JOURNAL ON COMMUNICATIONS

ISSN:1000-436X

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Structural Transformation in Uzbekistan: Output and Employment Dynamics of the Agriculture Sector

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Abstract

The present study investigates the output and employment performance of the primary sector of Uzbekistan's economy since its independence. The primary sector, comprising of agriculture, forestry and fishing is vital in the Uzbekistan economy. We employed two criteria's to assess the performance of agricultural sector such as sectoral contribution in total value addition and sectoral contribution in total employment, respectively, from 1991 to 2020 sample period. The study employed quantitative research methods such as annual growth rate, average growth rate over time, and compound annual growth rate at decadal end points and for whole period of 30 years. The findings of the study can be summarized as follows: the primary sector of Uzbekistan experienced a significant decline in output share from 26.88% to 23.55%. Similarly, the employment share of the primary sector in total employment also declined from 40.67% to 24.77%, showing a decline of approximately 15.9% during the sample period. These changes reflect the promising structural transformation and diversification that have taken place in the country's economy over the past thirty years. Therefore, this research is particularly relevant in the context of the ongoing structural transformation of Uzbekistan's economy.

Keywords: *Uzbekistan Economy, Primary Sector, economic performance, Average growth rate, Compound growth rate*

1. Introduction

The primary sector plays a vital role in the economic growth of a country as, on the one hand, it creates demand for the finished products of other sectors. On the other hand, it supplies essential raw materials to the different sectors, thus creating backwards and forward linkages for the development of the secondary and tertiary sectors of the economy (Thirlwall, 1989). After independence from the former Union of Soviet Socialist Republics (USSR), Uzbekistan adopted the strategy of gradualism for transforming its economy, combining with state control of key industries, focusing on privatization of cooperative farms, social welfare, and export market development. This

approach helped avoid severe recession[1] in the country. The economic recession was effectively halted in 1995. By 2001, gross domestic product (GDP) in Uzbekistan was 3% above the 1989 level, making the country's growth performance the best of the former Soviet Republics (Olimov and Fayzullaev, 2011). The primary sector of Uzbekistan's economy comprises of agriculture, forestry, and fishing. Agriculture is vital part of Uzbekistan's economy, contributing about 25% to the GDP and employing around 26% of the labor force.[2] The government of Uzbekistan anticipates that agriculture could catalyze the nation's economic recovery, and the new initiatives will assist farmers in enhancing productivity and exporting their goods. Consequently, Uzbekistan amended its economic policy following the election of President Shavkat Mirziyoyev in 2017. The new government implemented comprehensive reforms, particularly standardizing the exchange rate, deregulating the foreign exchange market, commencing price and trade liberalization, and enacting significant tax reductions for corporations and individuals. Simultaneously, the nation revised its trade, agricultural and industrial policies (Khitakhunov, 2020).

The present study aims to understand the crucial role of the primary sector in the growth and development of the Uzbekistan economy. This research is particularly relevant in the context of the ongoing structural transformation in the primary sector of Uzbekistan's economy. To this end, we have set the following two objectives:

Objectives of the study

1. To examine the change in volume and composition of output in the primary sector of Uzbekistan economy.
2. To examine the change in volume and composition of employment in the primary sector of Uzbekistan economy.

The rest of the paper is organized as follows. The next section presents review of the related theoretical and empirical literature highlighting the dynamics of structural transformation across countries and over time. Section 3 deals with the data on the main variables under consideration and their description. Further, methodology used to enable statistical analysis of structural transformation is discussed in Section 4. In Section 5, we present a discussion on the main results

[1] https://www.adb.org/sites/default/files/linked-documents/cps-uzb-2012-2016-ea.pdf
[2] https://www.trade.gov/country-commercial-guides/uzbekistan-agricultural-sectors

findings. The final section presents conclusion and policy implications derived from the present analysis.

2. Literature review

The current study emphasizes the phenomenon of structural transformation. As the process of economic growth starts, it is observed that most countries are involved in the primary sector. Since the early 1800s, an ever-increasing number of nations have witnessed the working class gravitating towards manufacturing and services due to industrialization. Anderson (1987) provided a lucid explanation of why as a result of economic growth relative share of agriculture sector in total GDP declines. Developing economies are typically characterized as dual economies, comprising a traditional agricultural sector and an advanced capitalist sector, with productivity presumed to be lower in agriculture compared to the modern sector.

The basic model was proposed by Lewis (1954) and then expanded by Ranis and Fei in 1961. Lewis's model is based on surplus labor within the agricultural sector. Decreased agricultural productivity results in higher salaries within the modern sector, encouraging worker migration from agriculture to the modern sector and thus facilitating structural transformation and economic growth. For many decades, development economists have been analysing the patterns of structural transformation during national economic growth (Clark, 1940; Fisher, 1939; Kuznets, 1966; Syrquin & Chenery, 1989; Timmer, 2009; Timmer et al., 2015).

Other predecessors, such as Schultz (1964), emphasize the significance of food supply from the agricultural sector. According to Schultz, agriculture is crucial for economic progress as it ensures societal subsistence, an essential requirement for economic growth. This preliminary perspective on agriculture's role within economies aligns with Kuznets' (1966) empirical finding that the significance of the agricultural sector diminishes as economic growth progresses. Improvements in growth and productivity within the agriculture sector can facilitate overall economic growth by reallocating labor and capital to other sectors of the economy. Subsequently, the percentage of employment within the manufacturing sector has also diminished (Herrendorf, Rogerson & Valentinyi; 2014; Fort, Pierce & Schott, 2018; Anderson & Ponnusamy, 2023).

As per the study of Barrett, Christian and Shiferaw (2017) economies of Africa are showing early signs of agricultural productivity growth consistent with early stages of structural transformation. Anderson

and Ponnusamy (2023) in their study on structural transformation used a panel dataset over the period from 1995 to 2018 comprising over 130 nations. The results align with long-term de-agriculturalization during development processes. A greater proportion of agricultural GDP and employment coincides with an increased percentage of agriculture in national exports**.** Gollin, Lagakos, Ma, and Mandi (2025) in their study draws on new evidence to show that these agricultural productivity gaps have remained remarkably persistent over the past decades despite massive shifts in the share of workers in agriculture. The gaps have even widened in several major economies, including some that have seen a dramatic exodus of labour from the agriculture sector (e.g. China).

The past economic literature concludes that some less-developed economies remain predominantly agricultural; however, there is a trend towards a decreasing share of agriculture in overall GDP (Acemoglu, 2007). Olimov and Fayzullaev (2011) used data from the State Committee of Uzbekistan on Statistics, and found that employment growth has consistently lagged behind real GDP growth. It peaked in 2004 (3.4%) and remained relatively stable, dropping considerably to 2.7% in 2009. The agricultural sector employs the most significant portion of the workforce, with approximately 50% of the rural population engaged in this field, characterized by low productivity and wages. Through a study, Tadjibaeva (2013) concludes that Uzbekistan's agricultural contribution to GDP places the country among those with a transitional economy moving from agriculture to urbanization. Despite the trend indicating a decrease in agriculture's contribution to gross domestic product, the employment rate in the agricultural sector has diminished at a relatively slow pace.

Among the studies on structural change Malikov, Qineti, and Pulatov (2016) found that structural change has occurred in the agriculture sector of Uzbekistan's economy since its independence in 1991, as is evident from the share of agriculture in total GDP and its employment share in overall employment figures**.** While International Labour Organization (2020) in their report highlighted that there has been notably limited labor mobility across economic sectors and geographic regions. It is essential to actively promote structural change that reallocates labor from low-productivity and obsolete sectors to those with significant potential for employment and output growth.

Eshov, Amirov and Askarova (2021) came to conclusion that modernization of the agro-industrial complex plays a vital role in Uzbekistan's agrarian policy. The inability to affect import volumes, stemming from the need for more competitiveness in a substantial portion of agricultural production, heightens the necessity for modernization. The sector's modernization, a key focus of Uzbekistan's

agrarian policy, will facilitate the shift to an innovative economy and enhance its competitiveness. Elov (2021) concluded that structural change has occurred in the agriculture sector of Uzbekistan's economy since its independence in 1991, as is evident from a share of agriculture in total GDP and its employment share in overall employment figures.

In their annual report on transition economies**,** Organization of Economic Cooperation and Development (2023) found that even though it started in 1991, Uzbekistan's economic structural transformation is still in its infancy. This is mostly due to the limited success in reallocating capital and human resources from historically important sectors that were marked by low productivity and job creation to newer, more productive uses. Agriculture's value added as a percentage of GDP dropped from 27% in 2010 to 25% in 2021, but it is still the highest in Central Asia, far exceeding the OECD average of 1% and Kazakhstan's value added of 5%.

Zakhidov and Roziyev (2024) found substantial economic and structural transformations have transpired in the agricultural sector of the Republic of Uzbekistan over the past two decades. Government policies, market dynamics, and technological advancements propelled these changes. Rikhsievni and Ugli (2024) finds Uzbekistan's employment structure analysis reveals a diverse and complex labor market. The data show that 42% of the workforce is engaged in formal employment, 39% in informal jobs, and 19% in labor migration, highlighting a substantial dependence on informal work and external labor markets.

3. Data sources

This study is primarily based on secondary sources obtained from World Development Indicators (WDI) provided by World Bank, International Labor Organization and State Committee on Statistics of Uzbekistan. Table 1 below provides a description of the main variables used in the present study.

Table 1: Variable description

Variable	Description	Source
Agriculture Value Added (Agriculture, Forestry, Fishing)	Constant Local Currency units (2010-2011)	World Bank
Agriculture, Forestry, Fishing value Added (% of GDP)	Constant Local Currency units (2010-2011)	World Bank

Employment in Agriculture	Modelled ILO Estimate	ILO

Source: Authors' own calculation using data from WDI Databank.

4. Methodology

This research employs a quantitative methodology to analyze the growth trends in order to measure and compare the output and employment performance in primary sector of Uzbekistan economy during the period from 1991 to 2020. In order to capture different dimensions of growth, three measures are utilized: the simple annual growth rate, the average annual growth rate, and the compound annual growth rate (CAGR). This approach will provide insights on overall trend, year to year volatility of the performance of agriculture sector in the national economy over the sample period.

a. Growth rate calculation

Simple annual growth rate measures the relative change in a given variable from one period to the next. The year-on-year growth rates for a series with *t* annual observations, say $y_1, y_2, \ldots\ldots y_t$ is defined as:

$$g_t = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

Where, g_t is the annual growth rate in year *t*, Y_t refers to the value of the variable in the current year, Y_{t-1} is the value of the variable in the previous year. This metric will help to identify annual volatility and cyclical patterns.

Average annual growth rate gives the overall trend over the entire sample period. The average annual growth rate can be calculated with the help of a following formula:

$$\text{Average annual growth rate} = \frac{1}{t}\{lnY_t - Y_0\}$$

Where Y_t is variable in final time period; Y_0 is variable in initial time period. *t* refers to number of years during the time period under investigation. While intuitive, the average annual growth rate does not account for the compounding effect of growth over time.

Compound annual growth rate (CAGR) has been calculated with the help of exponential function as follows:

$$Y_t = ab^T$$

Where Y_t is the value of the variable, a is a constant, b is the base of the exponential function, T is the time. The compound growth rate is given by:

$$\text{CAGR} = (b\text{-}1) \times 100.$$

5. Results and discussion

Variations in the volume of primary sector output (absolute growth)

We have calculated the average annual and compound growth rates of primary sector output to thoroughly assess the dynamics of primary sector. Additionally, the growth rates over the span of 30 and 10 years each have been computed for a thorough examination. The annual growth of primary sector output is presented in Table 2.

Table 2: Primary sector output, annual growth rate

Year	Annual growth rate	Year	Annual growth rate	Year	Annual growth rate
1991	2.22	2001	4.14	2011	6.08
1992	-6.47	2002	6	2012	6.96
1993	1.5	2003	6.8	2013	6.44
1994	-3.4	2004	8.33	2014	5.98
1995	2	2005	5.85	2015	6.1
1996	-5.7	2006	7.11	2016	6.17
1997	5.8	2007	6.46	2017	1.15
1998	4.1	2008	4.72	2018	0.25
1999	5.5	2009	5.82	2019	3.09
2000	3.16	2010	5.66	2020	2.96

Source: Authors' own calculation using data from WDI Databank.

The data analysis reveals that, except for the first six years of sample period, the primary sector annual growth rate is uneven and asymmetrical but less volatile. In 1992, the annual rate of growth was as low as -6.47 and as high as 2.22 in 1991. Because of the transitional slump, the primary sector's output exhibited erratic behavior throughout the initial 6 years (1991–1996). Nevertheless, owing to several reforms initiated there from 1994 onwards, Uzbekistan continued to report positive average annual growth rates in primary sector output from 1997 onwards, as is evident in Table 2.

The growth of agricultural output reached 6.46% in 2007 despite declining soil quality thanks to favorable global cotton prices, increasing grain harvests, and increased productivity from the privatization of agricultural cooperatives.[3] Agriculture grew only by 4.72% in 2008. Drought reduced cereal and cotton output, as did poor soil quality and a smaller sown area.[4] Agricultural output increased by 5.82% in 2009. Although the cotton harvest was hampered by adverse weather conditions, increased production of cereal crops and vegetable production contributed for growth.[5]

Favorable weather and higher vegetable crop cultivation led to agricultural output growth of 5.66% in 2010.[6] In 2011, the agricultural sector grew by 6.08%, with fruit and vegetable production and livestock breeding driving the expansion[7]. Table 2 indicates that the agricultural sector in 2013 grew by 6.44% as against 6.96% in 2012, supported by favorable weather and record harvests of the key cereal and vegetable crops[8].

Because of the unfavorable weather agricultural output grew by just 5.98% in 2014[9]. It expanded by 6.17% versus 6.10% a year earlier, reflecting higher production of fruit and vegetables. In April 2016, the Russian Federation and Uzbekistan agreed to expand bilateral trade in agricultural produce, prompting the government to announce a major horticulture development program[10]. Table 2 indicates that during 2017 expansion in agriculture slowed to 1.15% from 6.17% in 2016 as prices for imported inputs nearly doubled in Som terms, raising production costs and prices for consumers[11]. Expansion.in agriculture dropped from 1.15% in 2017 to 0.25% in 2018 as poor rainfall cut cereal harvests by 12.5% and crop production more broadly by 4.7%[12] . Thereafter

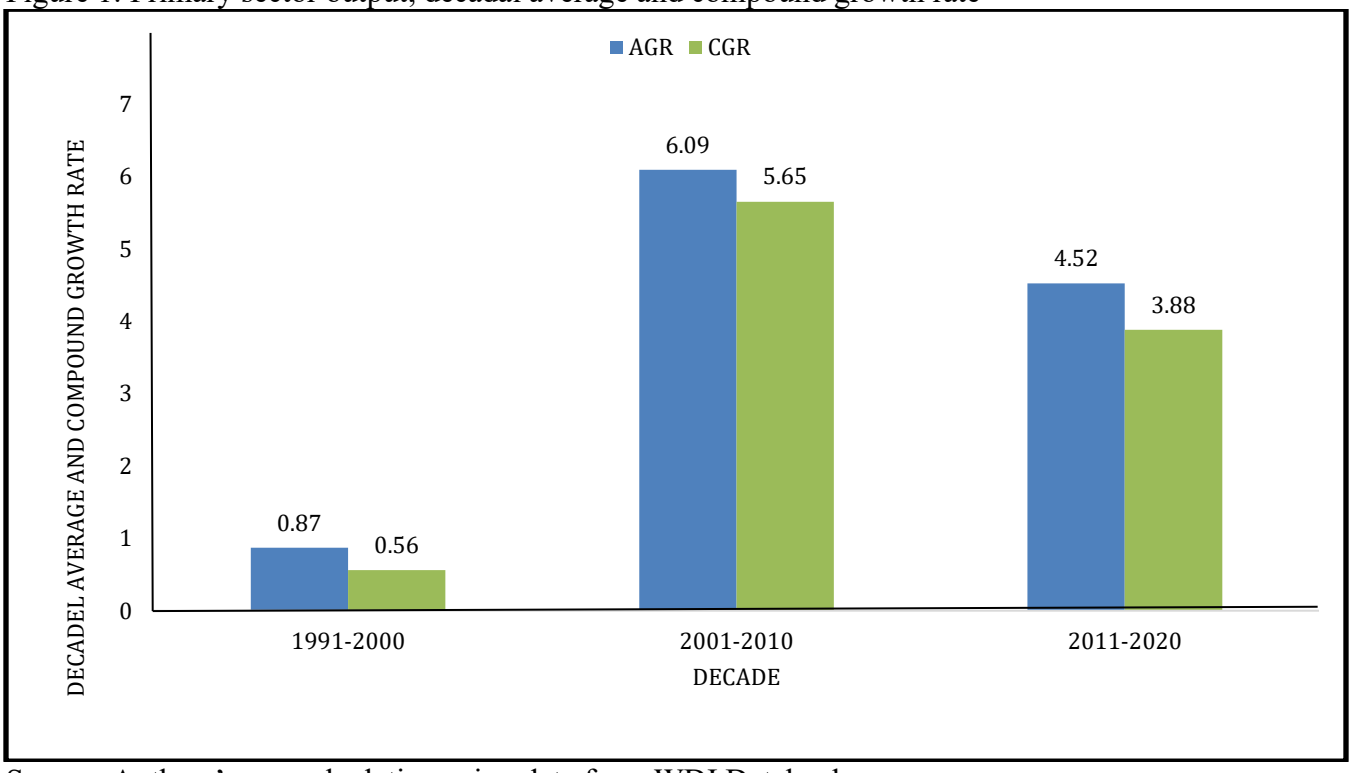
[3] https://www.adb.org/sites/default/files/publication/27707/ado2008.pdf
[4] https://www.adb.org/sites/default/files/publication/27704/ado2009.pdf
5 https://www.adb.org/sites/default/files/publication/27701/uzb.pdf
6 https://www.adb.org/sites/default/files/publication/28300/ado2011-uzb.pdf
7 https://www.adb.org/sites/default/files/publication/29704/ado2012.pdf

[8] https://www.adb.org/sites/default/files/publication/31241/ado2014-uzbekistan.pdf
[9] https://www.adb.org/sites/default/files/publication/154508/ado-2015.pdf
[10] https://www.adb.org/sites/default/files/publication/197141/ado2016-update.pdf
[11] https://greatermekong.org/wgasite/sites/default/files/documents/ado2018.pdf
[12] https://www.adb.org/sites/default/files/publication/492711/ado2019.pdf

agriculture sector expanded from 0.25% in 2018 to 3.09% 2019 as abundant water supply and price incentives for cotton and wheat raised crop harvests by 3.7% and livestock production by 1.7%[13].

Furthermore, the analysis shows that primary sector of Uzbekistan economy witnessed an average annual growth rate of 3.83% and a compound growth rate of 3.76% for the sample period under investigation (1991-2020). Figure 1 plots the decadal average and compound growth rate of primary sector output. The analysis shows that there has been a rise in decadal average growth rate of 6.09% (2001-2010) from 0.87% (1991-2000) and again to 4.52 % (2011-2020). This notable increase in the primary sector's output contribution can be ascribed to Uzbekistan's economic stabilization initiatives implemented after the country's breakup from the USSR in 1991. Moreover, Figure 1 shows a decadal compound growth rate followed a similar pattern over the first two decades. It increased from 0.56% in 1991-2000 to 5.65% in 2001-2010. It fell again to 3.88% between 2011- 2020. The difference between average and compound decadal growth rates for the periods 1991–2000, 2001–2010, and 2011–2020 are 0.31, 0.44, and 0.64, respectively; nonetheless, they vary, suggesting that the initial decadal growth rate was relatively lower.

Figure 1: Primary sector output, decadal average and compound growth rate



Source: Authors' own calculation using data from WDI Databank.

[13] https://www.adb.org/sites/default/files/publication/575626/ado2020.pdf

Composition of primary sector output (relative growth)

So far as an annual percentage share of the output of primary sector output is concerned, an erratic and irregular pattern has been found with numerous ups and downs, as shown in Table 3. The most significant decline in output occurred in 1996, approximately 2.25%, during which the primary sector's share decreased from 30.85% in 1995 to 28.60% in 1996. The highest fall in output was reported in 1996 at around 2.25%, wherein the share of the primary sector declined from 30.85% in 1995 to 28.60% in 1996. The contribution of the primary sector to the gross value added of the Uzbekistan economy declined from 26.88% in 1991 to 23.55% in 2011-2020. Thus, there has been a decrease of around 3.33% over a period of 30 years.

Table 3: Primary sector output, annual percentage share of GDP

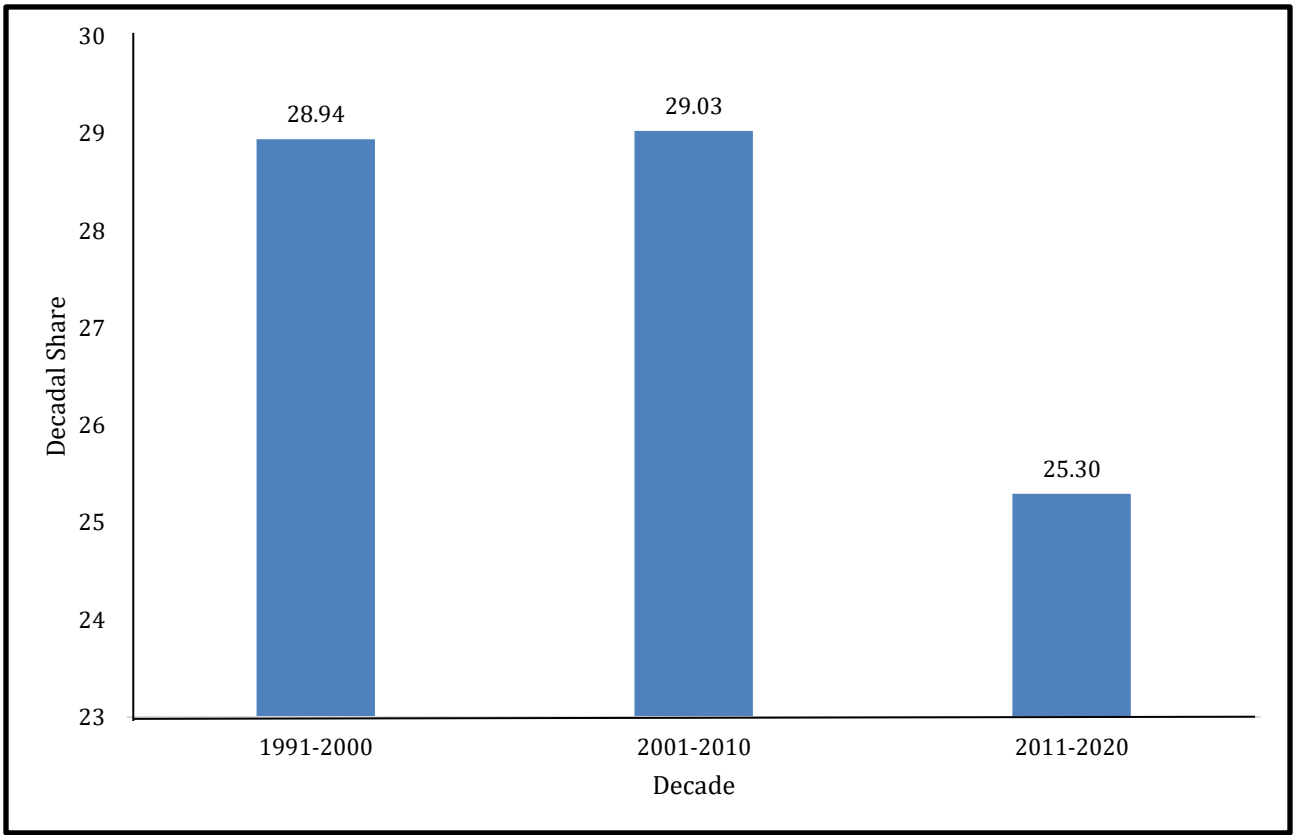
Year	Growth rate	Year	Growth rate	Year	Growth rate
1991	26.88	2001	28.84	2011	26.56
1992	28.31	2002	29.4	2012	26.53
1993	29.41	2003	30.13	2013	26.31
1994	29.97	2004	30.38	2014	26.09
1995	30.84	2005	30.07	2015	25.82
1996	28.6	2006	29.97	2016	25.88
1997	28.76	2007	29.14	2017	25.08
1998	28.71	2008	27.99	2018	23.86
1999	29.04	2009	27.41	2019	23.27
2000	28.85	2010	26.92	2020	23.55

Source: Authors' own calculation using data from WDI Databank.

To get a deeper insight into the output performance of the primary sector, an analysis is made at decadal end points. Accordingly, Figure 2 presents a decadal share of primary sector output as a percentage of GDP. The GDP share of the primary sector stood at 28.85% at the end of the first decade (2000) and declined steadily to 26.92% towards the end of the second decade (2010). It further reduced to 23.55% towards the end of the final decade (2020), meaning output declined by about 1.93% during 2001-2010 and 3.35% during 2010-2020. It implies that during the last decade, the output share of the primary sector has declined steeply. So far as average decadal shares are concerned, the output share was 28.94% during the first decade. It substantially increased to 29.03%

during the second decade, but during the third decade, it was reduced to 25.30% (Figure 2). While analyzing the output data of the primary sector of the Uzbekistan economy, it becomes amply clear that there has been a steady decline in the output of the respective sector, indicating that structural transformation has been taking place in the Uzbekistan economy. In order to support the findings of the above two sections, we also need to find out the employment share of the primary sector in the total employment during the period of our investigation. Thus Table 4 presents annual growth rate of employment in the primary sector over the sample period of 1991 to 2020.

Figure 2: Decadal share of primary sector output as a percentage of GDP



Source: Authors' own calculation using data from WDI Databank.

Variations in volume of primary sector employment (absolute growth)

Table 4 reveals that for the most part, during the study period, employment growth rates in the primary sector have been negative, except a few years like 1991-1995,1997, 2000, 2011, 2013-2016. The decline in the employment rate is due to the structural transition of employment from low productivity sectors, such as the primary sector, to high productivity sectors like the secondary

and tertiary sectors. This phenomenon, identified by Arthur Lewis (1954), is recognized as the initial phase of growth and development, commonly referred to as structural transformation. For the study period, the average annual growth rate of employment in the primary sector has been -0.50.

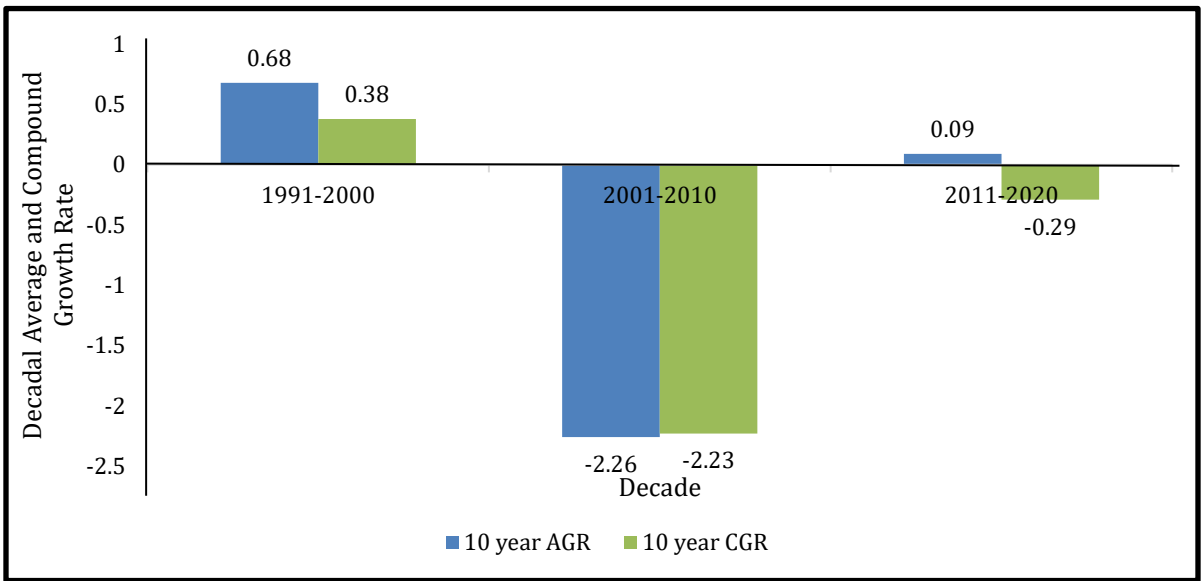
Table 4: Employment in primary sector, annual growth rate

Year	Growth rate	Year	Growth rate	Year	Growth rate
1991	2.77	2001	-0.36	2011	3.56
1992	2.97	2002	-0.54	2012	-0.98
1993	1.75	2003	-0.97	2013	2.99
1994	1.77	2004	-2.14	2014	2.16
1995	1.58	2005	-2.15	2015	1.17
1996	-0.5	2006	-2.48	2016	0.66
1997	1.25	2007	-3.15	2017	-0.25
1998	-3.22	2008	-3.98	2018	-0.56
1999	-2.01	2009	-3.98	2019	-2.1
2000	0.42	2010	-2.84	2020	-5.75

Source: Authors' own calculation using data from WDI Databank.

To achieve a robust basis and conclusion, we have computed the decadal average and compound growth rates, as plotted in Figure 3. The data analysis indicates that employment in Uzbekistan's primary sector exhibited an average annual growth rate of -0.50% and a compound annual growth rate of -0.51% during the study period (1991-2020). During the first decade (1991-2000), both the decadal average and compound growth rates are favorable because of the post-soviet transition and economic stability (reforms in the agriculture sector). The second decade (2001-2010) witnessed negative decadal average and compound growth rates because of urban migration, mechanization, and economic diversification. In the third decade, primary sector employment registered a positive decadal average growth rate and a slightly lower negative compound growth rate on account of agricultural reforms, rural development, diversification and support.

Figure 3: Primary sector employment, decadal average and compound growth rate



Source: Authors own calculation using data from WDI Databank.

Variations in composition of primary sector employment (relative growth)

Yearly, there is an irregular pattern in the primary sector employment with numerous ups and downs, as shown in Table 5. Primary sector employment showed a declining trend during our reference period. The highest decline of 1.46% in primary sector employment share is reported for the year 2007, wherein the share declined from 32.37% in 2006 to 30.91% in 2007. Two reasons for this decline are labor movement to more advanced sectors of the economy and labor migration to Russia

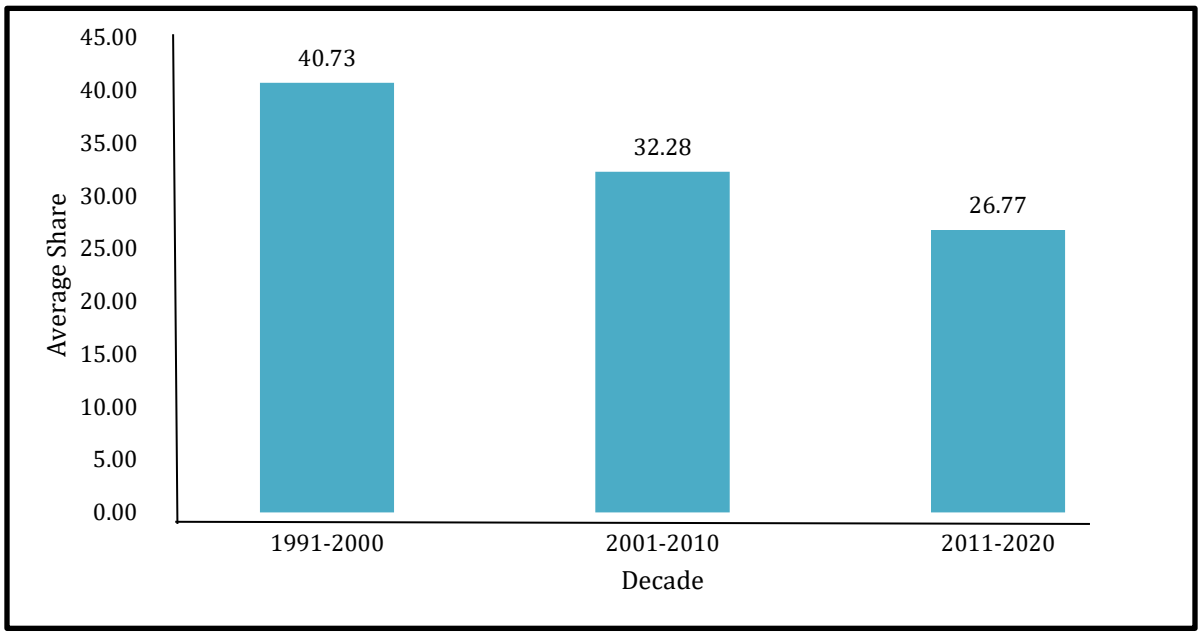
Table 5: Primary sector, annual employment share as a percentage of total employment

Year	Growth rate	Year	Growth rate	Year	Growth rate
1991	40.67	2001	38.17	2011	27.09
1992	40.45	2002	37.21	2012	26.6
1993	40.79	2003	36.17	2013	27.17
1994	41.29	2004	34.96	2014	27.53
1995	41.24	2005	33.69	2015	27.58
1996	41.55	2006	32.37	2016	27.42
1997	41.58	2007	30.91	2017	27.15
1998	40.86	2008	29.47	2018	26.65
1999	39.8	2009	28.09	2019	25.71
2000	39.08	2010	26.81	2020	24.77

Source: Authors' own calculation using data from WDI Databank.

The primary sector's share of total employment in Uzbekistan's economy fell from 40.67% in 1991 to 24.77% in 2020. Thus, over 30 years, there has been a decline of approximately 15.90%. A thorough analysis has been conducted to assess the proportion of primary sector employment relative to total employment at decadal end points. Figure 4 plots decadal share of primary sector employment in total employment. The average share was 40.73% in the first decade, 32.28% in the second, and 26.77% in the final decade of the reference period (1991-2020). The employment share was 39.08% at the end of 2000. It decreased to 26.81% by the end of the second decade (2010) and ultimately to 24.77% by the end of the final decade (2020) of the reference period. Employment share declined by approximately 14.31% from 2001 to 2010 and by only 2.04% from 2011 to 2020.

Figure 4: Decadal share of primary sector employment in total employment



Source: Authors' own calculation using data from WDI Databank.

6. Conclusion

The present research paper aimed to investigate the output and employment performance of the primary sector in the context of Uzbekistan's economy since its independence. The study employed two criteria's for measuring performance of agriculture namely (1) sectoral contribution in total output, (2) sectoral contribution in total employment. The statistical analysis performed in the study

indicated that, in absolute terms, the output of the primary sector of the Uzbekistan economy has grown at an average annual growth rate of 3.83% and at a compound annual growth rate of 3.76%. Employment in the primary sector contracted at an average annual growth rate of -0.50 and a compound annual growth rate of -0.51 during the study period of 1991 to 2020, indicating a disparity between primary sector output and employment statistics. In terms of relative share, on the one hand, the output of the primary sector declined from 26.88% in 1991 to 23.55% in 2020. On the other hand, the relative share of primary sector employment also declined from 40.67% in 1991 to 24.77% in 2020. The reduction in the primary sector's contribution to employment can be ascribed to ongoing economic diversification and structural transformation in the Uzbekistan economy over time. The analysis indicated that despite a labor outflow from the primary sector, the growth rate of this sector has remained disappointing, thus calling for policy intervention. In order to accelerate the pace of diversification, dynamic tradeable sectors should be developed to increase international competitiveness and create the overall resilient macroeconomic environment of the country.

Declarations

Ethical approval and consent to participate: not applicable
Consent to publication: not applicable
Funding: not applicable
Data availability: the datasets generated and/or analysed during the current study are available in the World Bank's World Development Indicators repository.
Conflict of interest: none
Clinical trial number: not applicable.

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