



Changing Role of Agriculture in Income, Employment and Value Added Per worker in Major Countries

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Received: 31 March 2022
Revised: 24 April 2022
Accepted: 08 May 2022
Publication: 15 September 2022

To cite this article

Kapoor, S., & Kaur, S. (2022). Changing Role of Agriculture in Income, Employment and Value Added Per worker in Major Countries. *Asian Journal of Economics and Business*, Vol. 3, No. 2, pp. 239-251. DOI: <https://doi.org/10.47509/AJEB.2022.v03i02.03>

Abstract: Agriculture sector has the largest share in employment and value added for many developing countries. This paper analyses the spatial contribution of agriculture sector to income, employment and per worker value added in top thirty countries which have highest share in agriculture sector in the World. The success of agricultural sector in income and employment has been designated to green revolution in India. China has proceeded with the process of structural change very rapidly. Ethiopia has the highest share of agriculture in employment which is an agriculture dominant country. The study gives clear picture that development of agriculture has been the essential element of structural transformation and will continue to be crucial in transformation in the future. The estimates of this study indicate that the changing role of agriculture in income and employment in the major countries followed by structural change has led to increasing the integration of the economies of the countries and their changing patterns of interlinkages between the agriculture sector and the other sectors in countries.

Keywords: Income, employment, value added per worker, GDP

Introduction

The agriculture and allied sector contributes 5.51 per cent of the gross value added and has major share in employment (about 26.75 per cent) in the world during 2019 (World Bank, 2021). The disguised unemployed labour is also found in this sector whose marginal productivity is zero. Different economists highlight the crucial role of agriculture sector in economic development of an economy. Rostow (1959) stresses on the role of agriculture acting as a leading sector in different stages of economic growth. Ruttan (1965) specified the sequential stages of a country in achieving development and considers industry as the dynamic element in growth process. Economic growth is achieved by transferring the labour from sectors with low output per worker to the sectors with higher output per worker. The impact of agriculture sector on an economy is much broader due to its backward and forward linkages.

Agriculture sector has the largest share in employment and value added in some developing countries (Kenya, Pakistan, Bangladesh, Ethiopia etc.). Due

to this reason, agriculture sector acts as stimulant to economic growth (Johnston & Mellor, 1961; Dorward *et al.*, 2004) which create jobs. The majority of the population in most of the developing countries has to depend on agriculture for their livelihood. It is important to point that the outlook of the role of agriculture has changed in the last decades. The structural change process has been described by different researchers. Fisher (1939), Clark (1940), Kuznets (1957) and Chenery (1960) were among the initial ones who discussed it. As compared to 1950s and 1960s when agriculture was underling in the process of development and the surplus labour transferred to industrial sector (Lewis, 1954) for investment in industrialization (Hirschman, 1958), the modern economists stressed on role of agriculture and rural development as an important part of the development process. Matsuyama (1992) analysed the importance of agricultural productivity in the industrialization process. Although agriculture continues to supply labour to manufacturing and services sector and raise the incomes of rural areas, it is important to know that will its role be different from the past when majority of people depended on this sector for livelihood? However, to study the relation between agriculture and economic development, the focus remains primarily on the impact of agriculture in structural change. This structural change out of agriculture has been studied empirically (Chand *et al.*, 2017; Alvarez-Cuadrado, & Poschke, 2011) and the concern has been given to the rural households who are lagging behind with the structural change in the economy. The agricultural productivity growth is generally less than the industrial productivity growth. Therefore, it becomes equally important and deserves more research on the changing role of income and employment in different countries as the structural change led growth has hardly benefitted the rural households in getting employment. This paper analyses the spatial contribution of agriculture sector to income and employment in the World. It is a known fact that the share of agriculture sector in gross domestic product and its contribution in employment declines during the economic growth of a country and growth is supplemented by the structural change in an economy. How does the role of agriculture sector differ over the period of time when economic growth takes place accompanied by the structural change in the economy? This study evaluates the changing role of agriculture sector in income and employment from the standpoint of structural change. It re-evaluates the changing role of agriculture in economic transformation in future among countries which have highest share among all countries in World. The countries are analysed and compared in terms of their changing share of agriculture sector in income, employment and per worker value added. In the present study,

analyses has been made in the countries going through different stages of agricultural transformation by taking top thirty countries having major share in agricultural sector. The World Bank Group (2014) has developed classification of a country based on its role of agriculture in GDP and employment. The five stages are classified as:

1. **Agriculture based countries** which employs more than 50 per cent of economically active population and agriculture value added is greater than 25 per cent of GDP.
2. **Pre-transition countries** which employs more than 50 per cent of economically active population and value added in agriculture is between 10-25 per cent.
3. **Transition countries** where agriculture employment share is between 25-50 per cent and value added in agriculture is between 10-25 per cent.
4. **Urbanized countries** where employment in agriculture is between 10-25 per cent and value added in agriculture remains unchanged.
5. **Developed countries** where employment declines to less than 10 per cent and value added in agriculture also drops to less than 10 per cent.

Data and Methodology

The study is based on the secondary data for top thirty countries which are contributing more than 80 per cent of the gross agricultural value added to the world agricultural GDP. The data is collected from World Development Indicators, World Bank for the year 1991 to 2020. The compound growth rate of agriculture and allied sector and growth rate of per worker value added in agriculture is estimated for selected periods of time. The compound growth rates are estimated (Singh *et al.*, 2021a; Singh *et al.*, 2021b; Kaur *et al.*, 2021) to study the growth with the following exponential model.

$$Y = ab^t$$

$\log Y = \log a + t \log b$ (by taking the log of both sides)

$$\text{CGR} = (\text{Antilog } b - 1) \times 100$$

where,

t = time period in year

Y = agriculture and allied sector/per worker value added

a & b = Regression parameters and

CGR = Compound growth rate.

Results and Discussion

With the economic development, the changes in share of agriculture in GDP and employment is high but declines in the developing nations and it is low but more stable in the developed nations in the world. Agriculture occupies more important position in the developing nations as compared to the developed nations where its importance is less. The countries transform for primary emphasis on the agriculture sector to a more industrially developed and service economies. In due course, the contribution in income by the agriculture sector is overshadowed by the industrial sector (Todaro & Smith, 2012).

Table 1 depicts the agriculture share in GDP among top 30 countries in World which indicates that countries are at different points of stage of transformation. The share of agriculture in GDP has been declining over the period in World from 9.84 per cent during 1991 to 5.64 per cent during 2001 which further declines to 4.34 per cent during 2011 except for minor rise to 5.51 per cent during 2020. Ethiopia stands highest among the countries in making contribution of agriculture share in GDP among countries during 1991 with 58.67 per cent. The unprecedented growth rate of agriculture in GDP has changed the economic structure of Ethiopia.

Table 1: Agriculture share in GDP among countries (Top 30 countries)

Country	Agriculture share in GDP (%)			
	1991	2001	2011	2020
Algeria	NA	9.75	8.11	14.13
Argentina	6.72	4.57	7.00	5.93
Australia	3.17	3.50	2.29	2.01
Bangladesh	31.68	21.85	16.81	12.92
Brazil	6.84	4.80	4.34	5.91
China	24.03	13.98	9.18	7.65
Colombia	17.45	8.32	6.09	7.65
Egypt, Arab Rep.	16.99	15.35	13.87	11.57
Ethiopia	58.67	42.34	41.25	35.45
France	2.61	2.11	1.65	1.60
Germany	1.10	1.08	0.91	0.74
India	27.33	21.62	17.19	18.32
Indonesia	19.66	15.99	13.51	13.70

contd. table 1

Country	Agriculture share in GDP (%)			
	1991	2001	2011	2020
Iran, Islamic Rep.	12.01	8.31	5.45	11.32
Italy	3.24	2.49	1.88	1.99
Japan	NA	1.37	1.08	1.01
Kenya	24.32	27.85	18.89	23.05
Korea, Rep.	6.82	3.57	2.21	1.83
Malaysia	14.36	8.01	11.45	8.19
Mexico	6.50	3.40	3.09	3.80
Nigeria	20.89	24.48	22.23	24.14
Pakistan	22.84	24.20	25.13	23.13
Philippines	18.34	13.30	14.10	10.18
Russian Federation	13.77	5.88	3.15	3.70
Saudi Arabia	5.43	5.17	2.17	2.56
Spain	NA	3.68	2.37	3.15
Thailand	12.65	8.58	11.59	8.63
Turkey	15.25	8.79	8.17	6.68
United States	NA	1.13	1.22	..
Vietnam	40.49	23.24	19.57	14.85
World	9.84	5.64	4.34	5.51

Source: World development indicators 2021, World Bank

The importance of agriculture has been emphasized as a consistent policy for the Ethiopian government although the country has rapidly industrialized over the period. The share of agriculture in GDP in Ethiopia declines over the period to 42.34 per cent during 2001, 41.25 per cent during 2011 and 35.45 per cent during 2020. This is followed by Vietnam whose contribution of agriculture in GDP has been 40.49 per cent during 1991 which drastically declines to 23.24 per cent during 2001, 19.57 per cent during 2011 and 14.85 per cent during 2020. Some of the other countries with substantial share has been Bangladesh, India, Kenya and China with 31.68 per cent, 27.33 per cent, 24.32 per cent and 24.03 per cent share in GDP respectively. However, the share of agriculture in GDP in Bangladesh declines over the period to 21.85 per cent during 2001, 16.81 per cent during 2011 and 12.92 per cent during 2020. The share of agriculture in GDP in India falls to 21.62 per cent during 2001, 17.19 per cent during 2011 with minor rise during covid-19 pandemic to 18.32 per cent when economy slipped down with only agriculture as the contributing sector in the

country. However, the success of agricultural sector in income and employment has been designated to green revolution in India. Singh *et al.* (2020) found the existence of disguised unemployment and labour migration in all the states although the traditional states have performed well from Green Revolution in India. It is important to note that the share of agriculture in GDP increases in Kenya during 2001 to 27.85 per cent which falls to 18.89 per cent during 2011 and then again rises to 23.05 per cent during 2020. The share of agriculture sector in GDP in China drastically declines over the period to 13.98 per cent, 9.18 per cent and 7.65 per cent during 2001, 2011 and 2020 respectively. China has proceeded with the process of structural change very rapidly. China is the first country which produced hybrid varieties on industrial scale and contributes nearly one-third rice production of the World (Shen, 2010).

Lewis (1954) stressed on surplus labour in the form of involuntary employment and is generally widely found in overpopulated developing countries where agriculture sector has a larger share in employment. Table 2 indicates the share of agriculture in employment among top 30 countries in the World. The agriculture share in employment declines from 43.70 per cent to 39.57 per cent, 32.05 per cent and 26.75 per cent during 1991, 2001, 2011 and 2020 in World respectively. Ethiopia has the highest share of agriculture in employment with 76.85 per cent which is an agriculture dominant country. Its share fluctuates with minor changes during 2001 and 2011 but shows higher decline during 2020 when its share declines to 66.63 per cent during pandemic. It is followed by Vietnam, Bangladesh, India and Thailand with 70.88 per cent, 69.51 per cent, 63.32 per cent and 60.33 per cent respectively. These countries have experienced decline in share of agriculture in employment over the period indicating structural change in the economies and the labour shifting to industrial and services sector as based on notions of models of Lewis (1954), Ranis (1961) and Jorgenson (1961). Moreover, these countries are transitioning in their next stage of economic growth. It is discernible that the share of agriculture in employment in other top 30 countries has declined over the period except in Kenya where the share has increased over the period between 1991 to 2001 and 2001 to 2011 but falls during 2020.

Table 3 gives estimates of the growth of agriculture and allied sector among top countries during three decades. Nigeria has the highest growth rate of 7.44 per cent between 1991 to 2005 which declines to 4.41 per cent between 2005 to 2020. However, the overall growth rate of agriculture and allied sector has been estimated as 6.86 per cent between 1991 to 2020. The second highest

Table 2: Agriculture share in employment among countries (top 30 countries)

<i>Country</i>	<i>Agriculture share in employment (%)</i>			
	<i>1991</i>	<i>2001</i>	<i>2011</i>	<i>2020</i>
Algeria	24.88	21.71	10.77	9.60
Argentina	0.34	0.83	0.64	0.06
Australia	5.36	4.75	2.82	2.56
Bangladesh	69.51	62.39	46.55	38.30
Brazil	19.64	16.42	11.99	9.08
China	59.70	50.01	34.80	25.33
Colombia	23.75	22.20	17.81	15.77
Egypt, Arab Rep.	39.02	28.54	29.24	20.62
Ethiopia	76.85	76.92	73.04	66.63
France	6.03	4.07	2.91	2.53
Germany	3.48	2.62	1.65	1.21
India	63.32	59.10	49.26	42.60
Indonesia	55.51	43.77	37.19	28.50
Iran, Islamic Rep.	24.96	24.47	18.81	17.37
Italy	8.31	5.21	3.68	3.89
Japan	6.73	4.91	3.97	3.38
Kenya	44.48	51.50	59.74	54.34
Korea, Rep.	14.61	9.96	6.37	5.14
Malaysia	22.49	15.13	11.88	10.28
Mexico	21.09	17.46	13.69	12.48
Nigeria	50.57	48.13	40.58	34.97
Pakistan	44.81	42.75	43.49	36.92
Philippines	44.91	37.03	32.68	22.86
Russian Federation	14.24	12.05	7.69	5.83
Saudi Arabia	7.86	6.03	4.26	2.41
Spain	10.22	6.56	4.10	4.03
Thailand	60.33	46.04	41.01	31.43
Turkey	29.76	27.14	24.16	18.11
United States	1.93	1.53	1.45	1.36
Vietnam	70.88	63.99	48.31	37.22
World	43.70	39.57	32.05	26.75

Source: World development indicators 2021, World Bank

Table 3: Growth rate of agriculture and allied sector among top countries during last three decades

<i>Country</i>	<i>Growth rate in %</i>		
	<i>1991 to 2005</i>	<i>2005 to 2020</i>	<i>1991 to 2020</i>
Algeria	6.60	5.59	5.91
Argentina	2.66	0.79	2.03
Australia	3.48	0.64	2.13
Bangladesh	3.19	3.93	3.91
Brazil	4.11	2.99	3.60
China	3.60	3.97	3.91
Colombia	1.80	2.76	2.29
Egypt, Arab Rep.	3.40	3.13	3.29
Ethiopia	2.62	6.15	5.32
France	1.57	0.64	0.96
Germany	-1.51	-0.07	-0.11
India	2.73	3.56	3.06
Indonesia	2.25	3.87	3.19
Iran, Islamic Rep.	3.11	3.17	3.08
Italy	0.85	-0.005	0.28
Japan	-1.08	-2.33	-1.73
Kenya	2.92	2.47	2.66
Korea, Rep.	0.78	1.09	1.18
Malaysia	1.36	1.93	2.21
Mexico	1.72	1.97	1.78
Nigeria	7.44	4.41	6.86
Pakistan	3.65	2.20	2.90
Philippines	2.68	2.03	2.80
Russian Federation	-0.38	1.91	1.31
Saudi Arabia	1.59	2.39	2.09
Spain	2.14	1.86	1.41
Thailand	0.74	0.97	1.50
Turkey	1.35	3.01	2.25
United States	4.49	1.77	1.74
Vietnam	4.21	2.78	3.54
World	2.61	2.86	2.81

Source: Author's estimation from World development indicators 2021, World Bank

growth rate of agriculture and allied sector has been in Algeria between 1991 to 2005 estimated as 6.60 per cent which declines to 5.59 per cent between 2005 to 2020. However, it stood at 5.91 per cent for the overall period between 1991 to 2020. The growth rate of agriculture and allied sector of United States has been estimated as 4.49 per cent which declines drastically to 1.77 per cent between 2005 to 2020. Vietnam subsequently follows United States with 4.21 per cent growth rate of agriculture sector between 1991 to 2005. It declines to 2.78 per cent between 2005 to 2020 with overall growth rate of agriculture and allied sector estimated as 3.54 per cent between 1991 to 2020. The growth rate of agriculture and allied sector in the World hovered around two per cent over the three decades.

Trends of Agriculture Per worker value Added among Countries

Increase in per worker value added is crucial in the transition process to the next stage in different countries. It provides extensive market for emerging industrial sectors and also helps in generating the capital investment for the new sectors. Table 4 shows the per worker value added in agriculture and the growth between time periods. The estimates indicate that the per worker value added has been highest in Argentina followed by United States and Germany during 1991. However, it declined in Argentina during 2005 but increases during 2019 with the overall growth rate estimated as 8.30 per cent between 1991 to 2019. In case of United States, the per worker value added increases during 2005 and 2019 with growth rate being highest between 1991 to 2005 at 6.61 per cent which drastically declines to 0.86 per cent during 2005 to 2019. Germany has been reported with minor decline in per worker value added during 2005 indicating reduced dependency of people on agricultural sector. The growth rate of per worker value added has been highest in United States followed by Nigeria, Italy and China between 1991 to 2005. As there has been large increase in the per worker value added in agriculture of Argentina during 2019, therefore, the growth rate has been estimated to be highest in Argentina between 2005 to 2019 estimated as 25.73 per cent. This has been subsequently followed by Algeria and China between 2005 to 2019, the growth rate of per worker value added in agricultural sector being recorded as 8.56 per cent and 8.30 per cent. It is important to note that the overall growth rate of per worker value added in agricultural sector has been positive between 1991 to 2019 in all the countries except Kenya which has been reported with negative growth rate of value added per worker estimated as -1.53 per cent. There has been major change in per worker value added in Algeria over the period whose growth rate has been

highest as 8.30 per cent followed by China, Nigeria and Argentina between 1991 to 2019.

Table 4: Agricultural per worker value added and its growth among countries

<i>Country Name</i>	<i>Agricultural per worker value added (constant 2015 US\$)</i>			<i>Growth rate of agricultural per worker value added (per cent)</i>		
	<i>1991</i>	<i>2005</i>	<i>2019</i>	<i>1991 to 2005</i>	<i>2005 to 2019</i>	<i>1991 to 2019</i>
Algeria	NA	6434	19430	3.99	8.56	8.30
Argentina	378339	135067	2758231	-7.65	25.73	5.13
Australia	43947	76504	86838	3.87	2.11	3.52
Bangladesh	506	731	1284	2.36	3.69	3.93
Brazil	2774	4173	9992	3.32	6.57	4.74
China	955	1880	5609	4.27	8.30	6.55
Colombia	3406	3854	5278	0.95	1.97	1.57
Egypt, Arab Rep.	3123	4294	7680	2.75	4.31	2.27
Ethiopia	483	454	804	-1.00	4.04	2.29
France	18772	35604	53556	3.86	2.73	3.34
Germany	23291	23248	43715	1.57	3.87	3.48
India	865	1072	2076	1.23	5.02	3.05
Indonesia	1322	1923	3601	1.99	4.77	3.22
Iran, Islamic Rep.	5834	6059	10739	-0.64	4.20	2.15
Italy	18154	38361	40311	5.23	0.56	2.78
Japan	NA	18356	17763	1.63	-0.51	0.43
Kenya	2583	1827	1795	-2.12	0.05	-1.53
Korea, Rep.	7227	12714	20572	3.48	3.65	4.06
Malaysia	9629	12452	16576	1.84	1.66	2.01
Mexico	4040	4836	5893	1.87	0.97	1.67
Nigeria	1412	2962	5591	5.63	5.18	6.36
Pakistan	2138	2427	2634	0.71	0.53	0.25
Philippines	1732	2268	3531	2.32	2.90	2.58
Russian Federation	5098	6244	14201	2.98	5.96	5.02
Saudi Arabia	26822	41715	54126	3.20	-0.21	0.99
Spain	NA	25562	43005	3.40	3.22	3.34
Thailand	1997	2251	3217	2.37	2.94	2.81
Turkey	6389	9048	12337	1.93	2.08	2.27
United States	52808	92920	100062	6.61	0.86	2.04
Vietnam	573	973	1735	3.40	3.55	3.90
World	1442	2292	4035	3.32	4.27	2.81

Source: Author's estimation from World development indicators 2021, World Bank

Therefore, there is a clear indication that the countries are passing through different stages of transition during different time-periods. But all the countries considered in this study have agriculture as the mainstay element in their transformation. This discussion gives clear picture that development of agriculture has been the essential element of structural transformation and will continue to be crucial in transformation in the future. However, the patterns of change may vary from time to time in the future due to global drivers such as natural resources, technological progress and demographics in the countries.

Conclusion

Agriculture sector has the largest share in employment and value added for some developing countries. This paper analyses the spatial contribution of agriculture sector to income and employment in the World. The study reevaluates the changing role of agriculture in economic transformation in future among countries which have highest share among all countries in World. The top thirty countries which have highest share in agriculture sector are analysed and compared in terms of their changing share of agriculture sector in income, employment and per worker value added.

Ethiopia stands highest among the countries in making contribution of agriculture share in GDP among countries during 1991 but it declines in the subsequent periods. Some of the other countries with substantial share has been Bangladesh, India, Kenya and China during 1991. The success of agricultural sector in income and employment has been designated to green revolution in India. China has proceeded with the process of structural change very rapidly. Ethiopia has the highest share of agriculture in employment which is an agriculture dominant country. It is followed by Vietnam, Bangladesh, India and Thailand. These countries have experienced decline in share of agriculture in employment over the period indicating structural change in the economies and the labour shifting to industrial and services sector. Moreover, these countries are transitioning in their next stage of economic growth. The estimates indicate that the per worker value added has been highest in Argentina followed by United States and Germany during 1991. However, it declined in Argentina during 2005 but increases during 2019. This discussion gives clear picture that development of agriculture has been the essential element of structural transformation and will continue to be crucial in transformation in the future. However, the patterns of change may vary from time to time in the future due

to global drivers such as natural resources, technological progress and demographics in the countries.

The estimates of this study indicate that the changing role of agriculture in income and employment in the major countries followed by structural change has led to increasing the integration of the economies of the countries and their changing patterns of interlinkages between the agriculture sector and the other sectors in countries. Therefore, it gives an overview that these linkages have been dominated by linkages from consumption-to-production which comes directly from dominant agricultural sector in the initial stages of development. As and when the economy becomes integrated with income growth and changing structure, these strong linkages effects from agricultural sector comes from the production side of countries.

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