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RESEARCH PAPER

Structurally Transforming Indian Economy with Special Reference to the Agriculture Sector

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ABSTRACT

Economic development has been seen as both a cause and an outcome of structural transformation. The transformation at national level is concluded to be stunted one, various factors were studied and analyzed to make a record of structural transformation in Indian economy for last few years. A decline in the GDP level was observed from 2007 (1046.9 UD$) till 2020 (1935.04 UD$). Among the sectors of economy, the agriculture sector contributed least to GDP in 2018 (15.97 per cent) and highest in 2021 (20.19 per cent). The CAGR was also computed and the agriculture (33%) and service (35%) sectors have shown a positive CAGR, whereas, industry sector witnessed a negative growth rate of 32 per cent. Among the major states of India, lowest per capita income was in Bihar (₹ 39170.3) and highest in Haryana (₹ 217402.8), which is about five times that of Bihar. It can be inferred that in terms of agricultural production, over a decade, pulses witnessed highest growth (3.16%), followed rice (2.22%), wheat (2.13%), cereals (2.0%), food grains (1.93%) and non-food grains (0.47%). The maximum share of agriculture in GSDP was seen in 2021 (20.19%) and least in 2018 (15.97%). A decrease in the share of agriculture in total work force was noticed from 2010 (52%) to 2021 (42%). The Gap analysis showed that, maximum gap was observed during 2010 (34.97%) and minimum in 2021 (21.81%). The percentage of employment in agriculture decreased from 2001 (59%) till 2021 (42%) due to many factors like the increase in urbanization, modernization, industrialization etc.

HIGHLIGHTS

- A positive CAGR was found for the agriculture and service sectors, whereas, industry sector witnessed a negative growth rate.
- Among the major states of India, lowest per capita income was in Bihar and highest in Haryana.
- Over a decade, pulses witnessed highest growth and least by non-food grains.

Keywords: Structural transformation, GDP, sectors of economy, CAGR, agriculture, employment

India's economy has drastically changed since it gained its independence. India remains predominantly a rural economy, with 66 per cent of its population residing in rural areas (World Bank, 2019). Agriculture continues to be the primary source of livelihood for a significant portion of this population. As the Indian economy moved to a higher growth path in the final two decades of the twentieth century, the growth was largely driven

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by the expansion of the services sector (Behera and Tiwari, 2015; Papola, 2005; Behera, 2015; Munjal, 2007). Lele and Goswami (2017) explored how India is navigating the fourth industrial revolution through public policies and collaborations between the public and private sectors, as well as NGOs, with a focus on advancing development, particularly in agriculture and rural areas. From a time of grain scarcity, we are now experiencing surpluses. This modification reflects the structural changes India has undergone. In fact, every country in the world has gone through or will go through this process. The structural transformation of a country occurs as it progresses on the path of development (Cortuk and Singh, 2011). The process of structural transformation is referred to as the reallocation of economic activity across the broad sectors of agriculture, manufacturing and services. The transformation is marked by a shift in dominance from agriculture to manufacturing, and eventually to the service sector, as the economy transitions from being underdeveloped to developed (Kuznet, 1975). Structural transformation has been the driving force behind the growth of Asia, leading to the services sector emerging as both the primary employer and the sector with the highest output share (Nayyar, 2019). Structural change can be stated as the reallocation of labour among economic sectors with varying levels of labour productivity, it is a result of growth as well as a factor in the process of economic growth (Joshi, 2016). The pattern of growth determines the pattern of labour reallocation. However, when labour is reallocated from lower-productivity sectors to higher-productivity ones, GDP is positively impacted. It has long been acknowledged that this contribution might be rather significant in low-income countries because productivity gaps between industries are frequently wide. Simon Kuznets, Hollis Chenery and most recently Peter Timmer (2009) studied the patterns of economic growth and transformation and found significant regularities in the structural composition of economic activity. Between 1965 and 2000, 86 different countries were covered by Timmer's evidence. He discovers a link between per-capita incomes and the employment proportion of agriculture in the GDP. This gives statistical proof that the contribution of agriculture to the broader economy declines as per-capita incomes rise. The findings also demonstrate that employment is declining more quickly than agriculture's percentage of GDP, which suggests that there may be a mismatch between the two (Mkhize and D'Souza, 2015). Agriculture still has a significant role in catalysing this shift, even though its influence in the structural transformation process is diminishing, according to Timmer (2009). Lewis (1955) first examined the ties between agriculture and development in the conventional dual-sector model of an economy, which explains growth as a division of labour between two sectors, the "capitalist" sector and the "subsistence" sector. Moving numerous underemployed workers with low productivity to a modernized, "capitalist," sector with greater productivity and wages was essential to the growth of "overpopulated" countries. The structural transformation includes agriculture as well as non-agriculture sectors. The broad category of "non-agriculture" sectors comprises industries including manufacturing, services, construction, mining, and utilities. Most of the economies have faced a classical pattern of structural change. The structural transformation brought about by growth involves shifting labour from agriculture to manufacturing and service sectors early on and from manufacturing and services to agriculture and services later on (Ghate and Wright, 2012). This is the classical pattern of structural transformation that has been seen mostly. Several East Asian economies that emerged in the post-war period clearly displayed the classical pattern of structural transformation. Japan and South Korea's observed patterns of transformation serve as excellent case studies But according to his study, India followed a different pattern.

Agriculture used to account for the majority of economic output and labour force prior to economic transformation. Because non-agricultural productivity is higher than agricultural productivity, agricultural share to overall GDP is far lower than its share to the labour force (Mehrotra and Jajati, 2021). As industrial growth accelerates, industry becomes even more productive, widening the productivity gap with agriculture, while agriculture's share of GDP continues to decline. During periods of high growth, the structural gap develops because the share of agriculture in GDP reduces significantly quicker than the share of agricultural labour. Farm incomes are clearly

lagging behind incomes generated elsewhere in the economy. The basic source of the severe political conflicts caused by structural transformation is the lag in real agricultural incomes. This tension is frequently exacerbated by the fact that agricultural production increases are quickly lost to farmers due to falling prices. As a result, labour migration is the primary driver of income convergence between the agricultural and non-agricultural sectors. The speed with which labour is pushed out of agriculture during structural transformation is determined by the labour intensity of industry. Services start to increase their proportion of value added and labour force with a lag. Economic growth is accelerated through structural change, which involves transferring workers from lower to higher productive activities. Agriculture productivity will begin to rise as technological change extends to the sector, as labour exits the sector, and agricultural investment rises. Agricultural labour productivity and incomes will often lag behind productivity and incomes in other sectors during the majority of structural economic transformations, creating a growing inter-sector income gap. Major political issues are frequently brought on by this income inequality. The growing disparity is caused by how long it takes for labour to leave agriculture to increase agricultural productivity, earnings, and incomes. Politics linked to the divergence of rural and urban areas have become increasingly volatile across Asia in recent years. The challenge was met head-on by China's policymakers, who expanded health insurance, free education upto grade nine, and safety nets to rural areas. India has also stepped up its policy responses. With improved infrastructure, irrigation, research and extension, and special production programs for food grains, horticulture, and other sectors, the 11th Five Year Plan (2007–2012) has resumed its focus on agriculture and rural development. The expansion of agricultural financing has accelerated. Self-help organizations for women have been established all around the country. More and more crops are now covered by the support prices, which have also been increased. So, here we are going to discuss about the structural transformation in India.

METHODOLOGY

The time series data for forty years were collected from various sources viz. Department of statistics and economics; Ministry of Agriculture and Farmers' Welfare, GOI; National Sample Survey Organization (NSSO); Central Statistics Office (CSO); Agricultural Statistics 2020-21. Various concepts were worked out using analytical tools for various concepts:

(a) Per cent annual Growth rate:

$$\text{AGR}(\%) = \frac{K_{t+1} - K_t}{K_t} * 100$$

(b) Compound Annual Growth Rate:

$$X_t = ab^t$$

$$Log\ X_t = Log\ a + t\ Log\ bb = (1 + r)/100$$

where,

X_t = Variable

t = time element which takes the values 1,2,3,……,n

a = intercept

b = regression coefficient

$$CAGR\ (\%) = (antilog\ b - 1)*100$$

RESULTS AND DISCUSSION

Gross Domestic Product is one of the important parameter to analyze the structural changes in Indian economy. The GDP level of various sectors of Indian economy was recorded for last two decades (2010 -2021).

Table 1: Level of GDP for the last two decades (2001 – 2021) (US dollar)

Year	GDP per capita	Year	GDP per capita
2001	459.47	2011	1458.11
2002	479.06	2012	1443.88
2003	556.33	2013	1449.61
2004	638.79	2014	1573.88
2005	726.92	2015	1605.61
2006	814.35	2016	1732.05
2007	1046.9	2017	1980.67
2008	1019.51	2018	1998.26
2009	1121.25	2019	2070.41
2010	1384.17	2020	1935.04

Source: *CSO and NSSO data 2021.*

Table 1 shows that during the last two decades i.e. 2001-2021, the GDP showed an increase except for the 2007-2008, 2011-2012 and 2019-2020. The GDP level decreased from 2007 (1046.9 UD$) to 2008 (1019.51 UD$), from 2011 (1458.11 UD$) to 2012 (1443.88 UD$) and from 2019 (2070.41UD$) to 2020 (1935.04 UD$).

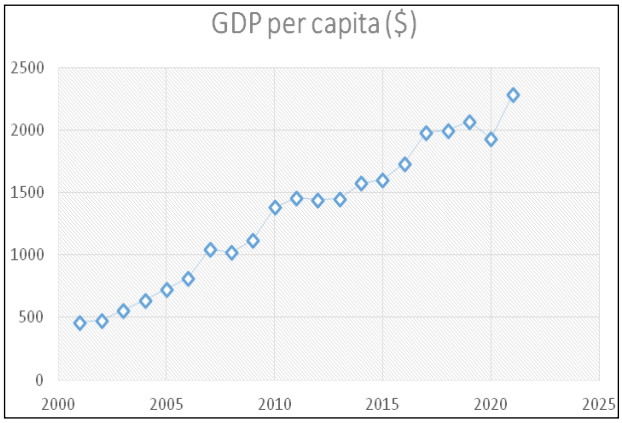


Fig. 1: The trend shown in GDP per capita of India for last two decades

Fig. 1 tells about the trend in GDP of India in US dollars from 2001-2021. The trend was almost similar except for 2008, 2012 and 2020. There was a decrease in the level of GDP for these years. The main sectors of Indian economy are agriculture, industry and service sector. The share of these sectors towards GDP was also computed and trends from 2010 – 2021 were recorded.

Table 2: Sector wise share in GDP of Indian Economy (per cent)

Years	Agriculture	Industry	Service
2010	17.03	30.73	30.73
2011	17.19	30.16	30.16
2012	16.85	29.4	29.4
2013	17.15	28.4	28.4
2014	16.79	27.66	27.66
2015	16.17	27.35	27.35
2016	16.36	26.62	26.62
2017	16.56	26.5	26.5
2018	15.97	26.38	26.38
2019	16.68	24.18	24.18
2020	18.32	23.52	23.52
2021	20.19	25.92	25.92

Source: *Author's calculations from CSO and NSSO data.*

Table 2 shows the year wise GDP share in India's GDP in per cent among the different sectors on India viz. Agriculture, industry and service sectors for 2010-2021. The agriculture sector contributed least in 2018 (15.97 per cent) and highest in 2021 (20.19 per cent). However, the variation in two decades was not much significant. The industry sector during the last two decades showed that maximum contribution was in 2010 (30.73 per cent) and least was in 2020 (23.52 per cent). This can be due to the COVID-19 emergence and lockdowns. Maximum contribution of service sector towards GDP of India was seen in 2010 (30.73 per cent), which continuously declined from 2010 till 2020. In 2020, least contribution of service sector to India's GDP was observed in 2020 (23.52 per cent). Thereafter, in 2021, an increase in contribution to GDP was seen in all the three sectors i.e. agriculture (20.19 per cent), industry (25.92 per cent) and service (25.92 per cent), over 2020, where contribution to GDP in agriculture, industry and service were 18.32 per cent, 23.52 per cent and 25.92 per cent respectively.

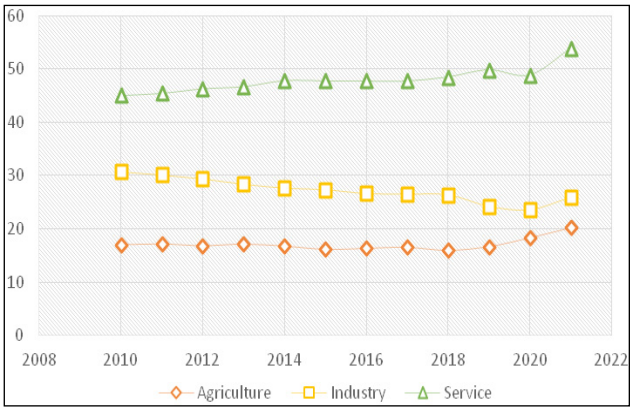


Fig. 2: The sectoral trends of GDP (per cent) in Indian Economy

Fig. 2 tells about the trend in the contribution of various sectors i.e. agriculture, industry and service sector in India's GDP. The agriculture and industry sectors showed nearly constant trend from 2010-2020 but for 2021, the share increased. Throughout the time period, the service sector has more share than two other sectors. During 2020-2021, the agriculture and industry sectors converge as compared to 2010.

The Compound Annual Growth Rate (CAGR) in percentage over 2010 – 2021 was computed and it was shown in Fig. 3. The agriculture and service sectors have shown a positive CAGR, whereas, industry sector witnessed a negative growth rate of 32 per cent. For rest of the two sectors, the growth rate of service sector (35 per cent) was higher than agriculture sector (33 per cent).

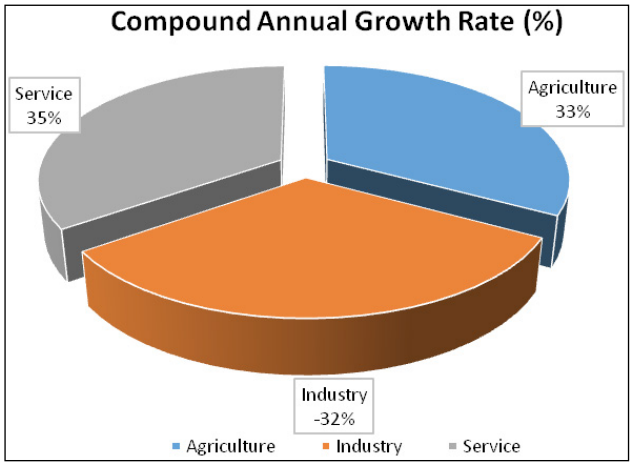
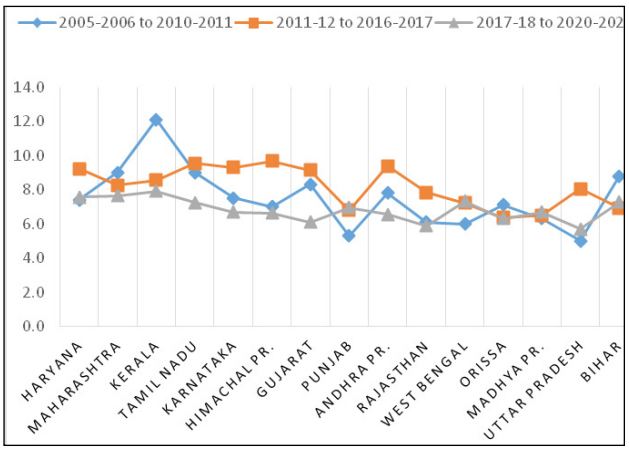


Fig. 3: The Compound Annual Growth Rates of different sectors of Indian Economy (%)

Economic Growth and Inequality at State Level

In Table 3, the level and growth in per capita income in major states of India from 2005-2006 to 2020-2021 have been displayed. In various time periods, there were a lot of variations in per capita GSDP. During 2005-06 to 2010-11, lowest per capita income was in Bihar (₹ 12015) and highest in Kerala (₹ 57877), almost four times of Bihar. Bihar observed the lowest per capita income again during 2011-12 to 2016-17, (₹ 26452), however, highest was in Haryana (₹ 135493.8) i.e. approximately 6 times that of Bihar. Similarly, during 2016-17 to 2021-22, lowest per capita income was in Bihar (₹ 39170.3) and highest in Haryana (₹ 217402.8), which is about five times that of Bihar. It was seen that during the whole time period, Bihar has seen lowest per capita income, similar findings were observed in a study conducted by (Mkhize and D'Souza, 2015).



Source: *Author's calculations based on CSO data (various years).*

Fig. 4: Annual Compound Growth Rate of per capita GSDP

The annual growth rates (%) are plotted for major states of India in Fig. 4. During 2005-06 to 2010-11, Uttar Pradesh has recorded lowest CAGR (5%),

Table 3: Level and growth in per – capita income in Indian states

States	Per Capita GSDP (₹)			Annual Compound Growth Rate in per capita GSDP (%)		
	Average of 2005-2006 to 2010-2011	Average of 2011-12 to 2016-2017	Average of 2017-18 to 2020-2021	2005-2006 to 2010-2011	2011-12 to 2016-2017	2017-18 to 2020-2021
Haryana	54964	135493.8	217402.8	7.4	9.2	7.6
Maharashtra	56997	124119.0	194592.5	9	8.3	7.6
Kerala	57877	122408.4	192975.0	12.1	8.6	7.9
Tamil Nadu	47911	118824.0	188125.8	9	9.5	7.2
Karnataka	40323	114906.8	181554.0	7.5	9.3	6.7
Himachal Pr.	48815	113045.0	179551.5	7	9.7	6.6
Gujarat	51724	111636.8	170653.3	8.3	9.1	6.1
Punjab	45345	102310.8	147345.3	5.3	6.8	6.9
Andhra Pr.	38005	85692.4	141110.0	7.8	9.4	6.5
Rajasthan	26011	70117.0	103373.5	6.1	7.8	5.9
West Bengal	30646	61380.0	92969.3	6	7.2	7.3
Orissa	26169	58383.6	88610.3	7.1	6.4	6.3
Madhya Pr.	21453	47695.8	70165.5	6.3	6.5	6.7
Uttar Pradesh	17489	39464.6	59477.0	5	8.0	5.7
Bihar	12015	26452.0	39170.3	8.8	6.9	7.3

Source: *CSO data and author's calculations.*

while, maximum was in Kerala (12.1%). Similar was the case from 2016-17 to 2021-22, highest CAGR was for Kerala (7.9 %) and lowest for Uttar Pradesh (5.7 %). An annual growth rate of 6.4 per cent was seen during 2011-12 to 2016-17, which was lowest, whereas, highest was in Himachal Pradesh (9.7%). When all the three time periods are compared, the phase of 2011-12 to 2016-17 witnessed lesser variation in CAGR values and were almost continuous.

Agricultural Performance

Table 4: The share of agriculture in GSDP and total workforce with Gap analysis

Year	Share of Agriculture in GSDP (%)	Share of agriculture in total workforce (%)	GAP
2010	17.03	52	34.97
2011	17.19	49	31.81
2012	16.85	47	30.15
2013	17.15	47	29.85
2014	16.79	46	29.21
2015	16.17	45	28.83
2016	16.36	45	28.64
2017	16.56	44	27.44
2018	15.97	43	27.03
2019	16.68	43	26.32
2020	18.32	43	24.68
2021	20.19	42	21.81

Source: *CSO data and author's calculations.*

The maximum share of agriculture in GSDP was seen in 2021 (20.19%) followed by 2020 (18.32%), 2011 (17.19%) and least in 2018 (15.97%). The share of agriculture in total work force decreased from 2010 (52%) to 2021 (42%). The Gap analysis showed that, maximum gap was observed during 2010 (34.97%) and minimum in 2021 (21.81%). Similar trend in share of agriculture in total work force and GAP was observed from 2001-2021.

Table 4 shows that there was an increase in the production of almost all of the agricultural crops. But during 2014-15, there was decrease in the production of agricultural crops. In case of cereals, rice, and wheat, a decrease in the production was observed from 2011-12 to 2012-13. A fluctuating pattern in agricultural production was seen in these crops. The pulses showed a decrease in production from 2010-11 (129.4 thousand tonnes) to 2011-12 (121.6 thousand tonnes), coming back to 129.4 thousand tonnes in 2012-13. Food grains witnessed an increase of 5.2 thousand tonnes from 2010-11 to 2011-12 and quantity produced remained same in 2012-13. Non good grains witnessed a varied kind of pattern. During 2020-21, an increase in the production of non - food grains was observed from 2019-20 (151.3 thousand tonnes) to 2020-21 (134.8 thousand tonnes).

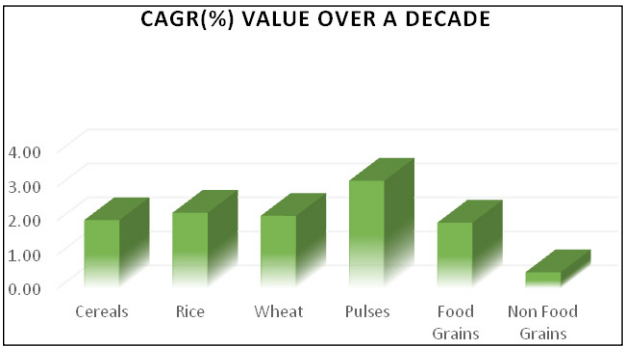


Fig. 5: The Compound Annual Growth Rate (CAGR %) of agricultural produce over a decade

It can be inferred from Fig. 5 that, over a decade, pulses witnessed highest growth (3.16%), followed rice (2.22%), wheat (2.13%), cereals (2.0%), food grains (1.93%) and non-food grains (0.47%).

The data for three time frames that are 2010-13, 2014-17 and 2018-21 shows that for all India age group, the highest percentage of agricultural workers to total workers was seen in 2018-21, that too for females (59.95%). Similarly, in case of youth, again the females make the highest percentage of agricultural workers to total workers in 2018-21 (51.86%). Males, females and person compared in all the three time frames were higher in case of cultivators rather than the labour. The worker population ratio (WPR) was highest among males in 2018-21 both at 'all India age group' and 'youth labor' cases that are 53.89 per cent and 50.94 per cent respectively.

Agriculture is the main source of employment to people in all time periods, 2001-05 (57.8%), 2006-11 (52.8%), 2012-17 (45.7%) and 2018-21 (42.8%). Table 6 indicates that after agriculture, employment is offered more by service sector followed by industry sector in the economy. During 2018-21, the highest employment was provided by agriculture sector (42.8%) followed by service sector (33.5%) and at the last by industry sector (27.5%).

Table 5: Agricultural production of produce from 2010 to 2021 (Thousand tonnes)

Agricultural Produce	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Cereals	111.1	119.1	117.3	120.7	114.6	115.5	123.7	127.2	129.2	134.8	138.2
Rice	102.2	112.1	112	113.5	112.3	111.1	116.8	120.2	124	126.5	130.1
Wheat	116.5	127.2	125.4	128.5	116	123.7	132.1	133.9	138.9	144.6	146.9
Pulses	129.4	121.6	129.4	135.6	122	116.7	165.5	181.7	158.9	164	182.2
Food Grains	114.3	119.5	119.4	123.3	115.9	115.7	131.1	136.8	134.4	139.8	141
Non Food Grains	128	129.3	129	136.4	132.3	126.1	134.7	142.1	142	151.3	134.8

Source: *Author's calculations based on data from Agriculture stats at a glance 2021-22.*

Table 6: Per cent distribution of agricultural from 2010–13 to 2018–21

Sex	Year	India All age group				Youth (15-29 year age)			
		Agricultural worker			WPR	Agricultural worker			WPR
		Cultivator	Labour	Agri. Worker % to Total worker		Cultivator	Labour	Agri. Worker % to Total worker	
Male	2010–13	76.96	21.83	40.24	52.07	73.63	25.01	32.73	48.32
	2014–17	77.18	21.60	38.28	52.25	73.17	25.47	30.89	48.59
	2018–21	76.55	21.63	39.95	53.89	73.97	23.33	32.9	50.94
Female	2010–13	64.52	34.21	56.99	16.51	65.75	33.00	48.87	13.46
	2014–17	67.66	31.20	55.29	17.61	67.3	30.99	46.82	13.32
	2018–21	70.34	28.00	59.95	21.85	72.63	25.31	51.86	17.55
Person	2010–13	73.23	25.55	44.13	34.69	71.42	27.24	36.08	31.44
	2014–17	74.15	24.66	42.49	35.29	71.52	27.03	34.17	31.43
	2018–21	74.25	23.99	45.57	38.17	73.51	24.00	37.55	34.73

Source: *Author's calculations based on NSO data and population data.*

Table 7: Sector wise labour per cent in Indian Economy

Time period	Average of Employment (%)			CAGR (%)		
	Agriculture	Industry	Service	Agriculture	Industry	Service
2001-05	57.8	19.4	28.4	-1.04	3.13	0.70
2006-11	52.8	22.8	29.2	-1.91	2.95	0.57
2012-17	45.7	26.3	31.7	-1.09	0.63	1.05
2018-21	42.8	27.5	33.5	-0.59	0.91	0.75

Source: *Author's calculations based on International Labour Organization, ILOSTAT database.*

Table 8: Employment in agriculture (%) from 2001-2021

Year	Employment (%)	Year	Employment (%)	Year	Employment (%)	Year	Employment (%)
2001	59	2006	55	2011	49	2016	45
2002	59	2007	54	2012	47	2017	44
2003	58	2008	54	2013	47	2018	43
2004	57	2009	53	2014	46	2019	43
2005	56	2010	52	2015	45	2020	43
						2021	42

Source: *International Labour Organization, ILOSTAT database.*

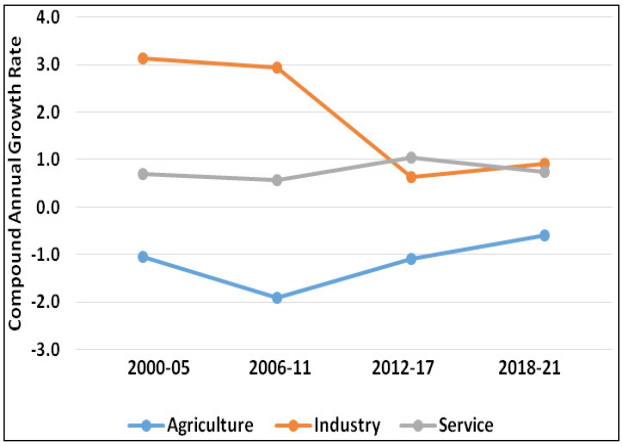


Fig. 6: Compound Annual Growth Rate (CAGR) of the sectors from 2000-2021

The Compound annual growth rate (CAGR) value over 2000-2021 time shows that agriculture and service sectors followed almost similar pattern. However, the industry sector witnessed a different pattern. For industry sector, the growth rate declined from 2000-05 (3.1%) to 2006-11 (2.9%) to 2012-17 (0.6%) and then increased a bit during 2018-21 (0.9%). The service sector showed minor fluctuations during the time frame. The highest CAGR value was during 2012-17 (1%) and least was during 2006-11 (0.6%). However, during 2000-05 and 2018-21, the CAGR value was same that is 0.7 per cent. The agriculture sector witnessed a negative CAGR for all the time frames, 2000-05 (-1%), 2006-11 (-1.9%), 2012-17 (-1.1%) and 2018-21 (-0.6).

The employment data in agriculture from 2001 to 2021 was collected and it clearly showed that the percentage of employment in agriculture decreased from 2001 (59%) till 2021 (42%). This can be attributed to the increase in urbanization, modernization, people inclination towards industrialization.

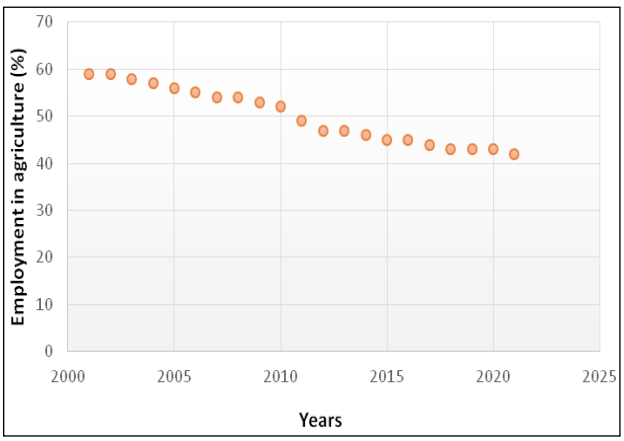


Fig. 7: Employment in agriculture (%) from 2001-2021

CONCLUSION

The study showed that the share of agriculture and labour force in India over some years have declined significantly. The structural of economy has been shifting from an agriculture oriented economy towards service or industry sector oriented economy. Additionally, the structural change is atypical as labour is shifting from agriculture to rural non-farm sectors. Moreover, the year wise share in India's GDP among the different sectors of India viz. Agriculture, industry and service sectors for 2010-2021 concluded that the agriculture sector contributed least in 2018 (15.97 per cent) and highest in 2021 (20.19 per cent). But still, its contribution in labour employment and other factors is declining. There was an increase in the production of almost all of the agricultural crops including cereals, pulses, wheat, rice, grains etc. but during 2014-15, there was decrease in their production. During 2016-17 to 2021-22, lowest per capita income was in Bihar (₹ 39170.3) and highest in Haryana (₹ 217402.8), which is about five times that of Bihar. The structural transformation is somewhat stunted but quite significant.

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