Recent Changes in Measurement of India's GDP: Overall Issues and Some Focus on Agriculture

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Abstract

This paper discusses (a) changes in measurement in industry and services (b) changes made in agriculture sector and (c) major issues on the measurement of GDP in new series. There are long term or legacy issues in agriculture, industry and services. The paper examines 10 major issues on measurement of GDP in the new series. These are: (1) MCA 21 data problems; (2) separation of Quasi corporations from household sector; (3) effective labour input method; (4) high growth rate of GDP vs. ground realities; (5) GDP at market prices vs. GVA at basic prices vs. GDP at factor prices; (6) GDP production and GDP expenditure method; (7) single vs. double deflation; (8) price deflators WPI vs. CPI; (9) nominal growth vs. real growth; (10) reference point for growth: advance estimates, provisional estimates, first revised estimates and second revised estimates. In our view, although there are some gaps in the measurement of GDP the new series and the methodology adopted are based on 'best advice' from experts available in the country. The issues discussed in the paper will be useful for next base revision of National Accounts Statistics.

Keywords: GDP, Agriculture, Manufacturing, Services, price deflators, Consumer price index

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1. INTRODUCTION

At the outset, it may be noted that India's National Accounts Statistics (NAS) is one of the most massive statistical exercises undertaken in the world. It has a better statistical system among the developing countries. A rough calculation shows that it

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has more than 3000 data sources and based on more than 300 surveys. In January 2015, CSO introduced a new series of National Accounts Statistics with 2011-12 as the base year, replacing the old series with 2004-05 as the base year. The year 2011-12 also coincides with the Employment and Unemployment Survey, NSS 68th Round.

What are the the basic reasons for controversy on the new series compared to the old series? Generally, base year revisions lead to a marginal rise in the absolute size and do not show much change in growth rates. The new series showed marginal decline in the base year size but the over-all GDP growth rate and some crucial growth rates increased significantly. For example, GDP growth rate in 2013-14 was 4.8% in the old series but 6.2% in the new series. There was also significant rise in manufacturing growth in the new series. Media reports say that ground realities, like growth in investment, credit, etc. indicate that GDP growth looks is much lower than 6% to 7.5% as shown in the new series.

The CSO (2015b) says, the guiding principles for change are: (1) revision of base year to a more recent year; (2) complete review of existing data base and methodology employed in the estimation of various macro-economic aggregates and alternative data bases; and (3) implementation of the international guidelines based on SNA, the System of National Accounts 2008 to the extent possible. It may be noted that CSO makes it clear that the new series are not comparable with the old series[2].

1.1.Long term issues

The long term issues on data have been discussed in various research papers and government reports[3]. Due to the loss of credibility of official statistics, especially in the 1990s, the National Statistical Commission was appointed, with Dr. C. Rangarajan as Chairman, with wide-ranging terms of reference. The reasons for deficiencies in data gaps and quality were traced to: (a) deterioration in administrative statistics at the primary level; (b) weakening of the institutional mechanisms of vertical coordination between the centre and the states; and (c) a

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[2] See Anant (2015)
[3] See *Data base of Indian Economy* of The Indian Econometric Society (TIES), Vol.1 and Vol.2.

similar weakening of the lateral coordination between the ministries at the centre and the central statistical organisation. After analysing the deficiencies of the Indian Statistical System, the commission has made several recommendations to revamp the statistical system. Rangarajan Commission gave 623 recommendations. They cover agriculture, industry, services, infrastructure, socio-economic statistics, financial and external sectors, corporate sector, prices, and the over-all National Accounts Statistics. National Statistical Commission (NSC) was appointed on a permanent basis subsequently. NSC has implemented many of the recommendations of the Rangarajan Commission.

Srinivasan (2013) discusses long standing unresolved data issues[4]. According to him, the "First National Income Committee chaired by Professor Mahalanobis, besides estimating value added in each sector of the economy, also provided its estimates of errors surrounding the estimates of the value added. The Central Statistical Office (CSO) has not published any error estimate since then, so that we have no idea how the proportions of errors (sector wise and in the aggregate) have been changing over time. It is time the CSO begins publishing error estimates." (p.14). (this is a quotation from TN Srinivasan. He is referring to standard errors. We can't change quotation.)Srinivasan also comments on the problems with the estimates of consumption, saving and investment of households.

Another issue often discussed relates to the differences between the estimates of private consumption by the National Accounts Statistics and the National Sample Survey. The Rangarajan Committee on poverty discusses these differences. Like in many countries, The Indian statistical system has two parallel estimates of private consumption. The NSS estimates are from the household consumer expenditure survey and involve the distribution of mean per capita consumer expenditure by deciles. The National Accounts Statistics (NAS) estimates are from the CSO. It yields a scalar value of consumption for the nation as a whole, with no disaggregation by region or class (except by broad commodity group). The NAS estimate of private consumption is derived as a residual by deducting from the estimates of production (adjusted for foreign trade) the estimated use in capital formation and public consumption.

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[4] Some of the long pending or legacy issues relating to NAS are discussed in Nagaraj and Srinivasan (2016).

These two estimates of consumption (NSS and NAS) do not match in any country. India is no exception. What is alarming in India is that the difference between NAS and NSS is widening overtime. For example, the difference was less than 10% in the late 1970s; it rose to 50% in 2009-10. At the aggregate level, the NAS consumption has always been more than the NSS consumption. The differences are much higher for non-food (46%) compared to food (26%). Some adjustments made reduced the differences.

An exercise [Rangarajan and Dev, 2016] that adjusts agricultural produce for the financial year including trade and transport margins and taxes reduces the difference from 45.8% to 41.2% for the year 2009-10 [for which year(s)? Or is it an average?] for the   For non-food expenditure, the financial intermediation services indirectly measures (FISIM), life insurance premium and imputed gross rental are part of NAS estimates with no counterpart estimates in NSS. An adjustment for this factor reduces the difference from 41.2% to 32.5% for the year 2009-10. But, still the differences are large. Non-food expenditure in NAS is much higher than in the NSS. Apart from problems in NAS, the fatigue of respondents in NSS surveys may not be able to capture some of the non-food expenditures (GOI, 2014).

CSO has been trying to solve the long term or legacy issues over time based on new data availability and new methodologies.

The objective of this paper is to provide an overview of major changes and issues relating to the recent changes in measurement of GDP. The paper is organised as follows. Section 2 examines the major changes made in the new series. There has not been much discussion on changes made in the agriculture sector as the focus has been mainly on manufacturing sector and trade. Therefore, in Section 3 we document the changes made in regard to agriculture sector in 2011-12 base year compared to 2004-05 base year. Section 4 discusses 10 major issues and debates on changes in measurement of GDP in the new series. Last section provides concluding observations.

2. Major Changes in Measurement of GDP in the New Series.

There have been many changes in the new series compared to the old series. We concentrate on four major changes in the data and methods. These are:
(1) Changes in corporate sector and financial sector data
(2) Data for the government sector;
(3) Changes in the factor income method for the informal Sector;
(4) Changes in trade sector data: wholesale and retail

2.1. Corporate Sector Data and Manufacturing Growth

It is known that old series used RBI study on company finances from a sample of around 2500 companies. There has been a discussion in the last several years to change this approach. Therefore, in 2011-12 series, corporate sector both in manufacturing and services has been comprehensively covered by incorporation of annual accounts of companies as filed with the Ministry of Corporate Affairs (MCA) under the e-governance initiative, MCA 21. For the 'manufacturing' enterprises MCA21 data base has been used to supplement the information available in the Annual Survey of Industries (CSO, 2015 a).   In the new series, CSO used the MCA 21 data set which had about 5.24 lakh non-financial private companies. New series also adopted the concept of enterprise in place of establishment. This led to big change in manufacturing sector value added.

Manufacturing growth was higher than in earlier series. It is important to keep in mind the following changes in order to understand the higher growth in corporate and manufacturing sectors.

(a) *Data sources used for estimating GVA in manufacturing sector are different.*

Table 1 provides the differences in the sources of data. In the old series, IIP and ASI data, both of which are establishment based, are used. The first estimate is derived by applying the IIP growth to estimates of the previous year. In the second revised estimate, these estimates were updated with the ASI figures when they are available. IIP reports output while ASI gives value added in the establishment. In the new series, IIP and MCA21 are used for 1st revised estimate while MCA21 and non-corporate ASI are used for 2nd revised estimate (Table 1).

Table 1 Sources of data for different estimates in old and new series for manufacturing

Series	Year 1 (advance &	Year 2 (1st revised	Year 3 (2nd revised

	provisional)	estimate)	estimate)
2004-05 series	IIP	IIP	ASI
2011-12 series	IIP + Advance filling of corporate accounts	IIP+MCA21	MCA21+non-corporate ASI
Source : CSO (2015c)			

(b) Change from establishment to enterprise

According to CSO (2015c), usually there is not much difference between establishment and enterprise value added. But for large enterprises, these differences are significant. For example, take Reliance under Mukesh Ambani. Earlier they used to go to all factories of Ambani. Now they collect data for all factories together at the CSO enterprise level. Because of this change, we are capturing marketing, development, logistics and financial activities that take place at manufacturing firms' head offices. The value added by marketing and other services were being excluded in the old series from the GDP because they were not covered in the ASI. Also, under the earlier approach, Marutis and Audis were all put together as the same by taking only volume of production. Now monetary value is calculated by including product improvement and differentiation.

(c) Financial Sector

In the 2004-05 series, only Banking (80%) and insurance and others (20%) were covered under the financial sector. By contrast, the new GDP series expands coverage of the finance sector by including stock exchanges, stock brokers, asset management companies, mutual funds, pension funds as well as regulatory bodies like SEBI, PFRDA and IRDA (CSO, 2015b). Earlier, informal finance was assumed to be one-third of formal non-banking finance industry. Now private moneylenders' contribution to the economy is measured using survey data.

2.2 Changes in Government Account: Local Bodies

Earlier information is based on local bodies of four states (Delhi, Himachal, Meghalaya and U.P.) only. Under the Thirteenth Finance Commission, DES (Directorate of Economics and Statistics) of eleven states – U.P., Tamil Nadu, Meghalaya, Maharashtra, Kerala, Karnataka, Himachal Pradesh, Delhi, Chandigarh, Andhra Pradesh and Telangana- have collected the accounts of local bodies. Local

bodies which were captured on a sample basis are now being captured on a complete account basis. On the basis of this information, which accounts for about 60% of the transfers to all local bodies, national level estimates are compiled (CSO, 2015b). The work is in progress to extend it to close to 100 per cent. This was a big change, due to which government accounting improved enormously.

2.3. Changes in Informal Sector and Labour

In the old series, labour input method (LI method) assumed that there is equal contribution from all categories of workers engaged in the economic activity. It assumes that the productivity of an employer, a casual wage worker, self employed worker, or a family worker is equal. Based on enterprise surveys of NSS, an average value added per worker is taken. Then total labour input is computed from Employment and Unemployment Surveys. Labour input is also projected for the period between two NSS surveys. Workforce is multiplied by the average value added per worker to arrive at GVA in that industry

In the new series 'Effective Labor Input Method' has been adopted. The new method addresses the differential labour productivity issue by assigning weights to the different categories of workers engaged in an economic activity based on their productivity (CSO, 2015b). The weights were based on the data from establishments covered in the NSS 67th round Survey on unincorporated Enterprises, 2010-11 (Table 2).

Table 2: Different weights to different workers: 67th Round

Activity	Owner	Hired	Helper
Trade& Repairs	0.66	1.00	0.28
Hotels & Restaurents	0.63	1.00	0.35
Transport	0.33	1.00	0.38
Communication	0.32	1.00	0.37
Real estate & professional services	0.76	1.00	0.16
Education	1.29	1.00	0.44
Health	0.73	1.00	0.25
Other services	1.09	1.00	0.00

Source: Rajakumar and Shetty (2015)

2.4. Changes in trade sector

In the trade sector, value added for unincorporated sector is estimated from Enterprise Survey and Employment surveys of NSSO. For 2004-05 base revision, 1999-2000 Survey was used as there was no survey of a later date available. Employment growth was 2.8% between 1999-00 to 2004-05. This growth was imputed for the years between FY 05 and FY 12. For 2011-12, the 67th Round (2010-11) survey was used. Annual growth rate in employment was only 0.8% for the period 2004-05 to 2011-12.

(This growth rate is for the period 2004-05 to 2011-12 and divided by the number of years. It becomes annual growth rate. So, there is no ambiguity)

2004-05 series therefore, overstated the value added in the trade sector. The decrease in GVA of Trade is mainly due to drop in the latest survey based estimates of trade for the unorganised sector. Large part of the trade happens in non-incorporated establishments. Trade surveys are done infrequently. For the old series of 2004-05, latest data could not be used because the trade survey was available only for the year 1999-2000. Therefore, for the period 1999-00 to 2004-05, Gross Trading Income (GTI) index was used (CSO2015b). Use of GTI index and old surveys has overestimated the value added for trade sector in the old series. In the new series, apart from using the latest survey 2010-11data, sales tax collection was also used as an indicator. The estimate of GVA for 2011-12 for **'**trade and repair services**' (level)** has gone down by 39.4% compared to the 2004-05 series.

These are the four major changes. Of course, there are many other changes documented in the CSO reports and individual research papers (e.g. see Rajkumar and Shetty, 2017[5]).

2.5. Differences in Old and New Series due to Changes in Measurement

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[5] The papers by Rajkumar and Shetty (2017) and Shetty and Rajakumar (2017) provide a comprehensive analysis of recent changes in GDP. On the issues relating to GDP measurement see Rajakumar (2015, 2016) and Rajakumar and Shetty (2015, 2015a, 2016, 2016a).

As a result of the changes in procedures, methodology, data sources and use of latest data from survey results, there are significant differences in the old and new series. These changes are discussed below.

The absolute GDP number in 2011-12 for the new series was 97.8% of the old series- 2.2% lower (Table 3). Recent revisions show that the absolute size of GDP was lower by 3.4% in new series compared to old series in the same year. (Rajkumar and Shetty, 2017) The absolute size in the new series was much higher in the new series for industrial sector (18% higher) while it was much lower for services (14.2% lower) in 2011-12 (Table 3). For trade, hotels, transport etc. new series showed 31.5% lower than old series.

Table 3. GVA at FC by economic activity at current prices (%)

Industry	New series as a % of Old Series		
	2011-12	2012-13	2013-14
1. Agriculture	103.7	105.2	102.4
2. Industry	118.2	119.4	123.2
Mining & quarrying	116.5	127.3	133.4
Manufacturing	118.8	124.0	132.5
Electricity Gas, etc	149.2	139.3	121.0
Construction	111.6	104.9	105.6
3.Services	85.8	87.0	89.4
Trade, hotels, transport, etc	68.5	71.5	77.5
Finance, real estate, etc.	109.3	109.8	105.1
Public administration, etc	88.6	86.4	89.0
GVA at Factor Cost	97.8	98.7	100.1

Source: Rajakumar and Shetty (2015)

The share of industry increased from 27.2% in the old series to 33.1% in the new series (Table 4). Similarly, manufacturing share rose from 14.7% to 18.1%. The share of services declined from 54.8% to 48.6%, while the share of trade and repair services significantly dropped from 15.9% to 9.7% (Table 4). There was only marginal rise in the share of agriculture.

Table 4. Shares of Different Sectors in 2011-12 (current prices)

Sectors	Old series 2004-05	New series 2011-12
Agriculture&Allied	17.9	18.4
Industry	27.2	33.1
Mining&quarrying	2.7	3.2
Manufacturing	14.7	**18.1**
Electricity	1.6	2.4
Construction	8.2	9.4
Services	54.8	48.6
Trade&Repair services	15.9	**9.7**
Hotels&restaurents	1.5	1.1
Transport, storage&com	7.3	6.5
Financial Services	5.7	5.9
Real Estate, public dwel	10.7	12.9
Public admin&defence	5.9	6.0
Other Services	7.8	6.5
Total GVA	100.0	100.0

Source: Same as Table 3

Although absolute size declined, growth rates of GDP were higher in the new series compared to the old series. For example, the growth rate of GVA increased from 4.7% in the old series to 6.6% in the new series in 2013-14 (Table 5). The growth of manufacturing sector rose from -0.7% to 5.3% while the growth rate of trade, hotels etc. increased from 3.0% in the old series to 10.9% in the new series.

Table 5. Growth rate of GVA at industry level at constant prices (%)

Industry	2004-05 series		2011-12 Series		
	2012-13	2013-14	2012-13	2013-14	2014-15
1.Agriculture	1.4	4.7	1.7	3.8	1.1
2.Industry	1.0	0.4	2.3	4.4	5.6
Mining and quarrying	-2.2	-1.4	0.5	5.5	1.7
Manufacturing	1.1	-0.7	6.1	5.3	6.7
Electricity, Gas, etc	2.3	5.9	2.3	2.9	5.9
Construction	1.1	1.6	-4.4	2.5	4.5
3.Services	7.0	6.8	8.0	9.1	10.9
Trade, hotel, etc	5.1	3.0	9.2	10.9	9.1
Finance, real estate	10.9	12.9	9.0	8.0	14.0
Public administration, etc	5.3	5.6	4.7	8.0	8.8
GVA Aggregate	4.5	4.7	4.9	6.6	7.5

Source: Same as Table 3

One of the significant changes relates to the huge rise in savings and capital formation of private corporate sector (PCS). Table 6 shows a rise of 40% in savings

and 45% in investment in PCS in the new series compared to the old series. This reflects in year-to-year high growth rates in both savings and investments.

Table 6. Saving and Investment of Private Corporate Sector

Year	2004-05 series (Rs in Cr)	2011-12 Series (Rs in Cr)	Annual change (in %)		New series as % of Old series
			2004-05 series	2011-12 Series	
Savings					
2011-12	658428	854124	6.1		129.7
2012-13	713141	995930	8.3	16.6	139.7
2013-14		1231624		23.7	
Gross Capital Formation					
2011-12	913282	1173855	-8.5		128.5
2012-13	925481	1346038	1.3	14.7	145.4
2013-14		1429734		6.2	

Source: Same as Table 3

Regarding gross savings of the total economy, ratio of gross savings to GNDI (gross national disposable income) in the new series was higher by 2.4 percentage points in the new series compared to the old series in 2011-12 (Table 7).

Table 7. Gross Savings by Type of Institution (In Rs. Crores)

Item	2004-05 Series		2011-12 Series		
	2011-12	2012-13	2011-12	2012-13	2013-14
Public Sector	111295 [1.2]	117919 [1.1]	125188 [1.4]	169210 [1.7]	179132 [1.5]
	(3.9)	(3.9)	(4.2)	(5.3)	(5.2)
Private Corporate Sector	658428 [7.1]	713141 [6.9]	854124 [9.4]	995930 [9.7]	1231624 [10.6]
	(23.3)	(23.4)	(28.5)	(31.3)	(35.4)
Household sector *	2054737 [22.2]	2212414 [21.4]	2014613 [22.2]	2016122 [19.7]	2065179 [17.8]
	(72.7)	(72.7)	(67.3)	(63.4)	(59.4)
Gross Savings	2824460 [30.6]	3043474 [29.4]	2993925 [33.0]	3181262 [31.1]	3475935 [30.0]
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Note: Figures in square brackets are as % of GNDI; round bracket represent sectoral shares in percentages. * 2011-12 Series includes valuables.

Source: EPW Research Foundation (2015)

However, there were significant compositional changes in gross savings by type of institution. The share of private corporate sector in gross savings rose from 23.3% in the old series to 28.5% in the new series in 2011-12. On the other hand, the share of the household sector declined from 72.7% in the old series to 67.3% in the new series in 2011-12. In fact, it declined much more in 2012-13 (Table 7).

Similar changes were noticed in gross capital formation (GCF). In the new series, the ratio of GCF to GDP rose to 36.1% compared to 33.6% in the old series (Table 8). But, it showed only a marginal rise in 2012-13. GCF by the type of institution shows that the share of private corporate sector in gross savings increased from 30% in the old series to 36.8% in the new series. It rose from 28.5% to 40.2% in 2012-13. The share of household sector in gross savings declined from 46.9% in the old series to 42% in the new series. The share declined much more in 2012-13. The share of public sector in gross savings did not show significant change between old and new series.

Table 8. Gross Capital Formation by Type of Institution

Item	2004-05 Series		2011-12 Series		
	2011-12	2012-13	2011-12	2012-13	2013-14
Public Sector	695835 [7.7]	821962 [8.1]	674395 [7.6]	719426 [7.2]	902048 [8.0]
	(23.0)	(25.3)	(21.2)	(21.5)	(25.5)
Private Corporate Sector	913282 [10.1]	925481 [9.2]	1173855 [13.3]	1346038 [13.5]	1429734 [12.6]
	(30.1)	(28.5)	(36.8)	(40.2)	(40.3)
Household sector *	1422541 [15.8]	1495283 [14.8]	1337552 [15.1]	1284620 [12.9]	1212302 [10.7]
	(46.9)	(46.1)	(42.0)	(38.3)	(34.2)
Gross Capital formation*	3031658 [33.6]	3242726 [32.1]	3185802 [36.1]	3350084 [33.5]	3544084 [31.2]
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Note: Figures in square brackets are as % of GDP; round bracket represent sectoral shares in percentages. * Excluding valuables

Source: EPW Research Foundation (2015)

3. REVISIONS IN AGRICULTURAL GDP

In order to make it adaptive to contemporary changes in agricultural practices, the agricultural statistical system has been subjected to review several times since independence. Some of the important expert groups were: (a) the Technical

Committee on Coordination of Agricultural Statistics (1949), (b) the National Commission on Agriculture (1976), (c) the High Level Evaluation Committee (1983) (d) the Workshop on Modernisation of the Statistical System (1998) (e) National Statistical Commission (2001), chaired by Dr. C. Rangarajan (f) more recently the Experts Group on Agricultural Statistics under the Chairmanship of Prof A Vaidyanathan (2010) and (g) Professional Committee on Agriculture and Allied Sectors under the chairmanship of Prof Y K Alagh in 2013.

The Rangarajan Committee says that "…despite impressive and commendable achievements in agriculture over the years, there is a growing concern over the quality of Agricultural Statistics that are now available" (p.87). "The major reason for the poor quality of area statistics is the failure of the *patwari* agency to devote adequate time and attention to the girdawari operations while yield estimates suffer on account of the poor performance of field operations. The heavy workload of the primary agency contributes substantially to the poor quality and delay in the availability of Agricultural Statistics" (p.87 and 88, GOI, 2001).

The Vaidyanathan Committee made recommendations on improving area statistics and crop cutting experiments. It advocated setting up of National Crop Statistics Centre (NCSC) and use of remote sensing techniques for collection of agricultural statistics. Y.K. Alagh Committee also made several recommendations on improving statistics of both agriculture and allied activities.

Though these committees mainly focused on policy issues like reilability, timeliness and professionalism to collect, produce and disseminate quality Agricultural Statistics, none of the Committees dealt with the compilation of National Accounts Statistics in respect of Agriculture and Allied Sectors, its data requirements, issues thereof and improvements.

The Ministry of Statistics and Programme Implementation (MOSPI) asked the author of this paper to Chair the "sub-Committee on Agriculture and Allied Sectors' to review the issues relating to complilation of Gross Domstic Products and other key macro-economic indicators in agricultural and allied sectors and recommended suitable improvements which would be useful for base year revision. Agriculture & Allied sector consists (i) Crop sector; (ii) Livestock sector; (iii) Forestry; and

(iv)Fishing & aquaculture. The activities covered are: 1) Crop sector includes crop production and operation of Government irrigation system; 2) Livestock sector includes breeding and rearing of animals and poultry, production of milk, slaughtering, preparation and dressing of meat, production of raw hides and skins, eggs, dung, raw wool, honey and silk worm cocoons, etc.;3) Forestry sector includes forestry, logging and farmyard wood (industrial wood and firewood from trees outside regular forests); and 4) 'Fishing & aquaculture' includes commercial fishing in marine and inland waters, subsistence fishing in inland waters and fish curing viz., salting and sun-drying of fish.

The primary role of the sub-committee was to examine the current methodology, Rates and Ratios being presently used and other issues, so that a new methodology could be devised and rates and ratios could be updated/revised. These exercises and inputs of the sub-committee will help and facilitate the smooth changeover process from the current base year of 2004-05 to the proposed new base year of 2011-12. The committee gave 50 recommendations which are given in Appendix 1. Some recommendations relate to continuation of present practices till new data are available. Other recommendations relate to have special surveys and use the available new data sources, rates and ratios. New series have taken into account some of the recommendations of the sub-committee depending on the availability of new data.

3.1. Changes in the new Series compared to the old series in agriculture sector as documented by CSO[6]

Compared to major changes in industry and services, the changes in GDP agriculture in the new series are small. In the new series, the Gross Value Added (GVA) of Agriculture and Allied sector for the year 2011-12 has been estimated to be Rs. 15,05,580 crore at basic prices compared to Rs. 14,99,098 crore at factor cost in the old series. It shows an increase of Rs. 6,482 crore i.e. 0.43 % increase over the previous GVA estimate. CSO says that the net increase in GVA is mainly on account of revision of prices of crops and livestock products, despite the fall observed in forestry and 'fishing & aquaculture' sectors.

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[6] See CSO (2015b)

Table 9 presents the sectors which showed 10 per cent or more differences in the estimates of gross value of output (GVO), value of inputs and GVA between the 2004-05 series and the 2011-12 series. Major changes were in live stock sector, inputs crop sector and forestry sector.

Table 9. GVO, Inputs and GVA of Agriculture and Allied Sectors, 2011-12

Description	2004-05 series (cr.)	2011-12 series (cr.)	% difference
A1. GVA (Crop Sector)	1225570	1236067	0.9
A2 Inputs (crop sector)	265126	249464	-5.9
Seed	26738	29408	10.0
Feed of livestock	60705	29117	-52.0
Diesel oil	29598	24684	-16.6
FISIM	14245	31543	121.4
B1 GVO- Livestock sector	470182	485103	3.2
Increment in livestock	14740	9854	-33.1
B2 Inputs (Livestock sector)			
Current repairs, maintenance and operationl costs	968	3037	213.8
Feed of livestock	123351	157740	27.9
FISIM	5643	216	-96.2
Total input (livestock)	130057	161090	23.9
C 1. GVO Forestry Sector	156004	154320	-1.1
Timber from trees outside forest	60066	73432	22.3
Firewood	74070	47979	-35.2
NTFP	28361	29720	61.9
Total GVA Agricultural and Allied Sectors	1499098	1505580	0.43

Note: New series estimates are at basic prices while the estimates in the old series were at factor cost. The GVA at factor cost for the new series is Rs. 15,53,960 crores.

Source: CSO (2015b)

Some of the changes in methodology and data sources in 2011-12 series are the following[7].

a. In the new series, the GVA of crop sector and that of the livestock sector have been compiled separately by bifurcating the common inputs. Therefore segregation of crop and livestock production is an important change in the new series.

b. Adoption of Agricultural Census (2010-11) and Livestock Census (2012) are two significant updates in data sources.

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[7] The data sources used for agriculture in 2011-12 series are given in Appendix 2.

c. Some of the crops under other pulses, other fruits and other vegetables are compiled separately on the basis of production from the Ministry of Agriculture, and prices from the State Directorates of Economics and Statistics (State DES).

d. Data on number of Tractors has been taken from "Agricultural Research Data Book", 2013, instead of Indian Livestock Census (ILC) for estimation of diesel oil consumption for crop cultivation.

e. Rates and Ratios of estimation of value of Meat products and Meat by-products have been updated as per results of Study of National Research Centre on Meat (NRCM), Hyderabad.

f. Various rates and ratios used for compilation of estimates of the Forestry Sector, i.e., Timber from Trees Outside Forest (TOF), Fodder from Forest and Fire wood have been updated as per India State of Forest Report (ISFR), NSSO 68th round Consumer Expenditure Survey (CES) – 2011-12, ASI 2011-12, Population Census-2011 and State Government Budget documents.

Changes made in the new series in some of the sub-sectors.

In the new series, changes have been made in crop sector value of output, livestock sector value of output, seed, diesel oil, organic manure, forestry, industrial wood and timber from TOF, firewood, non-timber forest products (NTFP), forestry inputs, fishing and aquaculture (CSO, 2015b).

The changes in these sub-sectors are the following.

a. Value of Output- Crop Sector

The sub-committee suggested that efforts should be made to cover all agricultural crops for bringing out area, yield rate, production, farm-harvest price and input costs so that GVO and GVA are estimated. If some of the crops are not covered annually, the same could be covered periodically say once in three years so that the GVO estimates are robust, reliable and directly computed.

In the new series, estimates of output for crops such as Cowpea, Rajma, Wal, Batna, and Choula (earlier covered under 'Other Pulses'), Beans, Bitter gourd, Bottleguard, Capsicum, Carrot, Cucumber, Muskmelon, Radish, Parwal, Pumpkin and Watermelon (earlier covered under 'Other Vegetables'), Aonla, Ber, Custard Apple, Kiwi, Passion Fruit, Peach, Plum, Pomegranate and Strawberry (earlier covered under 'Other Fruits') are compiled separately. The output of toddy is estimated from the consumption side, since there are obvious gaps in its reporting. The estimates of output for toddy have been updated using the estimates of consumption of Toddy from NSS 68th round CES, 2011-12.

Major changes are made in both output and inputs of livestock sector. CSO (2015b) provides these changes as given below.

Value of Output- Livestock Sector

Two major changes related to estimation of value of livestock sector have been incorporated . These are as follows.

I. Estimation of Meat (including meat products and meat by-products)

National Research Centre on Meat (NRCM), Hyderabad, has undertaken a study sponsored by the Ministry to update the yield rates used in estimation of value of Meat The study provided the ratio of meat-products and meat by-products to total meat produced in terms of value and quantity for each species of livestock. As the information on the prices of the meat-products and meat by-products are not being provided by State/UT on systematic and regular basis, therefore, percentage share of value of meat products and meat by-products to total value of meat has been used in estimation of value of total output of meat for 2011-12 series. The ratio (in percentage) of value of meat products and by-products to total value of meat as per NRCM study is given in Table 10.

Table 10 Ratio of value of meat products and by-products to total value of meat (%)

Item	Cattle	Buffalo	Sheep	Goat	Pig
Heads and legs	2.24	2.37	6.33	5.38	2.11
Fat	2.07	1.92	2.98	2.73	2.58
Skin	7.07	6.67	3.32	3.07	0.00
EOG [Energy, Oil and Gas?] Yes.	2.69	1.31	6.72	7.18	3.66
Other meat products	1.93	2.22	3.70	3.23	1.05
Total	16.00	14.49	23.05	21.59	9.40

Source: CSO (2015b)

II. Estimation of Dung by including Sheep and Goat droplets

In 2011-12 series, the value of evacuation/droplet from Goat and Sheep has been estimated by using results of a joint study by the Central Institute for Research on Goats and National Centre for Agricultural Economics and Policy Research on "Positive Environmental Externalities of Livestock in Mixed Farming Systems of India" published in year 2013. The evacuation rate as per study for Goat is 0.3 kg per day and for Sheep is 0.8 kg per day. The value of the droplets is estimated using the prices of dung and grouped with the estimates of dung. Also, the Livestock population has been updated as per Indian Live Stock Census-2012.

Major change: Segregation of Common inputs into crop sector and livestock sector

The major changes in the 2011-12 series are segregation of common inputs into crop sector and livestock sector, and estimation of seed, diesel oil and organic manure. These major changes relate to the procedure of apportioning the common input such as (I) Feed of livestock, (II) Expenditure on current repairs, maintenance and operational cost, (III) Market charges and (IV) FISIM (Financial Intermediation services Indirectly Measured) between crop sector and livestock sector. The procedure adopted for apportioning is given in CSO (2015b)

Seed

In the old series, except for paddy, the farm harvest prices were used for estimation of value of seed. The methodology did not account for improved/hybrid variety of seeds being used by farmers for growing crops mainly in irrigated areas. Some changes were made in 2011-12 series (see CSO, 2015b).

Diesel Oil

As mentioned above, for the new series, the number of tractors has been revised using number of tractors sold in last 13 years (excluding exports) from the report of "Agricultural Research Data Book 2013" and per tractor value of diesel oil consumption as per CCS (cost of cultivation studies), 2011-12.

Organic manure

In the new series, for estimation of the value of organic manure, livestock population derived from Indian Live Stock Census 2012 has been used.

Forestry

In forestry, due to revision of prices and decline in consumption of firewood, the GVA of the forestry sector has registered a decrease of Rs.2562 crore for the year 2011-12 in the new series. Similarly, timber from trees outside of the forests has been revised; it declined in the new series.

Firewood

In the new series, the value of firewood has been revised using NSS 68th round CES 2011-12. It showed a decline in consumption rate of firewood. Further, using latest data from ASI and Census, the ratio of consumption of firewood used for religious, industrial and rituals in households has been revised from 7.64% to 6%.

Non-timber forest products

Fodder from the forest has been revised as per India State of Forest Report (ISFR) 2013. As a result, GVA of NTFP increased.

Inputs-forestry

In the new series, input ratio has been revised on the basis of average expenditure on the purchase of goods and services and on repairs and maintenance of fixed assets to the total value of output of this sector in the government forest departments during 2011-12. It comes to around 16.2% in new series in place of 15.6% for old series.

Fishing and aquaculture

In 2011-12 Series, though no changes have been made in this sector, the reduction in GVA to the extent of Rs. 1,004 crore for 2011-12 has been due to the adoption of updated prices provided by the State DESs.

Cost of Cultivation Studies

For the purpose of obtaining estimates of cost of cultivation of major and minor crops, DES agriculture initiated 'The Comprehensive Scheme for Studying the cost of cultivation of Principal Crops in India' (CCS) in 1970-71. This is being

implemented in 14 states and 26 crops are covered. Agricultural universities and some general universities have been collecting this data. The agencies collect and compile data in different states and send it to DES for generating the estimates of cost of cultivation.

Sampling methodology adopted is three-stage stratified random sampling. There are about 840 tehsils and **8400** sampled operational holdings covered under the study. Samples changed every three years. In each size class of land, two holdings are selected. Thus 10 holdings are selected in each village. Data are collected on inputs and outputs in physical and monetary terms following uniform methodology. The field data are collected on the cost accounting method. Daily entries of debit/ credit for the expenditure/ income are made to assess the total cost/ benefit. Field data is collected by field men who are posted in the village and one field supervisor allocated to 10 field men. About 155 crop estimates are being made for the 26 crops and the time lag in release of data is about 2 years. Plot wise unit level data is made available after 3 years.

Though the primary objective of the scheme is to supply requisite data for recommending Minimum Support Price (MSP) by CACP, CSO uses input costs of feed, seed, and diesel from the results of this survey. The sources and methods of national accounts statistics for the old series show that some of the items from CCS were used for estimating GDP in agriculture (CSO, 2012). The important items collected through the CCS are: (1) quantity of seed rate by crops per hectare; (ii) value/quantity of by-products by crops per hectare; (iii) consumption of diesel, mobile oil and grease per tractor/pump set in quantity and value terms; (iv) utilisation of milk & milk products including details on conversion; (v) electricity consumed both in value and quantity terms; (vi) fodder fed to animals (green as well as dry); (vii) concentrate fed to draught animals; (viii) cost of insecticides & fertilisers; (ix) repairs &maintenance expenses of farm machinery, and (x) marketing expenses including transportation costs to the nearest market/mandi (CSO, 2012). However, data available in respect of items like electricity, insecticides, fertilisers, etc. are not used as better and more reliable data on such items are available from sources like Central Electricity Authority (CEA), Fertiliser Association of India (FAI), Pesticides

Association of India (PAI), etc. (CSO, 2012). (The CSO thinks that these sources are better than earlier sources)

New series also used data from CCS for some items of inputs (see Appendix 2) Regarding new series, the sub-commmittee on agriculture and allied activities discussed about the cost of cultivation studies (CCS). On CCS, the sub-committee says "though some of the items of inputs are estimated with the results of cost of cultivation studies, efforts should be taken to cover more items and make use of the analysed results for compilation and cross validation. This is more so when the plot level data are made available for more than 10 years. Time series analyses can also be on various inputs so analysed from the plot level data of the CCS" (CSO, 2014, p.55). The committee also suggested that time lag needs to be reduced for making effective use of cost of cultivation data.

4. TEN MAJOR ISSUES ON MEASUREMENT OF GDP IN NEW SERIES

Issue No.1. Problems with MCA-21 on private corporate sector

Major change in the new series is the use of MCA-21 data base. The quality of MCA-21 data for private corporate sector is being questioned. MCA data are based on the responses of self selected companies. This may have introduced errors of which the magnitudes are unknown. The critics say that higher growth in manufacturing could be due to use of MCA data and the quality is unknown. On this T.N. Srinivasan says the "move to the MCA-21 data from a bunch of self-selected companies again are biased with the size and direction of bias unknown.[8]" T.N. Srinivasan argues that one has to discuss the statistical issue of the validity and reliability of the estimates[9].

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[8] This is based on personal correspondence with the author. On RBI data T.N. Srinivasan says "Take for example the RBI sample of 2500 companies --as CSO itself points out, this sample is not a random sample from a well specified and known universe of companies nor is the sampling procedure stable over time. The estimates from this nonrandom sample drawn with varying procedures over time will be biased with the size and direction of bias unknown! The expectation that a sample frame and a statistically appropriate sampling procedure will be developed using the data from economic censuses and follow up surveys is yet to materialise. As of now the estimates from the RBI sample are of dubious statistical validity." (personal correspondence)

[9] Personal correspondence.

A study by Sapre and Sinha (2016) examines some issues in the estimation of GVA in the manufacturing sector. They discuss three problems: (a) choice of indicators in measuring outputs and costs for computing GVA; (b) possibility of overestimation due to blow-up of GVA; (c) potential mis-classification of manufacturing companies that can distort GVA estimates. In order to examine these questions, they first mapped the data fields of XBRL form and CMIE Prowess indicators to identify components of ouputs, taxes and intermediate costs. The paper argues that paid up capital (PUC) based blow-up of GVA can lead to overestimation of value. They proposed an alternative method of scaling up of GVA based on representative industry growth rates of GVA. Instead of paid up capital, growth rates of GVA for some identified representative industry is taken. Details are given in Sapre and Sinha paper.This method has an advantage over the PUC method as it scales up past year's GVA of unavailable firms, instead of blowing-up GVA of available firms. Here GVA of the firms for which data are not available is scaled than for available firms.

Blow up method

More controversy is on blow up method for non-responding companies. There are questions on the methodology used to blow up (Nagaraj and Srinivasan, 2016). Goldar (2016) asks some valid questions on criticisms of MCA data and blow-up method. For example, he says that 'since several critics feel that the new series is overstating growth, one may ask why should the bias caused by self selection in MCA data always push up the measured growth rate". Another question is even if blow-up factor is low, 'it may impact the level of GVA slightly, but why should that impact (reduce [increase?]) the estimated growth rate in GVA" (Glodar, 2016).

There are also some other suggestions on multiple blow up methods than single blow up method. Rajakumar and Shetty (2017) suggest blow up factors separately for public and private limited companies. CSO seems to have revised its estimates based on this suggestion. Manna (2017) indicates that companies in the lowest two or three size classes are somewhat inadequately represented in the database. He suggests that it is more appropriate to use separate blow-up factors for different

PUC size classes of the companies. Anyway, as many people mentioned, auditing of MCA 21 data would be useful.

The eternal problem of IIP

There is a lot of confusion for market analysts, researchers and policy makers regarding manufacturing growth in India. This is because of huge differences between growth rates of IIP and GVA. For example, IIP growth rate was -0.8% while GVA manufacturing growth rate was 5.6% in 2013-14.

Table 11. Growth Rates of IIP and GVA in manufacturing

Years	IIP growth rates (%)	GVA growth rates (%)
2012-13	1.3	6.0
2013-14	-0.8	5.6
2014-15	2.3	5.5
2015-16	2.0	9.3

Source: Compiled from CSO data

We know the differences between IIP and GVA in manufacturing. IIP is a pure volume (or output based) index and base is 2004-05. On the other hand, GVA is a value added concept with base 2011-12. Some estimates show that shifting the base of IIP to 2011-12 shows that growth rates of manufacturing are higher. The explanation for high growth in manufacturing by CSO is the following. "The 2011-12 series capture value addition information based on corporate filing right from the first year and comprehensively from second year as against 2004-05 series where this information was getting captured only in the 3rd year. During 2013-14, high domestic inflation coupled with lower international prices for imported inputs could have helped improve corporate bottom-lines. This improvement would not be apparent through IIP and ordinarily would not be reflected in national accounts in the old series until the 2nd revised (3rd year) estimates which would have come out in 2016" (p.4, CSO, 2015c)[10]. IIP data gives quantity for some and value for some items. Main difference is that IIP is output based measure while GDP is valuee added measure. Recently CSO has released IIP estimates using 2011-12 as base.

Table 12 Growth Rates of IIP with base 2004-05 and 2011-12

	2012-13	2013-14	2014-15	2015-16	2016-17
2011-12	3.3	3.4	4.0	3.4	5.0

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[10] Also see Anant (2016b) on IIP production

base					
2004-05 base	1.1	-0.1	2.8	2.4	0.7

Source: CSO, 2017

One advantage of IIP is that it is available every month. However, the large difference between IIP growth and GVA growth is leading to scepticism about the estimates relating to manufacturing. This difference has to be reduced as soon as possible by shifting to recent base for IIP besides improvements in quality of data. It may be noted that higher growth in GVA in manufacturing does not mean that we do not have problems with this sector. Volume growth is still important for indicators like employment and other supporting activities like transport, logistics, etc. Thus, slow growth in volume of output is a concern even if value added growth is high (CSO, 2015c). This is not criticism. We are saying that IIP although shows output growth is still useful because output and volumes are important for employment etc.

Issue No.2. Quasi corporations and the household sector

Quasi-corporations (QC) have been separated from the household sector and added to the corporate sector in the new series. As Nagaraj and Srinivasan (2016) say, one contentious issue is that the 'growth rate of QCs is taken to be the same as that of non-financial PCS'. This could have inflated QCs size and PCS growth Manna (2017).

Issue No.3 Effective Labour input method

Nagaraj (2016) and Nagaraj and Srinivasan (2016) raised some questions on the effective labour input method and application of nested Cobb-Douglas function for the unorganised sector. It may be noted that productivities and earnings differ across different categories of workers. In fact, Rajakumar and Shetty (2016) say that 'the assumption of equal contribution from all categories of workers even in an unorganised enterprise, namely working owners, hired informal workers and helpers, is indefensible" (p.13). Nagaraj and Srinivasan (2016) advocate nested

CES function for estimating marginal productivity of different category of workers. However, nested CES would be difficult to estimate as it involves non-linear estimation with many parameters (Goldar, 2016). Marginal productivity is estimated for different type of workers as they differ. I do not think in agriculture it is done.

Issue No.4. High growth rates of GDP versus Ground realities

The growth rates of GDP are higher in the new series compared to the old series. Comparing the ground realities like credit growth, volume growth, private sector investment, exports, etc., some say Indian economy does not look like growing at 7.6%. The critics say that growth rate could be 5 to 6% if you look at ground realities and other indices.

In a paper, Sengupta (2016a) argues that two sources of growth of GDP are investments and exports. This paper says "that over the period from 1950 to 2015, for the $100bn economies with growth rates similar to that of India, the average investment growth rate has been 15.4% and average export growth rate has been 12.8%". On the other hand, as shown in Table 12, the growth rate of gross fixed capital formation is only 4% and export growth was negative. Therefore, the paper says there is disconnect between low investment/ exports and high GDP growth of 7.6% in India for the year 2015-16.

Table 13: Investment and Exports growth rates, 2015-16

Time period	GFCF	Exports
April-June	7.1%	-5.7%
July-September	9.7%	-4.3%
October-December	1.2%	-8.9%
January-March	-1.9%	-1.9%
Annual	3.9%	-5.2%

Source: CSO estimates quoted by Sengupta (2016a)

Chief Statistician of India says talking about divergence between the numbers and the ground reality is like 'the five blind men describing an elephant' (Anant, 2016c). He says one has to look at totality rather than bits and pieces.

Issue no.5: **GDP at market prices versus Gross value added at basic prices or GDP at factor prices.**

One issue is whether we should use GDP at market prices or GVA at basic prices. Which one is the right one? GDP at market prices includes indirect taxes net of subsidies. The nominal growth in GDP would get inflated if indirect tax base is expanded. Reserve Bank of India prefers GVA at basic prices. Rajakumar and Shetty (2017) prefer GDP at factor cost[11]. According to them, "GDP at factor cost measures the value added as the contributions of labour, capital and other factors in the production process. The measure so derived represents true value added as it is not coloured by the presence of any item outside the contributions of factors of production. This is the true economic welfare particularly when GDP is coverted to per capita terms" (Rajakumar and Shetty, 2017).

Issue no. 6. GDP production versus GDP expenditure

Another issue is the differences between GDP in production method and GDP through expenditure method. They were large in the recent quarters of 2016-17. This is not new. These differences were there earlier also. The expenditure method is based on some thumb rules (Anant, 2016a). Production method is supposed to be a robust one. Another related one is about quarterly figures. It is known that quarterly figures are more volatile while annual figures of GDP are better for comparisons over time.

Issue No.7. *Single versus Double Deflation*

One issue is whether we should have single deflation or double deflation method while arriving at constant price series. Some feel we should have double deflation method i.e. deflate inputs and output separately. Bhandari (2016) shows that in the absence of doble deflation, manufacturing growth in FY 2015 could have been overestimated by 120 basis points. Felman (2016) also shows that single deflation

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[11] Also see Shetty (2015)

method overestimates GDP in manufacturing[12]. As shown in Table 14, GVA growth in manufacturing with single deflation was 5.5% while it was 4.3% with double deflation in FY 15.

Rajkumar and Shetty (2015) also favour double deflation method[13]. They say GVA in manufacturing growth comes closer to growth in IIP, if we use double deflation method.

Table 14: Double Deflation method

Manufacturing Sector	INR bn. Constant prices			Growth Rates (%) y-o-y		
	Output	Input	GVA (output-input)	Output	Input	GVA (output-input)
FY 15 official	75204	58533	16671	3.1	2.5	5.5
	Double Deflation			Double Deflation		
FY15 (HSBC est.)	75204	56425	18778	3.1	2.8	4.3

Source: Felman (2016)

As mentioned by CSO, SNA recommends double deflation only if we have complete prices for inputs. It is better to have single deflation method if we do not have complete data.

Issue no.8: Price Deflators: WPI versus CPI

In the new series, there are major differences in the sources of deflators as the divergence in annual inflation between WPI and CPI increased significantly. Difference between WPI and CPI inflation is quite large in recent years. Which one to use particularly for services? Is it CPI or WPI? Bhandari (2016) says that the manufacturing growth may have been overestimated by 450 basis points in FY 2016 due to the divergence between CPI and WPI inflation. Felman (2016)

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[12] For the summary of a conference on GDP measurement, see Sengupta (2016)
[13] See Dholakia (2015)

indicates that the biggest component of GVA in the trade sector is wages and the best proxy for wage costs is the cost of services. If we use CPI-services for trade sector, the GVA estimate would be much lower. In general, some prefer to use CPI for deflating services sector data because of big divergence between WPI and CPI. Rajakumar and Shetty (2017) say that the GDP deflators are mostly in tandem with WPI as shown in Fig 1.

However, the Chief Statistician says, "if looked carefully on a common set of commodities, the two indicators behave similarly. It is not that something is being done differently in the WPI but different commodities are behaving differently" (Anant 2016d). It is also clarified that there was no change in the use of prices in the old and new series. Only change, he says, is that earlier they were using CPI for industrial workers. Now they have started using the CSO's new CPI series. Other than this, whatever price information has been available is the same that has been available for the last 50 years.

Fig 1. Movements in Price Indices
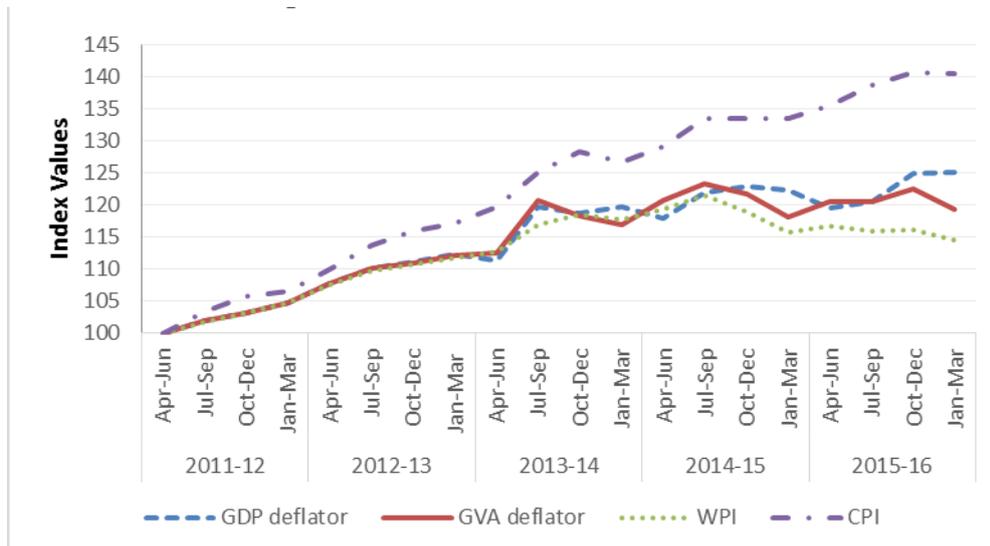
Source: Rajakumar and Shetty (2017)

Issue no.9: *Nominal Growth versus Real Growth*

Which is better for policy purposes? Is it nominal growth or real growth? Some people feel nominal growth is an important indicator for policy purposes. As a result

of negative inflation particularly for WPI, the difference between growth in constant and constant prices is low(Table 15). Also notice that nominal growth declined but real growth increased over time although it reversed in 2016-17. Nominal growth of GDP at market prices declined significantly from 13.9% in 2012-13 to 9.9% in 2015-16 before increasing to 11.0 in 2016-17. On the other hand, real growth of GDP at market prices increased from 5.6% in 2012-13 to 8.0% in 2015-16 before declining to 7.1 in 2016-17. The gap between growth in current and constant prices increased 2016-17 as WPI started showing higher inflation. Demonetisation also had adverse impact particularly for GVA growth in 2016-17.

Table 15. GDP and GVA growth in Current and Constant Prices (%)

	2012-13	2013-14	2014-15	2015-16	2016-17
GDP at Market Prices					
Current	13.9	13.3	10.8	9.9	11.0
Constant	5.6	6.6	7.1	8.0	7.1
GVA at basic prices					
Current	13.6	12.7	10.5	8.5	9.7
Constant	5.4	6.3	7.2	7.9	6.6

Note: 2011-12 (2nd RE); 2012-13 (2nd RE); 2013-14 (2nd RE);, 2014-15 (1st RE); 2015-16 (1st RE); 2016-17 (PE)
Source: Various documents of CSO

Issue no. 10: **Reference points for growth: AE, PE, FRE and SRE[14]**

The last issue is the relevant reference period for estimating GDP or GVA growth rates. CSO releases various estimates (Advance Estimate (AE), Provisional Estimate (PE), First Revised Estimate (FRE) and Second Revised Estimate (SRE)). Rajakumar and Shetty (2017) say that we should have estimates of growth for same reference points (e.g. PE vs. PE, FRE vs. FRE).

As shown in Rajakumar and Shetty (2017) Table 7, reproduced here as Table 16, if we use 2015-16 PE over 2014-15 PE, the growth of GDP at market prices was 6.6%.

Table 16: Comparison of growth rate using different reference points: GVA and GDP

[14] AE= Advanced estimates; PE=Provisional Estimates; FRE= first revised estimates; SRE= Second revised estimates

Sr. No.	Sectors	At contstant Prices		At current prices	
		2015-16 PE over 2014-15PE	2015-16 PE over 2014-15 FRE	2015-16 PE over 2014-15PE	2015-16 PE over 2014-15 FRE
1	Agriculture, forestry and fishing	1.3	1.2	6.5	4.9
2	Mining and quarrying	12.5	7.4	15.5	4.7
3	Manufacturing	2.6	9.3	0.5	8.1
4	Electricity, gas, etc	1.2	6.6	14.9	10.8
5	Construction	11.7	3.9	9.5	1.3
6	Trade, hotels, etc	4.9	9.0	3.5	6.6
7	Financial services, real estate, etc	11.6	10.3	6.8	7.4
8	Public administration	6.1	6.6	11.6	12.1
9	GVA at Basic Price	6.1	7.2	6.3	7.0
	GDP at market price	6.6	7.6	8.3	8.7

Source: Rajakumar and Shetty (2017) Based on data extracted from CSO (2015b and 2016b)

On the other hand, if we use 2015-16 PE over 2014-15 FRE, the growth rate was 7.6% - it increased one percentage point.

Shetty says that "one issue that worries me more in retrospect is the extent of revisions that get introduced as between advance estimates and provisional estimates and between provisional estimates and first revised estimates in the new series, unlike in the older series. This is contributing a major cause for the growth differences"[15]. One can give different estimates comparing PE versus PE, FRE versus FRE, etc. But, different growth rates should not lead to confusion among the users.

5. CONCLUDING OBSERVATIONS

This paper discusses (a) changes in measurement in industry and services (b) changes made in agriculture sector and (c) major issues on the measurement of GDP in new series. There are long term or legacy issues in agriculture, industry and services. We have many more problems in measurement of state level SDPs (state domestic product) for the new series (Dholakia and Pandya, 2017)[16].

Although overall GDP in agriculture did not change, there were lots of changes within sub-sectors with new data sources. Agriculture sector has been less

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[15] Personal correspondence
[16] See Barman (2016) on micro and macro issues of Indian statistical sytem

discussed compared to the changes in industry and services in the new series of GDP. There has been some long term or legacy problems in agricultural statistics as pointed out by Data base of Indian economy volume I and II, Rangarajan Committee, Vaidyanathan Committee and Alagh Committee. In revising agriculture GDP series, CSO has taken into account the latest ratios, rates and data depending on the availability. In the future revision, hopefully, CSO will sponsor or conduct surveys to further improve agriculture data base.

For example, one of the recommendations of the sub-committee is that "IASRI should be requested to conduct special study/surveys on Horticulture Statistics to estimate production, prices and input costs for the important Horticultural crops. Since the percentage share from Horticulture is increasing, urgent action is required to estimate the state-wise production, price and input cost for the major horticultural crops. This gains importance due to the discontinuance of the Central Sector schemes on Fruits and Vegetables with effect from this financial year (2014-15)" (CSO, 2014).

Similarly on fisheries, CSO is already thinking of using the study on input costs of marine fish production being conducted by Central Marine Fisheries Research Institute (CMFRI), Kochi, and study on input cost of inland fish production conducted by the Central Inland Fisheries Research Institute (CIFRI), Kolkata

We have discussed in this paper 10 major issues on measurement of GDP in the new series. These are given below.

(1) MCA 21 data problems: Major change in the new series is the use of MCA 21 data. Most controversy is on blow up method for non-responding companies.

(2) separation of Quasi corporations from household sector: Due to this separation, the size of quasi corporations is inflated. The criticism is that the approach in the new series overestimates growth in quasi corporations.

(3) effective labour input method : This method is appropriate as productivities differ across different categories of workers. There are some issues in estimation of effective labour input.

(4) high growth rate of GDP vs. ground realities: Comparing the ground realities like credit growth, volume growth, private investment and exports etc. some say that Indian economy does not look like growing at 7%.

(5) GDP at market prices vs. GVA at basic prices vs. GDP at factor prices: Some (e.g. RBI) prefer GVA at basic prices because GDP at market prices would get inflated if indirect tax base is expanded.

(6) GDP production and GDP expenditure method: Production method is supposed to be a robust one because the expenditure method is based on some thumb rules.

(7) single vs. double deflation: Some say we should have double inflation method i.e. deflate inputs and output separately. However, as the system of national accounts (SNA) recommends double deflation can be used only if we have complete prices of inputs.

(8) price deflators WPI vs. CPI: The divergence in annual inflation between WPI and CPI increased significantly in recent years till 2015-16. Some prefer to use CPI for services because of the differences in WPI and CPI. However, the differences in inflation for the deflators declined in 2016-17.

(9) nominal growth vs. real growth: Real growth is true indicator of progress. Nominal growth is also an important indicator for policy purposes.

(10) reference point for growth: advance estimates, provisional estimates, first revised estimates and second revised estimates: There is confusion of growth rates because of different estimates AE, PE, FRE and SRE. One can get different estimates comparing PE vs.PE, FRE vs. FRE etc.

The new GDP series show value added increased much faster than volume of output. [Some points suggest that growth is greater due to the method used. Others use better data sources. But that makes for non- comparability of old and new series. So, is the current GDP growth higher as reflected by the new series, or low, as reflected by the old series?] (It is true the growth was higher in new series as compared to that of old series. However, they are not comparable due to changes in methodology. We do not have any comparable series. Therefore, it is difficult to say whether growth rates in new series are higher/lower than comparable older series. In our view, there are some gaps in the measurement but the new series are based on 'best advice' from experts available in the country. There has been improvement but still it will take some time to catch up with SNA 2008 due to gaps in both

organised and unorganised sectors. These discussions on GDP in different forums will be useful for next base revision of National Account Statistics. CSO also has to focus on statistical validity of the estimates which is important. At broader level main goal is to improve timeliness, reliability, quality and adequacy of Indian official statistics.

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Appendix 1.

Summary of Recommendations of the Sub-Committee on Agriculture and Allied Activities (Chaired by S.Mahendra Dev)

1. The Sub-Committee is fully endorsing the views and the recommendations of the Prof. A. Vaidyanathan Committee for imbibing professional approach for data collection and processing of Agricultural Statistics through qualified team of professionals so that errors in area enumeration and crop cutting experiments are reduced to the extent possible and the requisite data are made available within a timeframe.

2. IASRI should be requested to conduct special study/surveys on Horticulture Statistics to estimate production, Prices and input costs for the important Horticultural crops. Since the percentage share from the Horticulture is increasing, urgent action is required to estimate the state-wise production, price and input cost for the major horticulture crops. This gains importance due to the discontinuance of the Central Sector schemes on Fruits and Vegetables with effect from this financial year (2014-15).

3. NAD would make efforts to conduct Special Surveys on estimating input rates for the Fishery Sector with the involvement of CMFRI and CIFRI for both Marine and Inland Fisheries including that of Cultured Fishery Sector and High valued Fishery sector.

4. The crop statistics are available only for 41 crops. Efforts should be taken to cover all agricultural crops for bringing out area, yield rate, production, farm-harvest price and input costs so that GVO and GVA are estimated. If some of the crops are not covered annually, the same could be covered periodically say once in three years so that the GVO estimates are robust, reliable and directly computed.

5. Since the percentage share of small millets and other cereals within cereal group and farm sector is insignificant, the existing methodology of estimation of GVO would be continued.

6. Unless special surveys are conducted, price data will not be available for each of the pulses crop grouped under other pulses. Data on production is available. Value of Output of Other Pulses is estimated by production multiplied by 85 percent of weighted average price of arhar, urad, moong, masoor, and horsegram. The existing methodology would be continued for estimating the GVO of other pulses. Therefore, the Committee is recommending to conduct special Surveys for these pulse crops to estimate the average weighted price for each growing State at least once in two years.

7. Unless special surveys are conducted, price data will not be available for each of these Oil Seeds grouped into others. Data on production is available. The existing methodology can be continued for estimating the GVO of other Oil seeds. Therefore, the Committee is recommending to conduct special Surveys for these oil seed crops to estimate the average weighted price for each growing State at least once in two years.

8. The contribution of Other Sugar and other fibre crop groups are too insignificant and hence the existing methodology may be continued.

9. The value of Toddy production is estimated by multiplying the value of Toddy consumption in rural and urban area in a State by 97 respective rural and urban Population. Value of Output of Toddy is estimated at constant price multiplied by WPI growth of NonFood items. Till new NSSO survey results are made available, the present methodology may be continued.

10. The contribution of other Condiments & Spices crop in the Farm sector is insignificant and hence the existing methodology may be continued.

11. The yield rate of Fodder per hectare for both irrigated and unirrigated may be continued until a new study results are made available.

12. The existing methodology for the estimation of GVO from Grass would be continued till new NSS survey results are made available. In case new results from NSS 70th round is made available the same may be used.

13. The contribution of miscellaneous food crops and non-food crops to Farm Sector are insignificant and hence the existing methodology for the estimation of GVO may be continued. Value of Output of Kitchen Garden is 0.21% of Net area sown multiplied by weighted average value per hectare of all fruits and Vegetables. The existing rate may be changed based on the results of 70th round NSS survey results or latest Agriculture Census results.

14. Of late, State governments supply production data which are quite differing from the final estimates of the Ministry of Agriculture. The reason being stated is that the State Goverments revises the data even after final estimates were released by the 98 Ministry of Agriculture, GOI. Ministry of Agriculture should be apprised of the importance of freezing of the estimates once finalized by it. No further changes should be considered.

15. There should be systematic and scientific efforts to collect horticulture data fully on 244 horticultural crops including production, yield rate, area, input costs and related details. 16. Due to rising share in GVO of Horticulture Sector, Horticulture activities may be considered as significant segment of agrarian activities and hence should be brought part of Agriculture Census and Surveys

17. Apart from area, and production data, there is need to collect reliable data on Inputs, Prices, Imports, Storage facilities, Market facilities, exports, etc.,

18. Multiple agencies involved with wide differences in their estimates and no cross validation mechanism existing. There should be nodal agency in the Ministry of Agriculture to consolidate the data on production, area, yield rate, input costs, etc. both at state level and at National level.

19. Value of output of Other-Vegetables is estimated by multiplying Production with weighted average prices of all vegetable crops for which separate data is available for estimating the GVO of Other Vegetables(Beans, Bitter gourd, Bottle guard, Capsicum, Carrot, Cucumber, Muskmelon, Radish, Parwal, Pumpkin and Watermelon). There should be nation-wide survey to estimate average price of these vegetable crops at state level. Till then, the existing methodology may be continued.

20. Value of output for Other Fruits (Amla, Ber, Custard Apple, Kiwi, Passion Fruit, Peach, Plum, Pomegranate, Strawberry, etc.) is estimated by multiplying Production with weighted average prices of all fruits for which separate data is available. There should be nation-wide survey to estimate average price of these fruit crops at state level. Till then, the existing methodology may be continued.

21. The Integrated Sample Survey (ISS) conducted by the Department of Animal Husbandry need to expand it coverage to include Camel and Sheep Milk, Duck Egg for all the states, Goat Hair, Camel Hair and Pig Bristles.

22. There is also need to cover the Unregistered Sector for meat and animals slaughters, Meat Product (Heads and Legs, Fats from Slaughter and Fallen Animals) and Meat By-product (Hides and Skins).

23. Special surveys need to be conducted to estimate inputs of livestock sector i.e. Feed of Livestock, Market Charges and Operational Cost, etc. at state level. This is important to derive GVA for the Livestock sector.

24. The Rates and Ratios obtained by CSO through National Meat Research Centre may be considered in place of the existing Rates and Ratios.

25. Seed rates (quantity per hectare) are available from the Cost of Cultivation Studies (CCS) and the State Agricultural Departments only for the principal crops and some minor crops. Special studies required to be conducted to supplement CCS to 100 cover other crops as well so that the overall input costs on seed usage is captured.

26. The estimates of consumption of chemical fertilizers are based on the material wise consumption of chemical fertilizers, as per 'Fertilizer Statistics', a publication of Fertilizer Association of India. The same may be continued.

27. For estimation of value of input as dung manure, the present method based on evacuation rate and utilization rates of Dung for manure may continue until alternative rate are made available through special surveys.

28. The existing method for Animal feed of roughages consisting of fodder, cane trash and grass and 95 per cent of production of by products (stalks and straws) in the agriculture sector considered to be consumed by livestock population would be continued taking into account the adjustments for the consumption of animals not used in agriculture sector(viz., bullocks, horses, camels etc., mainly used for non- agricultural purpose such as transportation etc..) and fodder from forest and some percentage of fodder from Non Forest.

29. The rate of concentrates for different animals are Cattle/ Buffalo is Rs. 685.26, Sheep/ Goat/ Pigs is Rs.164.82, and Poultry is Rs. 121.38 based on the Cost of Cultivation Studies and corroborated by special studies by State DES's would be continued.

30. Annual data on irrigation charges payable to the government from the States, consolidated from the respective irrigation departments based on the budget analyses would be continued.

31. Market charges based on the Special studies conducted by the Ministry of Agriculture may be continued to use till new results are made available.

32. Data on electricity consumed for agricultural purposes and its corresponding price per unit supplied by the Central Electricity Authority (CEA) on an annual basis at state level would be continued to be used.

33. Estimates of consumption of pesticides and insecticides both in terms of quantity and value supplied by the Directorate of Plant Protection and Quarantine, Ministry of Agriculture, would be continued to be used.

34. The existing method of consumption of diesel oil based on the number of tractors and diesel engines estimated through the Indian Livestock Census (ILC) in use and per unit consumption of diesel oil based on CCS would be continued. Whenever the new results are made available by the Livestock Census and CCS, the same would be substituted.

35. The existing method of estimation of expenditure on current repairs and maintenance based on All India Debt and Investment Survey (AIDIS) would be continued.

36. Though some of the items of inputs are estimated with the results of cost of Cultivation studies, efforts should be taken to cover more items and make use of the analysed results for compilation and cross validation. This is more so when the plot level data are made available for about than 10 years. Time series analyses can also be on various inputs so analysed from the plot level data of the CCS.

37. The Committee is of the view that the Farm-Harvest prices of all commodities should be collected at least on regular intervals if not annually. Also they should be made available without considerable time lag.

38. Growth Rates between all India annual Average price and Wholesale price of all most all the crops, Livestock products, Fishery products and forestry products are not consistent. Even the direction is not the same and magnitudes are too alarming in some cases. This need special attention and priority to effect corrective measures.

39. The significant difference noticed between the price data from the DES of State Governments and the Farm-harvest prices should be examined and stages or error should be plucked. All possible effort by the Ministry of Agriculture through its DMI to eliminate the price differences between DMI and DES price data should be undertaken immediately.

40. In view of the large scale differences and delay in receipt of the price data, The Committee is of the view that the price data should be compared with the GR of WPI and abnormal differences noticed if any in the price data then, the GR of WPI should be used. Also in the absence of receipt of price data from any state, the Committee is recommending for the use of GR of WPI over the previous year price of the agriculture commodities.

41. Special study may be conducted to estimate state-wise the production, price and input costs of high valued Fishes and Cultured Fishes

42. Based on the availability of data from the special study commissioned, the production, GVO and other parameters may 103 be shown separately for cultured fish (marine), Cultured Fish (Inland), High valued fish and Ornamental fish.

43. Based on the results of Special surveys being conducted by CMFRI, the input rate may be revised for deriving GVA from GVO in the Marine sector.

44. Based on the results of Special surveys being conducted by CIFRI, the input rate may be revised for deriving GVA from GVO in the Marine sector.

45. Necessary steps by CSO may be taken to ensure timely supply of the data on production and prices of industrial wood from forest by the State Forest Departments.

46. The state wise ratio given by FSI for estimating the proportion of fodder from forest may be continued.

47. The current methodology for the estimation of TOF based on the product of production figure available for 2010-11 based on all India biennial Survey conducted by FSI and the average annual growth rate of growing stock may be continued.

48. Special study may be awarded to collect state-wise price of TOF and inputs costs for TOF

49. The existing methodology of estimation of fuel wood consumption and deriving of GVO based on the Quinquennial Surveys of Consumer Expenditure, conducted in the NSSO may be continued.

50. In the absence of fresh data and alternative methodology the same input ratio of 15.6% may be continued. However, if fresh rate is made available based on the nation-wide survey by FSI; the same could be used for deriving GVA from GVO in the Forestry Sector.

Appendix 2.

Data Sources for Agriculture used in 2011-12 series

1. Agri (crops)	Data Sources			Data Sources		Data Sources
a. Value of output		(4) by products	Area: LUS from DES Ag / State DESs Value per hectare: CCS from DES Ag/State DESs (except for poppy husk and poppy seed). Value of poppy husk and poppy seed are made available by State DESs.	(ix) Camel hair/Goat hair /Pig bristles	Population: ILC, 2003, 2007 and 2012 from DADF Yield rates for goat hair: DMI Reports Prices: State DESs	
(1) Major and minor crops		(5) Other products Gur	Production and Seed Rates: DESAg Quantity of sugar cane crushed by factories: Dte. of Sugar, Ministry of Consumer Affairs, Food and Public Distribution Quantity of sugarcane used in manufacture of khandsari in manufacturing sector: ASI & NSS Survey of manufacturing enterprises (non-ASI) Prices: State DESs	(x) Dung and Droplet (a) Dung Fuel (b) Dung Manure	Population: ILC, 2003, 2007 and 2012 from DADF Prices, evacuation rate for dung, utilization rate for dung cake & dung manure: State DESs	
(i) Major crops	Production: Directorate of Economics and Statistics, Ministry of Agriculture (DESAg) Prices: State DESs	(1)palmyra	Production and prices: State DESs	(xi) Other Products – Silk – Ere, Tasar, Muga, Honey and Bee Wax	Production and prices of silk: Central Silk Board Production and prices of honey: KVIC Production and prices of bee wax: State DESs	
(ii)Minor crops	Production:	(iii) Bagasse	Prices: State	(xii)	Population:	

	Horticulture Statistics Division (DAC, M/o Agriculture) & State DESs Prices: State DESs		DESs	Increment in livestock	ILC, 2003, 2007 and 2012 from DADF Prices: State DESs
(iii)Small millets	Production: DESAg Prices: State DESs	(iv) Backyard and Foreyard farming(kitchen gardeni.e. homestead land raising for crop and having area less than 0.01	Net sown area: LUS from DES Ag / State DESs	**Inputs Livestock**	
Iv Other pulses	Production DESAg and State DESs	(b) Inputs crop sector		(1) Repair and maintenance for livestock and operational costs	Average cost of Repair and Maintenance on (i) Barns; (ii) Animal Sheds and (iii) other miscellaneous costs: All India Debt and Investment Survey (AIDIS), 2013
(2) Commercial crops		1.seed		(2) Market charges for Live stock	Number of slaughtered animals: ISS from DADF Municipal charges per slaughtered animal: State DESs
(tea)	Production of processed tea: Tea Board Prices: State DES	(i) Wheat, Jowar, Bajra, Barley, Maize, Ragi, Small Millets, Gram, Arhar, Urad, Moong, Masoor, Linseed, Sesamum, Groundnut, Rapeseed & Mustard,	Seed rate, seed replacement rate, area: CCS from DESAg Area under the crop, prices: State DESs	(3) Feed of livestock for Livestock Sector	Age-wise Species-wise Population: ILC, 2003, 2007 and 2012 from DADF ® State-wise average price for Dry Fodder, Green Fodder and Concentrates

		Castor, Black Pepper and Turmeric			: CCS from DESAg
((ii)Coffee	Production: Coffee Board	(ii) paddy, sugarcane and potato	Seed Rate, Seed Price: CCS from DESAg	(4) Forestry	
(iii) Rubber	Production: Rubber Board Prices: State DES	(iii) Other cereals, other condiments & spices, coconut, miscellaneous food crops ®	VPH of seed: Study conducted by Directorate of Marketing Inspection (DMI), M/o Agriculture Area: State DESs	(1) Industrial wood from Forests	Production and Prices: State DESs
Iv Cashenuts and CoCoa	Production: Directorate of Cashewnut and Cocoa Development Board Prices: State DESs	(iv) Misc. Non-Food Crops, Tapioca, Fodder, Guar Seed, Cotton, Dry Chillies, Other Vegetables & Dry-ginger	Value per Hectare (VPH): Benchmark study conducted by State DESs Area: State DESs	(2) Industrial Wood from Trees outside forest	Growing Stock: India State of Forest Report (ISFR), 2011 and 2013 from Forest Survey of India
V. Horticulture crops	Production: Horticulture Statistics Division (DAC, M/o Agriculture) Prices: State DESs	(2) Pesticides	Consumption and prices: Dte. of Quarantine & Plant Protection	(3) Firewood	Monthly Per Capita Quantity of Firewood consumed: NSS 68th Round CES, 2011-12 Population: Projections based on Population Census-2011 Firewood used for industrial purposes: ASI -2011-12 ® Prices: State DESs
Vi Opium	Production and Prices: Central Bureau of Narcotics	(3) Repair & Maintenance for crop sector	Average cost of Repair and Maintenance on (i) Orchards &	**Non-timber forest products**	

			Plantation Resources, (ii) Wells & Irrigation, (iii) Agricultural Machinery & Implement and (iv) Transport Equipment: All India Debt and Investment Survey (AIDIS), 2013		
Vii Arecnut	Production: Directorate of Arecanut and Spices Development ® Prices: State DESs	(4) Electricity	Consumption of electricity for agricultural purposes and prices: Central Electricity Authority	(i) Minor forest products	Value of Output: State DESs
Viii Flowers (separately cut flowers and spike)	Production: Horticulture Statistics Division (DAC, M/o Agriculture) Prices: State DESs	(5) Chemical Fertilisers	Consumption and Prices: Fertiliser Association of India	(ii) Fodder from forest	Percentage of Livestock dependent on forest for fodder: India State of Forest Report (ISFR), 2013 from FSI
(3) Miscellenaous crops		(6) Diesel oil ®	Number of tractors: Agriculture Research Data Book, ICAR Number of diesel engines: ILC, 1997 and ILC, 2003 Consumption of diesel oil per diesel engine and per tractor: CCS from DESAg	(b)Inputs of forestry	Central & State Govt. Budget documents
(i.) other cereals		(7) Irrigation charges ®	Gross irrigated	5. Fishing	

			area: State DESs Receipts of Government from sale of water: State Government Budget		
(ii)other sugars (excluding Palmyra)	Area: LUS from DES Ag / State DESs	(8) Feed of livestock for Crop Sector ®	Age-wise Species-wise Population: ILC, 2003, 2007 and 2012 from DADF Prices of Dry Fodder, Green Fodder and Concentrates : CCS from DESAg	(1) Marine fish, inland fish and prawns ®	Production: DADF ® Production, disposals and prices: State DESs
(iii) Other oilseeds (excluding Taramira)	Area: LUS from DES Ag / State DESs	**2. Irrigation System**		(2) Subsistence fish	Production, disposals and prices: State DESs
(iv) Other fibres	Area: LUS from DES Ag / State DESs	(i) Operation of Govt. Irrigation system ®	Central & State Govt. Budget documents		
(v)Other drugs and narcotics	Area: LUS from DES Ag / State DESs	(**3) Livestock Products**			
(vi) other condiments and spices	Area: LUS from DES Ag / State DESs	Value of output			
(vii) Other fruits	Production: Horticulture Statistics Division (DAC, M/o Agriculture)	(i) Milk (Cattle, Buffalo and Goat), Eggs and Wool ®	Production: DADF (Integrated Sample Survey (ISS) for MLP) Prices: State DESs		
(viii) other vegetables	Production: Horticulture Statistics Division (DAC, M/o Agriculture)	(ii) Camel milk ®	Production: State DESs Prices: State DESs		
(ix) Tobacco stem	Production of tobacco leaves: DES Ag / State	(iii) Duck eggs ®	Production: ISS from DADF, in cases where		

	DESs Prices of tobacco leaves: State		ISS covers duck eggs		
(x) Toddy	MPCE of Toddy: NSS 68th Round CES, 2011-12 Rural and urban population: Population Census 2011	(iv) Meat (Registered + Unregistered) ®	Production: ISS from DADF and State DESs Prices: State DESs		
(x1)Fodder	Total and irrigated area under fodder crops: DES Ag and State DESs Prices: State DESs	(v) Meat (Products and byproducts) (includes fats, edible offals & glands, hides & skins, heads & legs of slaughtered animals)	--		
(xii) Grass	Area: LUS from DES Ag / State DESs Prices: State DESs	(vi) Poultry Meat ®	Poultry population: ILC, 2003 and ILC, 2012 from DADF Production of eggs: ISS from DADF Prices: State DESs		
(xiii) Mulberry	Production and prices: State DESs	(vii) Fats from Fallen Animals (only for cattle and buffalo) ®	Mortality rates: DMI reports Population: ILC, 2003, 2007 and 2012 from DADF		
(xiv)miscellaneous food and non-food crops	Area: LUS from State DESs Value per hectare: State DESs	(viii) Cattle hides, Buffalo hides, Goat skin and Sheep skin (fallen animals) ®	Mortality rates: DMI Reports Population: ILC, 2003, 2007 and 2012 from DADF		

Source: CSO (2015b)