Agriculture is a cause of sub optimal measurement in National Accounts

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Introduction

Agriculture plays an important role in the Indian economy. India has been an agriculture economy since its independence. There are many states which depend on agriculture-based activity for their economy. Over 70% of the rural household depends on agriculture for their livelihood, with 59% of India's total workforce employ in Agriculture in 2016[1]. Currently, the contribution of agriculture and allied activities in the nation's GDP is one-third and are the single largest contributor in it. As agriculture holds a dominant position in contributing country's GDP, it becomes necessary to collect and maintain the agriculture statistics in a systematic manner. To check the reliability of agricultural statistics and its correct valuation in the national economy, this paper is divided into three sections. The first section talks about the statistics of some domain of agriculture particularly the land use and yield estimates. In this section, the sources and methodology used in to estimate the land use and yield rates, are discussed. The agencies responsible for collecting the data, the estimation time and recommendation to improve the agriculture statistical system by many committees are also included in this section. The second section talks about the evolution of National Accounts Statistics (NAS) in India and how the agriculture and livestock sector computed in it. This section is also talked about the subsequent revisions in the base year of national account aggregates. The final section talks about the data gap and other discrepancies in the agricultural statistical system and the other challenges in estimating the agriculture and allied sector contribution in national accounts.

Statistics on Land use and Yield of crops, sources and methodology

India has a two-tier system for collecting and compiling agricultural statistics, at the state level - State Agricultural Statistics Authorities (SASAs) and at centre level - Directorate of Economics and Statistics Ministry of Agriculture (DESMOA) is the pivotal agency for collecting and compiling agricultural data at the all-India level and publishes all the data related to agriculture in "Agricultural Statistics at a Glance" series. The DES is responsible for the data of estimates of area, production and yield of almost 80% of agricultural crops. The production of crops is estimated through the multiplication of area estimates by corresponding yield estimates. The other agencies are the National Sample Survey Organisation (NSSO) and State Directorate of Economics and Statistics (DESs). These authorities are responsible for providing data for a wide range such as land use, land holdings, crop area, crop production, irrigation, livestock, fishery, forestry, etc. (Govt. of India)

The data on land use is collected based on three categories. In the first category, which is commonly referred to as "temporarily settled States", the data is compiled from the village land records maintained by revenue agencies or patwari. In 18 major states and 4 union territories of India, this system is followed to collect the land data. The data is collected through a system of Timely Reporting Scheme (TRS) under which 20% of villages are randomly selected for area estimates. In the second category, which is commonly referred to as

"permanently settled States", the data is collected through sample surveys in a large sample of 20% villages or investigator zones under the scheme of Establishment of an Agency for Reporting of Agricultural Statistics (EARAS). The third category covers those states and union territories where there was no agency for reporting the data. The village headman is responsible for providing the land data, based on their knowledge and experience, in these states. The land use data was collected under nine categories: a) Forests, b) Area under non-agricultural use, c) Barren and uncultured land, d) Permanent and other gazing lands, e) Land under miscellaneous tree crops and groves, f) Culturable waste land, g) Fallow lands other than current fallows, h) Current fallows, i) Net area sown. To provide detail and useful information for land development programs these nine categories are further expanding to 22 categories. (Govt. of India, 2017)

The estimates for yield are collected through Crop Cutting Experiments (CCE) initiated under General Crop Estimation Survey (GCES). Currently, 95% of crop production is estimated through yield estimates obtained by CCE. The Field Operations Division (FOD) of NSSO, provides training and technical guidance to States and Union territories for properly conducting CCE for better yield estimates. The CCE process involves many steps, starting from the random selection of a field followed by identification and marking of experimental plots, harvesting the crops and recording of it for adjustment of dry grains, all these steps are performed by trained field staff. (Govt. of India, 2017)

The various activities of farming including sowing, harvesting, and threshing etc., have been performed during the season for agricultural crop i.e. from July to June. However, for policy purposes related to pricing, marketing, import/export and distribution etc., the government require the advance estimates of production of crops. Thus the advance estimates at four different point of time in a year have been evolved to meet the requirement. The first advance estimates are prepared in the month of September every year in which area and production of kharif crops are estimated. The second advance estimates are prepared in the month of January every year. Under second advance estimates, the first assessment of kharif crops are getting revised and for the rabi crops, the first assessment is being prepared. The third advance estimates are prepared at the end of March or at the beginning of April every year. Under third advance estimates, the advance estimates of both kharif and rabi crops provided earlier, are validated with the latest information available through various related authorities. The fourth advance estimates are prepared in the month of June/July every year. The third advance estimates for both kharif and rabi crops are getting revised in fourth advance estimates, it also helps in SASAs to provide better estimates for both crops since by end of the May mostly rabi crops get harvested. The final estimates released in December/January of the following agricultural year.

The agricultural statistics are subjected to timely review so that they can modify and adapt several changes according to agricultural practices. There have been many expert committees set up to monitor the work of the agricultural system. These committees are the Technical Committee on Coordination of Agricultural Statistics (1949), the National Commission on Agriculture (1976), the High Level Evaluation Committee (1983), and the Workshop on Modernization of the Statistical System (1998). The Technical Committee set up on 1949, under the chairmanship of Shri W.R. Natu, focused on standardizing the concepts and definitions, making a uniform system to collect the data, suggesting the scope of enquiry where land records were lack and a pattern of organization to collect the data at different levels. The National Commission on Agriculture critically reviewed the agricultural statistics and recommended to form a strong foundation for statistical operations to help the government in making the policies. Under the chairmanship of Prof. A.M. Khusro, the High Level Evaluation Committee emphasis on the data gap including the methodological gap and recommended making the strong database for agricultural statistical system. It also identified new areas such as crop estimates and crop forecasting at the local-level Community Development Block (C.D.Block). The Workshop on Modernization of the Statistical System was organised to identify the lacunae in the system to modernise it. The suggestion in the

Workshop was made to use the latest techniques to improve the timeliness, reliability, and adequacy of the agricultural statistics.

Evolution of National Accounts Statistics

National Accounts Statistics (NAS) is the major source of all macroeconomics data of India. It is annually published by the Central Statistical Organization (CSO) of the Ministry of Statistics and Programme Implementation (MOSPI). The efforts to compute the nation's income has started before the independence, by many individuals and research workers. Post-independence, thus, a serious need for providing the estimates of national income and other related aggregates were felt. For policy and planning purposes, an expert committee named National Income Committee was set up by the Government of India in 1949 under the chairmanship of Prof. P.C. Mahalanobis. The Committee was set up to make a recommendation regarding the compilation of estimation of national income, improving the statistical data, and to promote the research in the field of national income. The Committee recommended preparing the national income estimates on an annual basis. The estimates and details of the methodology adopted in estimating the national income were first published in the report of National Income Committee by the Ministry of Finance in 1951. Later, accepting the recommendation by Committee, the Government of India transferred the work of estimation to the Central Statistical Organisation (CSO) where a full-fledged National Income Division was set up which now called as National Accounts Division. (Govt. of India, 2012)

The CSO prepared the first official estimates of national income with the base year 1948-49 at constant prices. These estimates along with the corresponding estimates of current prices and the accounts of Public Authorities published as Estimates of National Income in 1956 and was continued to be published till 1966 as commonly known as Conventional Series. As the availability of data was improved over the years, the methodology for national income estimates was reviewed and after the proposals expressed in the seminar and several other studies accepted, the base year was revised to 1960-61 at constant prices. Along with it, the estimates of capital formation and saving for the years 1960-61 to 1965-66 was added to the revision. As the coverage in the publication extended to the estimates of private consumption expenditure, saving, capital formation, factor incomes, consolidated accounts of the nation and detailed accounts of the public sector, the title of the publication changed to the present title of National Accounts Statistics (NAS) in January 1975.

After the title of the publication was revised in 1975, the base year was changed to 1970-71 from 1960-61 and the estimates according to the new base year was published in NAS 1978. The estimates were based on the latest data collected from different sources such as population census, livestock census, various sample surveys and ad-hoc studies. The estimates and detailed methodology used in estimates was published in "National Accounts Statistics: Sources & Methods, April 1980", CSO (1980). In February 1988, the CSO further revised the base year to 1980-81 from 1970-71. This series, after a comprehensive review of database and the methodology used into estimates various aggregates, involved many conceptual and methodological improvement as per the latest data available such as estimates of consumption of fixed capital based on the estimates of fixed capital stock using the Perpetual Inventory Method (PIM) also, it was the first time when Sikkim state was included in the coverage.

In February 1999, the CSO again revised the base year from 1980-81 series to 1993-94 series. However, this time the revised base year was not change decennially. It was because earlier in the NAS, the information on workforce captured by the population census but in 1999, it was observed that the data on Worker Participation Rate (WPR) estimated by NSSO was better than the population census. Hence the CSO used the workforce data estimated by NSS from the NSS 1993-94 survey results and revised the base year to 1993-94. Other than the estimation of workforce by NSSO, the total population obtained through population census, horticultural

statistics released by National Horticulture Board, agriculture production, floriculture, data on valuation of other agricultural output available from Ministry of Agriculture, estimation of tailoring service contribution, public service in the quasi-government services, and the Employee Provident Fund Organisation (EPFO) contribution in the GDP are among the changes and methodological improvement adapted in this series.

In February 2006, the CSO revised the base year with 1999-2000 of national accounts series from 1993-94 base year, this was called fifth revision of the base year. In continuing the practice of adopting the NSS data on the workforce, the series used the data on WPR from the NSS 55th round (1999-2000) and population data from the Population Census in 2001. For continuing the process of improvement, the CSO used many studies conducted by State Governments, the Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, and the Socio-Economic Research Centre (SERC) for updating the data used in the compilation of national accounts. Along with this, the CSO also conducted a study on yield rates of meat and meat products to update the data on these products. In addition to this, the inclusion of the capital expenditure and other economic activities expand the coverage in new series in the GDP estimates. The current series of National Accounts was revised the base year from 1999-2000 to 2004-05 in January 2010. Further, the attempts were made to implement the recommendation recommended in the previous series and to use as much latest data as possible in estimation. (Govt. of India, 2012)

Agriculture in NAS

The agriculture and allied activities in the National Accounts Statistics, include the agriculture proper, livestock & livestock products and operation of irrigation. The agriculture proper includes the growing of field crops such as fruits, nuts, seeds and vegetables, managing the plantation crops such as tea, coffee and rubber, other agriculture and horticulture services, and ancillary activities such as gur making, transportation of produce to primary markets, activities yielding rental income from farm building and machinery, and interest on agricultural loans. The livestock and livestock products include breeding and rearing of animals, production of milk, slaughtering, preparation and dressing the meat, production of raw hides and skins, eggs, dung, raw wool, honey and silkworm cocoons etc. The operation of irrigation includes the supply of water through various government channels to the agriculturists. Often agriculture and livestock activities go together and it is not always right to segregate these activities, thus the value-added estimates are prepared for combine activity but for estimating the value of output, agriculture and livestock are estimated separately. (Govt. of India, 2012)

To estimate the contribution of agriculture and allied sector in GDP, the production approach is used in terms of gross value added (GVA). The GVA is expressed as the difference between the value of products, by-products and ancillary activities at prices received by the producers and the value of inputs of raw materials and services consumed in the process of production at purchaser's price. The contribution of the operation of an irrigation system in GDP is estimated by using the income approach. Under this, the gross factor income generated through irrigation services is estimated but the irrigation system operated by agriculturists does not take into consideration as its value is automatically counted in the value of the output of crops and the expenditure in the overall input costs.

Challenges of agriculture database and gaps in NAS

For making concrete planning and policy, there is a growing need for agricultural statistics at the regional level and to do so, the related data must be collected by district-level agencies. But here the major challenge is that the data on production and prices at the district-level are not available for all crops. To estimate the district-level data, crops are divided into three categories: 1) crops for which the district-level data on production, area and prices are available. In this case, the wholesale prices of the primary market are used. 2) Crops for which

the district-level data on production are available but data on prices are not available. In this case, the value of output at district-level is computed by using district-level production data and neighbouring district prices if available. In case if neighbouring district prices are not available, regional prices are used and if regional prices are not available then state prices are used. 3) Crops for which district-level data on production and prices are not available but data on the area are available. In this case, the district-level value of output is computed through the state-level value of output based on district-level area. (Govt. of India. 2012)

There are significant data gaps, along with the district-level data, found in the agricultural system, such as the annual estimates for yield rates of minor crops, are not consistently available[2]. The estimates of yield rates for minor crops are available only after a considerable time lag and are also, not based on scientific methods. The major data gaps in agriculture are related to the separate data for many minor crops such as cashew, emerging new commercial crops such as mushroom and floriculture, high valued minor crops, other kinds of plants and medicinal herbs. These relatively new areas of cultivation and other ancillary activities such as cut flowers, dried flowers and other parts of plants (as it is possible) may not be computed in the estimation of GDP as these activities are not likely to be carried out in farmlands. The estimates of grass and fodder are also based on the 1952-53 estimation of yield rates which is the very old norm today.

In the case of livestock, there is a huge time lag in the availability of the data. The livestock population data are available on the lag of five years through livestock census, the yield rates of livestock products are also not regularly available and along with that, there is no uniformity between states related to reference period[3]. However, the production estimates for milk, egg and wool are available on the lag of two years, the milk estimation from the animals other than a cow, buffalo, and goat is not available. In addition to this, the utilisation data of milk in other forms such as desi ghee, butter, khoa, cream etc., are not available. Similarly, the yield rates estimate for meat products and by-products are not based on any scientific techniques. There are also huge data gaps in terms of no reliable annual estimates of livestock population as there is a lack of annual data related to the death of the animals due to natural calamities. (Kulshreshtha, 2004)

Some discrepancy also found out in the quality of data particularly in timely completion of area enumeration as per the findings of the new initiative of Improvement of Crop Statistics (ICS) taken by NSSO. As per the findings it has observed that the timely completion of the area at country level is less than 40% for autumn and less than 60% in winter, rabi and summer. (Kulshreshtha, 2004). Also, the same data at the state level is alarmingly unsatisfactory for some of the states. There is also a high chance of incorrect data submitted manually. The lack of correct area estimates leads to incorrect yield estimates through crop cutting experiments and thereby weakening the agricultural statistics. About prices, the price is currently estimated based on primary market centres, but the data of prices related to the first point of the transaction are not available. For correct estimation of the value of agriculture and livestock products, the prices for many items and from many markets need to be collected. As many committees have been set up to check the accuracy of agricultural statistics, though there are many gaps in the system which needs to be filled.

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[2] The list of major crops and minor crops are shown in Appendix
[3] The value of the output of Agricultural crops and Livestock products and their sources are shown in Appendix

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Appendix

Major Crops	Minor Crops
Paddy	Potato
Wheat	Onion
Jowar	Banana
Bajra	Tapioca
Maize	Sweet Potato
Ragi	Pepper
Barley	Ginger
Small millets	Garlic
Gram	Chillies
Tur	Turmeric
Groundnut	Arecanut
Sesamum	Coriander
Rapeseed and Mustard	Cardamom
Linseed	Sun Hemp
Castor Seed	Tobacco
Safflower	Guar Seed
Niger Seed	Coconut
Soybean	
Sunflower	
Cotton	
Jute	
Mesta and Sugarcane	

Source: Directorate of Economics & Statistics, Department of Agriculture and Cooperation

Value of output of agricultural crops and their data sources

S.No.	Groups	Sources of Data
1	Cereals: Paddy, Wheat, Jowar, Bajra, Barley, Maize, Ragi & Small Millets and other cereals	Production and Area: Directorate of Economics and Statistics (DES), Ministry of Agriculture (M/o Ag) & State DESs in respect of principal crops. Area under other crops is obtained from LUS and state DESs. Prices: State DESs
2	Pulses: Gram. Moong, Tur, Moth, Horse Gram, Masoor, Urad, peas etc. and other pulses	Stated at (1) above.
3	Oil Seeds: Linseed, Groundnut, Rapeseed and Mustard, Sesamum, Castor seed, Coconut, Safflower, Niger seed, Soyabean, Taramira Sunflower and other oilseeds	- do -
4	Sugar: Sugarcane, palmyara, Gur other sugar	Gur production= 9 to 10% of sugarcane used for gur making (total sugarcane production-cane crushed by factories-used for seed-used for chewing-cane used for khandsari)
5	Fibres: Kapas, Jute, Sunhemp, Mesta, other fibres	Stated at (1) above.
6	Indigo dyes and tanning material: Indigo, other dyes and tanning material	State DES of Tamilnadu and Rajasthan for production and prices, LUS for area under other dyes etc.
7	Drugs & Narcotics: Tobacco, Tea, Coffee, Opium, Betel leaves, Isabgol, Saffron, Coca, other drugs & narcotics.	Tea Board, Coffee Board, Cashewnut & Coca Development Board, Central Bureau of Narcotics - for area and production

		Prices: DES and respective Boards.
8	Condiments & Spices: Cardamom, Dry chilies, Black pepper, Dry ginger, Turmeric, Garlic, Fennal, Cumin, Ajwain, Methi, Tamarind, Nut meg, Cloves, Cinnamon, Coriander, Arecanut and other condiments and spices	Stated at (1) above.
9	Fruits and Vegetables: Banana, Mango, Grapes, Cashewnut, Papaya, Apple, Mosambi, Lemon, Orange, Lichi, Pineapple, Sapota, Guava, Potato, Sweat potato, Tapioca, Brinjal, Cabbage, Cauliflower, Okra, Tomato, Green peas, mushroom, other vegetables, Onion, Cherry, Almonds, Walnut, Pear other temperate fruits, Subtropical fruits, Other citrus fruits, Jack fruit, Drumstick, floriculture, backyard farming	Area and Production: (1) Land use statistics (LUS), DES/ M/o Ag. (2) National Horticulture Board (NHB),M/o Ag (3) NSS Reports Prices: State DES
10	Other Misc. crops: Rubber, Fodder, Mulberry, Guar Seed, Grass, Misc. Food & Misc. Nonfood crops	Production: LUS Prices: State DES
11	By products: Straw, Stalks and sticks of cereals and pulses cane trash, bagasse, poppy seed and poppy husk	Production: 1) CCS Reports 2) State/UT DES's Prices : State/UT DES

Source: National Accounts Statistics – Sources and Methods, 2012

Value of output Livestock and Livestock Products and their data source

S.No.	Categories	Item	Sources of Data
1	Milk	Milk	Integrated Sample Survey (ISS), Dept. of Animal Husbandry, Dairying and Fisheries, M/o Agriculture) for production data. Prices: State DES
2	Meat Group (i) Meat (ii) Meat Products (iii) By-products	Beef, Mutton, Pork, Poultry Meat and glands Fats, heads and legs Hides, skin, guts, blood, bones, horns, hoofs, tail stump, useless meat and Oesophgus	Production : State DESs Yield rates of CSO studies Prices: State DES (ii) and (iii) Production: CSO studies Prices : State DES
3	Eggs	Eggs	Production : ISS Prices: State DESs.
4	Wool & Hair (i) Wool (ii) Hair and Bristles	Sheep Wool Goat hair, Camel hair and Pig bristles	Prod. : ISS; Prices: State DESs Prod. : CSO Studies Prices: State DESs
5	Dung	Dung Fuel and Dung Manure	Prod. : ISS Prices : State DESs
6	Silk worm, Cocoons and Honey	Silk worm (Mulberry, Tussar, Ericot and Munga), Honey	Silk worm: Central Silk Board for prodn. and prices; Honey: KVIC for production and prices
7	Increment in Stock	Increment in livestock of all categories of all animals	Population : 17th all India Livestock Census (15 Oct. 2003) and 18th Livestock Census (15th Oct.2007), Prices : State DES

Source: National Accounts Statistics – Sources and Methods, 2012