popularly know as 'Annawari' method which has a large scope of personal bias used in most of the states in India. Moreover, outturn statistics are still not compiled for a number of crops. Similarly, up-to-date data on agricultural by-products are not available and the present estimates are based on the outdated data.

b. Animal Husbandry: This one of the weakest sectors in so far as data relating to output is concerned. The present method of estimation of output consists in doing some sort of mathematical exercise. Applying the rate of yield per animal, percentage distribution, utilisation and conversion rates, output of various livestock and poultry products is estimated. The data on yield rates are

mostly based on local enquiries and not on any scientific survey. Similarly, no authentic data on animals' death and animals slaughtered outside recognised slaughter houses are available.

- c. **Prices:** Gross value from some of the commodity producing sectors is obtained as the product of outturn and the appropriate price. From the point of view of district income estimation, the price statistics themselves. Even though the coverage of price statistics is enlarged considerable in recent years, these cannot meet fully the requirement of district income estimation.

- d. **Cost of Production:** In order to obtain the net value added which is the contribution to the district income, value of inputs is required to be deducted from the gross value, as in case of agriculture, animal husbandry, forestry, fishery and mining. In the case of agriculture, information obtained from outdated surveys and local enquiries is used to estimate certain cost of cultivation.

- e. **Earning data:** The contribution of non-commodity production sectors is generally measured by income method. In many a case income is obtained as the product of working force and per head earnings. In spite of the importance of data on earnings, there is great dearth of earning statistics. At present the major source of earning data for national, state and district level income estimation are Income-tax revenue statistics published by the Central Board of Revenue, NSSO and Local surveys. None of them meet the full requirement of the national, state and district income estimation.

3.11 Conclusions

In this chapter we have discussed some issues regarding the methodology for the estimation of district income in India which was provided by the Central Statistical Organisation. Since the regional planning is vital important in the formulation of the proper strategies for the overall development of the district, the estimation of the district income must be done by proper methodology and analytical framework. Sector-wise different methods of estimation of GDDP along with their precautions while implementing has been discussed in this chapter.

The importance of district income estimation at constant prices to avoid the price effect along with the detailed process of district income estimation and also the contribution of agricultural sector in the in general and crop husbandry sector (special reference to sugarcane crop) in particular has been discussed in this chapter.