

The agricultural sector's contribution to economic growth in central Java Province

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Abstract

The agricultural sector plays an important role in maintaining regional economic stability, particularly during periods of crisis. The COVID-19 pandemic affected sectoral growth and changed the performance of several agricultural subsectors. This study aims to (i) analyze the potential of the agricultural sector and subsectors; (ii) analyze changes in the *share* of the agricultural sector and subsectors; (iii) determine the role of the agricultural sector in economic growth; and (iv) analyze the contributions and trends in the agricultural sector and subsectors before and after the COVID-19 pandemic in Central Java Province. This study employs a descriptive quantitative approach using secondary data obtained from the national Gross Domestic Product (GDP) and the Gross Regional Domestic Product (GRDP) of Central Java Province at constant 2010 prices by economic sector, covering the period 2014–2023. The analytical methods used include growth trend analysis, Location Quotient (LQ), Dynamic Location Quotient (DLQ), Shift-Share Analysis, and Klassen's Typology. The results indicate that the growth trends of the agricultural sector and its subsectors before and after the pandemic exhibit negative regression coefficients, reflecting a decline in growth rates during the crisis. Nevertheless, the agricultural sector continued to exhibit characteristics of a base sector, both before and after the pandemic. LQ and DLQ analyses indicate that the food crops, horticulture, and livestock subsectors experienced an upgrade in status to become base subsectors and were classified as leading subsectors after the pandemic. Conversely, the plantation, forestry, and fisheries subsectors were classified as non-base and lagging. The overall growth structure of the agricultural sector was classified as "advanced but under pressure," with the livestock subsector falling into the "advanced" category before the pandemic, and the food crops and horticulture subsectors falling into the "advanced" category after the pandemic. These findings confirm that the food crops and horticulture subsector is consistent, highly competitive, and reliable in maintaining regional economic stability during times of crisis and recovery.

Keywords: Palm Sugar; Agroindustry; Income; Business Sustainability; Institutional

1. Introduction

Economic growth is the process of continuous change in a country's economic conditions toward a better state over a specific period, characterized by an increase in production capacity and national income. One sector that plays a crucial role in Indonesia's economic growth is agriculture, given that Indonesia is an agrarian country with abundant natural resources, fertile soil, and adequate water supplies. This role is evident in the large number of people and workers who depend on the agricultural sector, as well as in its contribution to the national economy. In macroeconomics, the agricultural sector plays a role in providing food, creating jobs, especially in rural areas, serving as a source of household income, contributing to GDP and regional GDP, ensuring social and economic stability, and supplying raw materials to the industrial sector.

Based on data from the Central Statistics Agency (BPS) for 2018–2021, the agricultural sector ranked second after the manufacturing sector, with an average contribution of 13.22% to Indonesia's GDP. In 2021, the highest contributions from the agricultural sector on the island of Java came from East Java, Central Java, and West Java, which were the main

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contributors to rice production and other commodities supporting national food security. In the same year, Central Java received the Abdi Tani award from the Ministry of Agriculture for having the highest value of agricultural commodity exports as one of the largest food baskets on the island of Java, Central Java's agricultural sector ranks third in its contribution to the regional economy, following the manufacturing sector and wholesale and retail trade including automobile and motorcycle repairs. However, the stability of the regional economy faced challenges when the COVID-19 pandemic began in Solo on March 13, 2020, causing a slowdown across nearly all sectors. Of the 17 business categories, 11 experienced contraction, while only six posted positive growth. The deepest contractions were in the manufacturing sector at -1.28%, transportation and warehousing at -1.16%, and wholesale and retail trade, along with automobile and motorcycle repairs, at -0.55%. Conversely, a deeper contraction was mitigated by the information and communication sector, which contributed 0.80% agriculture, forestry, and fisheries, at 0.31%; and health and social services, at 0.07%. This indicates that the agricultural sector was relatively more resilient than other sectors during the pandemic.

Despite facing various challenges, the agricultural sector and its subsectors in Central Java have demonstrated considerable resilience and adaptability, as evidenced by their consistent contribution to the regional economy, the level of community participation in agribusiness activities, and the high demand for food products during the period of social restrictions. These conditions indicate that the agricultural sector plays a strategic role both under normal circumstances and during crises by serving as an economic buffer, maintaining food stability, and providing employment opportunities when other sectors are in decline. Several previous studies have examined the contribution of the agricultural sector and the impact of the COVID-19 pandemic, including Widianingsih and Irham (2015) on the agricultural sector's contribution to economic growth in West Java, on the health, economic, and social impacts of COVID-19, on the pandemic's impact on economic growth on the island of Java, on the classification of regencies and cities in Central Java based on economic indicators resulting from the pandemic. However, research specifically analyzing the contribution of the agricultural sector to economic growth in Central Java Province during the pandemic remains limited. Therefore, this study is important for demonstrating the contribution of the agricultural sector to the regional economic structure and for formulating strategies to strengthen, anticipate, and mitigate problems in a sustainable manner. The analysis was conducted using growth and contribution trend approaches, the Location Quotient (LQ), the Dynamic Location Quotient (DLQ), Shift-Share Analysis (SSA), and Klassen's typology.

2. Material and methods

This study employs a secondary data analysis method with a descriptive-analytical approach. According to Sugiyono (2017), secondary data refers to data obtained indirectly from other parties through documents or intermediary sources. The data were obtained from the Central Java Central Statistics Agency (BPS) and publications issued by other government agencies for the 2014–2023 period. The study was conducted in Central Java Province and covers all regencies and cities engaged in agricultural activities, including food crops, horticulture, plantations, livestock, forestry, and fisheries subsectors. The analysis is divided into two periods, namely before the COVID-19 pandemic (2014–2019) and during and after the pandemic (2020–2023). The agricultural sector and its subsectors constitute the subjects of the study. At the same time, the research variables include the sector's contribution to regional GRDP, Location Quotient (LQ) to identify base sectors, Dynamic Location Quotient (DLQ) to examine changes in comparative advantage, Shift-Share Analysis to measure the effects of national growth and competitive advantage, and Klassen Typology to classify sectors as advanced, developing, lagging, or depressed.

This research was conducted from June to August 2024 in Central Java Province, which was purposively selected because the agricultural sector has significant potential to contribute to the growth of the province's GRDP. The study used secondary data obtained from the Central Java Provincial Central Statistics Agency (BPS), regency and municipal BPS offices, the Regional Development Planning Agency (BAPPEDA), and other relevant government agencies. The data cover two periods, namely 2014–2019 as the pre-COVID-19 period and 2020–2023 as the period during and after the pandemic. The analysis examines growth trends and contribution trends of the agricultural sector and its subsectors, uses Location Quotient (LQ) to identify comparative advantages, combines LQ and Dynamic Location Quotient (DLQ) to assess future sectoral potential, and applies Shift-Share Analysis and Klassen Typology to analyze shifts, changes in sectoral shares, and the classification of agricultural sectors and subsectors.

3. Results and discussion

3.1. The Potential of the Agricultural Sector and Subsectors Before and After the COVID-19 Pandemic in Central Java Province

The economic base theory states that regional economic growth is determined by demand for goods and services from outside the region. Based on this theory, the regional economy is divided into base and non-base sectors. A base sector can produce goods and services for local consumption and export them outside the region, whereas a non-base sector serves only the local market. The status of an economic sector can be identified using the Location Quotient (LQ) method, which compares the relative share of sector *i* in the region's total income to its share of the national income for the same sector. In this study, the LQ analysis compares the Gross Regional Domestic Product (GRDP) of the agricultural sector in Central Java Province with that of the national agricultural sector. An LQ value greater than 1 indicates that the sector is a base sector, while an LQ value of less than 1 indicates that it is a non-base sector. The results of the LQ analysis for the agricultural sector and its subsectors in Central Java Province are presented in Table 1.

Table 1 Analysis of the Location Quotient (LQ) for Sectors and Subsectors in Central Java Province

Agricultural Sectors and Subsectors in Central Java	Location Quotient (LQ)										Average
	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	
Agriculture	1.00	1.01	1.00	1.01	1.00	1.02	1.04	1.06	1.08	1.06	1.03
Food Crops	1.50	1.44	1.45	1.42	1.45	1.49	1.52	1.58	1.60	1.52	1.50
Horticultural Crops	2.37	2.44	2.39	2.39	2.25	2.30	2.36	2.41	2.45	2.46	2.38
Plantation Crops	0.34	0.33	0.33	0.34	0.35	0.35	0.35	0.36	0.37	0.36	0.35
Livestock	1.63	1.63	1.68	1.61	1.66	1.70	1.68	1.65	1.64	1.63	1.65
Forestry	0.70	0.70	0.72	0.72	0.70	0.72	0.73	0.71	0.73	0.77	0.72
Fisheries	0.39	0.39	0.38	0.41	0.39	0.40	0.41	0.42	0.42	0.44	0.40

Source: Data processing results, 2024.

Table 3.1 above shows the trend in LQ values from 2014 to 2023. The LQ value for the agricultural sector has consistently declined each year, with an average LQ value of 1.03, which falls within the baseline criteria. The agricultural sector's LQ value is driven by the LQ values of its subsectors, which fluctuate but generally trend downward except for the food subsector, which saw an increase in its LQ value to 1.50 in 2023. Three agricultural subsectors fall within the baseline criteria food crops, horticultural crops, and livestock. The plantation, forestry, and fisheries subsectors are classified as non-base sectors (LQ value < 1). For a more detailed explanation of the LQ values for the agricultural sector and its subsectors, as well as a comparison of LQ values before and after the COVID-19 pandemic, see Table 2.

Table 2 shows that the agricultural sector was a core sector both before and during the COVID-19 pandemic in Central Java Province. The analysis results indicate that the LQ value for the agricultural sector before the COVID-19 pandemic was 1.04, which decreased by 0.02 to 1.01 after the pandemic. Although the LQ value decreased during the COVID-19 pandemic, the agricultural sector's contribution to Central Java Province's total GRDP remains higher than its contribution to the national GDP. Furthermore, the agricultural sector is capable of meeting the needs of Central Java Province while also being able to supply other regions or export to them.

The agricultural sector remains the backbone of the economy despite a decline in its LQ value, as farmers have not completely halted their farming activities; consequently, the production of agricultural commodity production has continued, although productivity has generally declined. The decline in the agricultural sector's LQ value is due to farmers reducing their farming activities following the Central Java Provincial Government's implementation of the PPKM (Enforcement of Community Activity Restrictions) policy, which significantly disrupted farming processes and outcomes from upstream to downstream as well as the marketing of agricultural products. In addition, agricultural inputs such as seeds, fertilizers, and pesticides have become difficult to obtain, leading to a decline in the productivity of agricultural commodities. Similarly to China, disruptions in international trade have caused farmers to face shortages

of agricultural inputs such as seeds, fertilizers, and pesticides. The following are the results of the LQ analysis for each agricultural subsector in Central Java Province.

Table 2 Results of the *Location Quotient* (LQ) Analysis for Agricultural Sectors and Subsectors Before and After the COVID-19 Pandemic in Central Java Province

Agricultural Sectors and Subsectors in Central Java	Analysis <i>Location Quotient</i> (Lq)		Analysis Changes
	Before Covid-19	After Covid-19	
Agriculture	1.04	1.01	-0.04
Food Crops	1.53	1.45	-0.07
Horticultural Crops	2.37	2.40	0.02
Plantation Crops	0.36	0.34	-0.02
Livestock	1.66	1.64	-0.02
Forestry	0.73	0.71	-0.02
Fisheries	0.41	0.39	-0.02

Source: Secondary data processed 2024.

3.1.1. Food Crops Subsector

The analysis shows that the food crops subsector falls within the base sector, with an average LQ value of 1.50 from 2014 to 2023. Meanwhile, the LQ value before the COVID-19 pandemic was 1.53, and after the pandemic it was 1.45 a decrease of 0.07. Thus, the COVID-19 pandemic negatively affected the food crops subsector. Nevertheless, the food subsector remains foundational, supported by the potential of key commodities such as rice, corn, and tubers in Central Java Province.

3.1.2. Horticultural Crops Subsector.

The analysis results show that the horticultural crops subsector is classified as a base sector, with an average LQ value of 2.38 from 2014 to 2023. Meanwhile, the LQ value before the COVID-19 pandemic was 2.37, and after the pandemic it was 2.40 an increase of 0.22. Thus, the COVID-19 pandemic had a positive impact on the horticultural crops subsector. The LQ value for the horticultural crops subsector is the highest among the subsectors. This is due, in part, to the availability of land suitable for horticultural crops and the variety of horticultural crops cultivated such as vegetables, flowers, etc. in Central Java Province. This subsector remains a key regional sector, particularly in mountainous and lowland areas such as Magelang, Temanggung, and Wonosobo.

3.1.3. Plantation Crops Subsector.

The analysis results indicate that the plantation crops subsector is a non-base sector, with an average LQ of 0.35 from 2014 to 2023. Meanwhile, the LQ value before the COVID-19 pandemic was 0.36, and after the pandemic it was 0.34 a decrease of 0.02. Thus, the COVID-19 pandemic negatively affected the plantation crops subsector. The relatively low LQ value for the plantation crops subsector is due to its smaller role compared to that of the same sector at the national level. Additionally, the LQ value for the plantation crops subsector fluctuated during the study period. This subsector is not a leading sector in Central Java, unlike in regions such as Sumatra or Kalimantan.

3.1.4. Livestock Subsector.

The Livestock Subsector is an agricultural subsector that meets the baseline criteria, with an average LQ of 1.65. Meanwhile, the value before the COVID-19 pandemic was 1.66, and after the pandemic it was 1.64 a decrease of 0.02. Thus, the COVID-19 pandemic negatively affected the livestock subsector in Central Java Province. The fact that the LQ value consistently remains above 1 indicates that this subsector is strong, particularly in beef cattle, broiler chicken, and egg production. The stability of this sector reflects resilience and high local demand, both for consumption and for the food industry.

3.1.5. Forestry Subsector.

The analysis results indicate that the forestry subsector is a non-base sector, with an average LQ of 0.72 from 2014 to 2023. Meanwhile, the LQ value before the COVID-19 pandemic was 0.73, and after the pandemic it was 0.71 a decrease of 0.02 indicating that the COVID-19 pandemic hurt the forestry subsector.

3.1.6. Fisheries Subsector.

The analysis results indicate that the fisheries subsector is in the non-core sector, with an average LQ of 0.44 from 2014 to 2023. Meanwhile, the LQ value before the COVID-19 pandemic was 0.41, and after the pandemic it was 0.39 a decrease of 0.02. Thus, the COVID-19 pandemic negatively affected the fisheries subsector.

The decline in the LQ value during the COVID-19 pandemic was observed in the agricultural sector and nearly all of its subsectors compared with the period before the pandemic. This was due to disruptions in the economy of Indonesia, including Central Java Province, which caused the agricultural sector's contribution to Central Java's economy to decline as well.

The LQ value for the horticulture subsector increased during the COVID-19 pandemic compared to the pre-pandemic period. This was due not only to the continued growth of the horticulture subsector's GRDP at the Central Java provincial level but also to an increase in the horticulture subsector's GDP at the national level.

Furthermore, a DLQ analysis was conducted to complement the LQ analysis, as the LQ analysis has the limitation that its results are static that is, they reflect conditions only in a specific year. Therefore, the DLQ analysis was used to predict the basis and non-basis components of a sector and its subsectors in the future. The results of the DLQ analysis for the agricultural sector and subsectors, both before and during the COVID-19 pandemic in Central Java Province, are presented in Table 3

Table 3 Results of the *Dynamic Location Quotient* (DLQ) Analysis for the Agricultural Sector and Subsectors Before and After the COVID-19 Pandemic in Central Java Province

Agricultural Sectors and Subsectors in Central Java	Dynamic Location Quotient (DLQ)	
	Before Covid-19	After Covid-19
Agriculture	0.06	1.13
Food Crops	0.01	3.20
Horticultural Crops	0.12	4.53
Plantation Crops	0.37	0.30
Livestock	1.32	0.40
Forestry	0.01	0.77
Fisheries	0.04	1.12

Source: Secondary data processed 2024.

Table 3 shows that the DLQ value for the agricultural sector increased by 1.07, rising from 0.06 before the COVID-19 pandemic to 1.13 after the pandemic. The increase in the DLQ value is due to the post-COVID growth rate in Central Java being faster than the national growth rate in the agricultural sector. The subsectors that experienced growth were food crops, horticultural crops, forestry, and fisheries. Meanwhile, the plantation and livestock subsectors experienced declines or slowdowns following the COVID-19 pandemic.

Furthermore, to identify economic shifts and the potential for future development of agricultural sectors and subsectors in Central Java Province, LQ and DLQ analyses can be used. The results of this combined analysis of LQ and DLQ values can serve as criteria for classifying agricultural sectors and subsectors. Agricultural sectors and subsectors can be classified into four categories: leading, potential, key, and lagging. The results of the combined LQ and DLQ analysis of agricultural sectors and subsectors in Central Java are presented in Table 4 below:

Table 4 Results of the Combined Analysis of the Location Quotient (LQ) and Dynamic Location Quotient (DLQ) for Agricultural Sectors and Subsectors Before and After the COVID-19 Pandemic in Central Java Province

Agricultural Sectors and Subsectors in Central Java	Dynamic Location Quotient (DLQ)	
	Before Covid-19	After Covid-19
Agriculture, Livestock, and Fisheries	Potencial	Top Performer
Food Crops	Potencial	Top Performer
Horticultural Crops	Potencial	Top Performer
Plantation Crops	Behind	Behind
Livestock	Top Performer	Potencial
Forestry	Behind	Behind
Fisheries	Behind	Mainstay

Source: Secondary data processed 2024.

Table 4 shows that the agricultural sector, both before and during the COVID-19 pandemic, was classified as an advanced sector ($LQ > 1$ and $DLQ > 1$). During the study period, it served as a base sector but has the potential to become a non-base sector in the future if the agricultural sector does not increase its production and productivity.

Based on the combined analysis of LQ and DLQ for the 2014–2023 period, nearly all agricultural subsectors both before and during the COVID-19 pandemic experienced an improvement in their classification. This indicates that the COVID-19 pandemic had a significant impact on agricultural subsectors; however, farmers particularly in rural areas continued farming, ensuring that agricultural production remained consistent and stable throughout the pandemic.

The subsectors classified as “potential” before the COVID-19 pandemic and as “leading” afterward are the food crops subsector and the horticultural crops subsector, which have LQ and DLQ values greater than 1 ($LQ > 1$ and $DLQ > 1$). This indicates that these subsectors are classified as foundational subsectors, they were able to withstand the COVID-19 pandemic, meet the needs of their own regions, export to other regions, and are projected to remain leading subsectors in the future because their DLQ values are greater than 1 ($DLQ > 1$).

Furthermore, the lagging subsectors are plantation and forestry, with LQ and DLQ values less than 1 ($LQ < 1$ and $DLQ < 1$). This indicates that these subsectors are classified as non-basic, they cannot meet their own regional needs and require assistance or imports from other regions to do so. This issue requires greater attention from the government, as projections indicate that these subsectors will remain underdeveloped in the future due to their low DLQ and LQ values ($DLQ < 1$ and $LQ < 1$). Furthermore, with greater government attention to the plantation and forestry subsectors, along with policies that can boost production and productivity, these subsectors will improve their status and avoid remaining in the “lagging” category indefinitely.

LQ, DLQ, and combined LQ and DLQ analyses were also conducted at the regency/city level in Central Java Province to provide a more detailed understanding of the agricultural sector before and after the COVID-19 pandemic. The results of the LQ analysis at the regency/city level in Central Java Province are presented in Table 5 below

Table 5 shows that the agricultural sector was the primary sector in most regions both before and after the COVID-19 pandemic. The 24 regencies in Central Java classified as having an agricultural- based economy are: Cilacap Regency, Purbalingga Regency, Banjarnegara Regency, Kebumen Regency, Purworejo Regency, Wonosobo Regency, Magelang Regency, Boyolali Regency, Wonogiri Regency, Karanganyar Regency, Sragen Regency, Grobogan Regency, Blora Regency, Rembang Regency, Pati Regency, Jepara Regency, Demak Regency, Temanggung Regency, Kendal Regency, Batang Regency, Pekalongan Regency, Pemalang Regency, Tegal Regency, and Brebes Regency. Meanwhile, the regencies and cities included in the non-base agricultural sector consist of 11 regencies and cities, namely Banyumas Regency, Klaten Regency, Sukoharjo Regency, Kudus Regency, Semarang Regency, Magelang City, Surakarta City, Salatiga City, Semarang City, Pekalongan City, and Tegal City.

Table 5 Results of the Location Quotient (LQ) Analysis for the Agricultural Sector Before and During the COVID-19 Pandemic in the Regencies and Cities of Central Java Province

Agricultural Sector by Regency/City in Central Java Province	Analysis of the Location Quotient (LQ)	
	Before Covid-19	After Covid-19
Cilacap Regency	1.20	1.13
Banyumas Regency	0.96	0.91
Purbalingga Regency	2.02	2.23
Banjarnegara Regency	2.25	2.30
Kebumen Regency	1.76	1.63
Purworejo Regency	1.73	1.64
Wonosobo Regency	2.35	2.40
Magelang Regency	1.59	1.53
Boyolali Regency	1.64	1.68
Klaten Regency	0.88	0.84
Sukoharjo Regency	0.65	0.64
Wonogiri Regency	2.34	2.32
Karanganyar Regency	1.00	1.00
Sragen Regency	1.17	1.11
Grobogan Regency	2.18	2.12
Blora Regency	2.17	2.20
Rembang Regency	2.08	1.94
Pati Regency	1.86	1.87
Kudus Regency	0.17	0.20
Jepara Regency	1.02	0.98
Demak Regency	1.70	1.55
Semarang Regency	0.83	0.82
Temanggung Regency	1.74	1.75
Kendal Regency	1.57	1.55
Batang Regency	1.57	1.50
Pekalongan Regency	1.22	1.18
Pemalang Regency	1.88	1.94
Tegal Regency	1.02	0.98
Brebes Regency	2.75	2.70
Magelang City	0.01	0.01
Surakarta City	0.01	0.01
Salatiga City	0.35	0.35
Semarang City	0.07	0.06
Pekalongan City	0.37	0.36
Tegal City	0.36	0.37

Source: Secondary data processed 2024.

The analysis results show that the LQ values for the core agricultural sector that increased after the COVID-19 pandemic were in Purbalingga Regency, Banjarnegara Regency, Wonosobo Regency, Boyolali Regency, Blora Regency, Pati Regency, Temanggung Regency, and Pemalang Regency. The LQ value for the agricultural sector in Purbalingga Regency

increased by 0.21, or 10%, from 2.02 to 2.23 following the COVID-19 pandemic. The LQ value for Banjarnegara Regency rose by 2.08%, Wonosobo Regency by 1.8%, Boyolali Regency by 2.9%, Blora Regency by 1.3%, Pati Regency by 0.6%, Temanggung Regency by 0.8%, and Pemalang Regency by 3.3% following the COVID-19 pandemic.

The LQ values for the agricultural sector the base sector that experienced a decline following the COVID-19 pandemic were: Cilacap Regency (6.3%), Kebumen Regency (7.4%), Purworejo Regency (5.2%), Magelang Regency (4.2%), Wonogiri Regency (0.7%), Karanganyar Regency (0.3%), Sragen Regency (4.9%), Grobogan Regency (2.7%), Rembang Regency (6.4%), Demak Regency (8.5%), Kendal Regency (1.1%), Batang Regency (4.2%), Pekalongan Regency (3.2%), and Brebes Regency (1.7%) following the COVID-19 pandemic. Meanwhile, Jepara Regency and Tegal Regency were classified as non-agricultural-based sectors because their LQ values remained at 0.98 after the pandemic.

The agricultural sector in these 24 regencies contributed a higher percentage to the GRDP of their respective regencies/cities compared to the agricultural sector's contribution to the GRDP at the Central Java provincial level. Meanwhile, the agricultural sector in these 24 Central Java regencies was able to meet their own needs, and the remaining capacity (LQ value of -1) was sufficient to assist other regions in meeting their agricultural needs or to export to neighboring areas.

The analysis results show that the LQ values for the agricultural sector classified as a non-base sector in Magelang City, Surakarta City, and Salatiga City remained unchanged during the COVID-19 pandemic, staying constant at 0.01 and 0.35, respectively. The LQ value for the agricultural sector in Banyumas Regency declined during the COVID-19 pandemic by 0.05, or 4.6%, from 0.96 before the pandemic to 0.91 after the pandemic. The LQ values for Klaten Regency fell by 4%, Sukoharjo Regency by 2.1%, Semarang City by 5%, and Pekalongan City by 1% following the COVID-19 pandemic.

The contribution of the agricultural sector in these 11 non-agricultural cities and regencies to their respective GRDPs is lower than the contribution of the agricultural sector to the GRDP at the provincial level of Central Java. Furthermore, these areas are unable to meet their own local needs because their agricultural sector LQ values are less than 1 ($LQ < 1$), forcing them to rely on agricultural supplies from other regions and surrounding areas. The economic structure of these six cities is indeed dominated by sectors other than agriculture, namely trade, manufacturing, mining and quarrying, and construction (Central Java BPS, 2024).

DLQ analysis was conducted to complement the LQ analysis. LQ analysis has a limitation in that its results are static that is, they reflect conditions only during the study period. Therefore, DLQ analysis is necessary to predict whether a sector will be "base" or "non-base" in the future. The results of the DLQ analysis for the agricultural sector, both before and during the COVID-19 pandemic, in the regencies and cities of Central Java Province are shown in Table 6 below

Table 6 Results of the Dynamic Location Quotient (DLQ) Analysis of the Agricultural Sector Before and During the COVID-19 Pandemic in the Regencies and Cities of Central Java Province

Agricultural Sector by Regency/City in Central Java Province	Dynamic Location Quotient (DLQ)	
	Before Covid-19	After Covid-19
Cilacap Regency	0.41	0.16
Banyumas Regency	0.88	0.48
Purbalingga Regency	3.88	1.50
Banjarnegara Regency	3.49	1.43
Kebumen Regency	0.08	0.40
Purworejo Regency	0.63	0.29
Wonosobo Regency	3.37	2.10
Magelang Regency	1.45	0.06
Boyolali Regency	3.54	0.64
Klaten Regency	0.88	0.38
Sukoharjo Regency	0.43	1.09
Wonogiri Regency	0.44	2.09
Karanganyar Regency	3.72	0.55

Sragen Regency	0.01	0.21
Grobogan Regency	1.01	1.10
Blora Regency	0.41	0.84
Rembang Regency	0.02	0.49
Pati Regency	10.36	7.53
Kudus Regency	39.38	25.13
Jepara Regency	0.11	0.34
Demak Regency	0.08	0.00
Semarang Regency	2.68	0.65
Temanggung Regency	1.54	1.02
Kendal Regency	5.55	0.62
Batang Regency	0.41	0.20
Pekalongan Regency	0.14	0.88
Pemalang Regency	1.05	2.54
Tegal Regency	0.03	0.31
Brebes Regency	0.91	0.50
Magelang City	1.45	0.04
Surakarta City	2.01	4.57
Salatiga City	6.21	0.70
Semarang City	0.46	0.77
Pekalongan City	0.24	0.51
Tegal City	2.22	3.70

Source: Secondary data processed 2024.

Table 6 shows that more than half of the regencies and cities in Central Java Province had a lower or slower growth rate in the agricultural sector compared to the agricultural sector at the Central Java provincial level before the COVID-19 19, except Purbalingga Regency, Banjarnegara Regency, Wonosobo Regency, Boyolali Regency, Sukoharjo Regency, Wonogiri Regency, Grobogan Regency, Pati Regency, Temanggung Regency, Kendal Regency, Pekalongan Regency, Pemalang Regency, Surakarta City, Semarang City, Salatiga City, and Tegal City. Meanwhile, after the COVID-19 pandemic, the agricultural sector in the regencies and cities of Central Java Province experienced a faster growth rate compared to the agricultural sector at the Central Java Provincial level.

The agricultural sectors that have shown a faster growth rate compared to the agricultural sector at the Central Java provincial level, both before and after the COVID-19 pandemic, are those in Purbalingga Regency, Banjarnegara Regency, Wonosobo Regency, Boyolali Regency, Pati Regency, Temanggung Regency, Kendal Regency, Pemalang Regency, Surakarta City, Semarang City, Salatiga City, and Tegal City. The DLQ value for the agricultural sector in Purbalingga Regency before the COVID-19 pandemic was recorded at 3.88, which decreased by 2.38 or 61% after the pandemic to 1.50. The DLQ score for Banjarnegara Regency during the COVID-19 pandemic was recorded at 3.49, and after the pandemic, it decreased by 2.06 or 59% to 1.43. The DLQ score for Wonosobo Regency also decreased by 37%, from 3.37 to 2.10. The DLQ score in Pati Regency also decreased by 26%; Temanggung Regency's score fell by 33%; Kendal Regency's score dropped by 88%; Pemalang Regency's score rose by 141%; Surakarta City's score increased by 127%; Semarang City's score rose by 67%; Salatiga City's score fell by 88%; and Tegal City's score rose by 66%.

Meanwhile, the agricultural sectors that experienced slower growth rates compared to the agricultural sector in Central Java Province, both before and after the COVID-19 pandemic, were in Cilacap Regency, Kebumen Regency, Klaten Regency, Sragen Regency, Blora Regency, Rembang Regency, Jepara Regency, Demak Regency, Batang Regency, Tegal Regency, and Pekalongan City. The DLQ value in Cilacap Regency during the COVID-19 pandemic was recorded at 0.41, decreasing by 0.25 or 60% after the pandemic to 0.16. The DLQ value in Kebumen Regency increased by 0.38, rising from 0.08 before the COVID-19 pandemic to 0.40 after the pandemic. The DLQ value in Klaten Regency was 0.88 before the COVID-19 pandemic and fell to 0.38 a 56% decrease.

As for the regencies and cities that experienced a positive change in the growth rate of the agricultural sector that is, shifting from a slower rate ($DLQ < 1$) to a faster rate. ($DLQ > 1$) During the COVID-19 pandemic, compared with the provincial level of growth rate, Sukoharjo Regency had the highest growth rate. Its pre-pandemic DLQ value of 0.43 increased by 0.66, or 153%, to 1.09 after the COVID-19 pandemic. The increase in the DLQ value in these regencies and cities is because the growth in the agricultural sector's GRDP in these regencies and cities was greater than the growth in their total GRDP.

Table 7 Results of the Combined Analysis of the Location Quotient and Dynamic LC for the Agricultural Sector in the Regencies and Cities of Central Java Province

Agricultural Sector by Regency/City in Central Java Province	Before Covid-19	After Covid-19
Cilacap Regency	Potential	Potential
Banyumas Regency	Lagging	Lagging
Purbalingga Regency	Leading	Leading
Banjarnegara Regency	Leading	Leading
Kebumen Regency	Potential	Potential
Purworejo Regency	Potential	Potential
Wonosobo Regency	Leading	Leading
Magelang Regency	Leading	Potential
Boyolali Regency	Leading	Potential
Klaten Regency	Lagging	Lagging
Sukoharjo Regency	Lagging	Mainstay
Wonogiri Regency	Potential	Leading
Karanganyar Regency	Leading	Potential
Sragen Regency	Potential	Potential
Grobogan Regency	Leading	Leading
Blora Regency	Potential	Potential
Rembang Regency	Potential	Potential
Pati Regency	Leading	Leading
Kudus Regency	Mainstay	Mainstay
Jepara Regency	Potential	Lagging
Demak Regency	Potential	Potential
Semarang Regency	Mainstay	Lagging
Temanggung Regency	Leading	Leading
Kendal Regency	Leading	Potential
Batang Regency	Potential	Potential
Pekalongan Regency	Potential	Potential
Pemalang Regency	Leading	Leading
Tegal Regency	Potential	Lagging
Brebes Regency	Potential	Potential
Magelang City	Mainstay	Lagging
Surakarta City	Mainstay	Mainstay
Salatiga City	Mainstay	Lagging
Semarang City	Lagging	Lagging
Pekalongan City	Lagging	Lagging
Tegal City	Mainstay	Lagging

Source: Secondary data processed 2024

To identify economic shifts and the potential for future development in the agricultural sector across regencies and cities in Central Java Province, LQ and DLQ analyses can be employed. The results of the combined analysis of LQ and DLQ values can serve as criteria for classifying agricultural sectors. Agricultural sectors can be classified into four categories: leading, potential, key, and lagging. The results of the combined analysis of LQ and DLQ for the agricultural sectors in the regencies and cities of Central Java Province are presented in Table 7 above.

Table 7 shows that the agricultural sector in Purbalingga Regency, Banjarnegara Regency, Wonosobo Regency, Grobogan Regency, Pati Regency, Temanggung Regency, and Pamalang Regency both before and after the COVID-19 pandemic was classified as a key sector; during the study year, it served as the backbone sector and has the potential to remain so in the future.

The agricultural sector in Kudus Regency and Surakarta City was classified as a key sector both during and after the COVID-19 pandemic. Meanwhile, Cilacap Regency, Kebumen Regency, Purworejo Regency, Sragen Regency, Blora Regency, Rembang Regency, Demak Regency, Batang Regency, Pekalongan Regency, and Brebes Regency were classified as potential sectors both before and after the COVID-19 pandemic.

The agricultural sector in Banyumas Regency, Klaten Regency, Semarang City, Pekalongan City, and Tegal City was classified as a lagging sector both before and after the COVID-19 pandemic. This indicates that during the study period, it was a non core sector and will remain a non-core subsector if the COVID-19 pandemic persists and the sector does not receive development priority from the Central Java Provincial Government. The economic structure in Banyumas Regency, Klaten Regency, Semarang City, Pekalongan City, and Tegal City is dominated by non-agricultural sectors, including trade and manufacturing.

Meanwhile, there are 11 (eleven) regencies and cities that experienced a change in classification after the COVID-19 pandemic compared to before the pandemic, including Magelang Regency, Boyolali Regency, Sukoharjo Regency, Wonogiri Regency, Karanganyar Regency, Semarang Regency, Jepara Regency, Kendal Regency, Tegal Regency, Magelang City, Salatiga City, and Tegal City. Four of these regencies saw their classification change from “flagship” before the COVID-19 pandemic to “potential” after the pandemic. This indicates that during the study period, agriculture served as a base sector but has the potential to become a non-base sector in the future if the COVID-19 pandemic persists and the sector does not receive priority for development from the government. This change in classification was due to an increase in the growth rate and contribution of the agricultural sector across these four regencies, driven by the Central Java Provincial Government’s continued prioritization of agriculture. The regencies and cities that did not experience a change in the classification of their agricultural sectors, either before or after the COVID-19 pandemic, did so because the agricultural sector’s growth rate and contribution of the agricultural sector in those regencies and cities tended to be stable and were not affected by the pandemic.

3.2. Shifts and Changes in the Share of Agricultural Sectors and Subsectors Before and After the COVID-19 Pandemic in Central Java Province

Shift-Share Analysis is a quantitative analytical tool commonly used to analyze shifts in the economic structure of the agricultural sector in Central Java Province relative to the economic structure of the agricultural sector at a higher level (national) as a benchmark or reference. This analysis uses three components as its basis: the National Growth Effect, the Proportional Effect, and the Differential Shift. The National Growth Effect (Provincial Share) illustrates how national-level economic growth influences the economic structure of Central Java Province, particularly the structure of the agricultural sector. The Proportional Shift indicates the relative change in the performance of a sector in a specific region compared to the same sector in the national reference region. The Proportional Shift is also referred to as the “Industry Mix” effect. This metric can be used to assess the concentration of a regional economy specifically, whether certain industries are growing faster than their counterparts in the reference region. The Differential Shift indicates the competitiveness (competitive advantage) of a region’s industries relative to the economy of the reference region. If the differential shift of an industry is positive, then that industry has higher competitiveness (competitive advantage) than the same industry in the reference region.

Shift-Share analysis is used to examine shifts in the economic structure of the agricultural sector in Central Java Province before and after the COVID-19 pandemic. The discussion regarding shifts in the agricultural sector’s economic structure indicates that changes in the agricultural sector’s GRDP in Central Java Province before and after the COVID-19 pandemic were influenced by the reference region’s (national) economic growth component (Nij), the industrial mix (Mij), and competitive advantage (Cij). The impact of these three components on the economic structure of the agricultural sector and the total growth of the agricultural sector in Central Java Province is shown in Table 8 below.

Table 8 Results of the Shift-Share Analysis of Agricultural Sectors and Subsectors Before and During the COVID-19 Pandemic in Central Java Province (in billions of rupiah)

Agricultural Sector/Subsector in Central Java Province	Components							
	Before Covid-19				After Covid-19			
	Nij	Mij	Cij	Dij	Nij	Mij	Cij	Dij
Agriculture	11027,50	10050,75	-5971,85	15106,40	17751,90	-8805,90	-843,20	8102,80
Food Crops	3810,91	-489,39	-1392,92	1928,60	5650,19	-6315,16	1028,97	364,00
Horticultural Crops	2851,53	3481,34	-2363,17	3969,70	4599,69	-1849,57	1414,88	4165,00
Plantation Crops	1148,52	1014,67	-374,59	1788,60	1880,56	-797,33	-511,93	571,30
Livestock	2013,67	3146,26	823,17	5983,10	3716,23	-1145,90	-865,02	1705,30
Forestry	425,80	-176,64	-314,47	-65,30	589,98	-535,54	-29,84	24,60
Fisheries	777,06	1707,06	-982,42	1501,70	1315,25	41,16	-83,81	1272,60

Source: Secondary data processed 2024.

Table 8 presents the Shift-Share Analysis for the agricultural sector in Central Java Province. The results show that both before and after the COVID-19 pandemic, the agricultural sector as a whole experienced positive growth. This is reflected in the National Share (Nij) value, which consistently remained positive standing at 11,027.50 billion rupiah before the pandemic and increasing significantly to 17,751.90 billion rupiah after the pandemic. This increase indicates that the agricultural sector in Central Java continues to benefit from national economic growth. However, the Industry Mix (Mij) and Competitiveness (Cij) values, which tend to be negative especially after the pandemic (Mij = -8,805.90; Cij = -843.20) suggest that the sector's growth is not driven by industrial structural advantages or regional competitiveness. Therefore, the agricultural sector is classified as "advanced but under pressure," meaning that although it is growing in absolute terms, its growth is weaker than that of other sectors at the national level and it is less competitive regionally.

The food crops subsector showed significant improvement after the pandemic. Before the pandemic, this subsector was classified as "advanced but under pressure" with a negative Cij value (-1,392.92). However, post-pandemic, the Cij value turned positive at 1,028.97, and its total growth contribution (Dij) increased to 364.00 billion rupiah. This reflects an increase in the competitiveness of food crops, most likely driven by rising household demand for staple foods during the pandemic. Consequently, this subsector has been reclassified as an "advanced sector."

The horticulture subsector also demonstrated very positive performance. Post-pandemic, this subsector experienced an improvement in competitiveness, as reflected by a Cij value that rose to 1,414.88 and a total growth contribution (Dij) reaching 4,165.00 billion rupiah. These conditions led to the horticulture subsector being classified as an "advanced sector," indicating that it not only grew in absolute terms but also possesses a superior industrial structure and competitiveness. This growth was likely driven by increased consumption of fruits and vegetables, as well as the strengthening of local supply chains during the pandemic.

In contrast, the plantation subsector remains classified as a "lagging sector." This is based on the Cij and Mij values, which remained negative both before and after the pandemic, indicating the subsector's weak competitiveness and structure. Although the total contribution to growth (Dij) increased to 571.30 billion rupiah, this figure is relatively low compared to other subsectors. The sub-sector's weak performance may be attributed to its reliance on export commodities and limited innovation in cultivation and post-harvest practices.

The livestock subsector is classified as a "developed but under pressure" sector. After the pandemic, the Nij value increased to 3,716.23 billion rupiah, but the Mij (-1,145.90) and Cij (-865.02) values remained negative, indicating pressure on the industrial structure and competitiveness of this subsector. Nevertheless, the total value (Dij) remains positive at 1,705.30 billion rupiah, indicating that this subsector still contributes significantly to growth, albeit not optimally. These pressures likely stem from rising feed prices, logistical disruptions, and the threat of livestock diseases.

The forestry and fisheries subsectors show relatively stagnant performance. Consistently negative Cij and Mij values indicate that these two subsectors lack a competitive industrial structure, and their growth is slower than that of other sectors at the national level. Although the Nij values for both subsectors remain positive, this reflects external drivers

from the national economy rather than internal strengths. Therefore, these two subsectors remain categorized as “lagging sectors.”

Table 9 Results of the Shift-Share Analysis of the Agricultural Sector Before and During the COVID-19 Pandemic in the Regencies and Cities of Central Java Province (in billions of rupiah)

Agricultural Sector/Subsector Central Java Province	Components							
	Before Covid-19				After Covid-19			
	Nij	Mij	Cij	Dij	Nij	Mij	Cij	Dij
Cilacap	1786,14	-922,54	-70,17	793,43	981,44	-690,13	-99,78	191,53
Banyumas	1156,05	-597,1	66	624,95	654	-459,88	31,85	225,97
Purbalingga	1092,9	-564,48	104,26	632,68	626,79	-440,74	40,73	226,78
Banjarnegara	1068,57	-551,92	134,84	651,5	624,62	-439,22	56,62	242,02
Kebumen	1159,02	-598,63	-432,87	127,52	577,07	-405,79	56,08	227,37
Purworejo	739,86	-382,14	-98,8	258,92	392,23	-275,81	1410,09	1526,51
Wonosobo	1042	-538,19	-65,11	438,7	590,24	-415,04	1,66	176,86
Magelang	1175,34	-607,06	-44,57	523,71	640,15	-450,14	-53,18	136,84
Boyolali	1137,38	-587,45	211,23	761,15	667,9	-469,65	98,38	296,63
Klaten	771,83	-398,65	-56,1	317,08	424,73	-298,66	-6,62	119,45
Sukoharjo	546,19	-282,11	22,75	286,84	306,06	-215,21	66,07	156,91
Wonogiri	1561,63	-806,58	-249,94	505,11	857,5	-602,98	94,46	348,99
Karanganyar	824,06	-425,63	75,13	473,57	469,12	-329,87	31,77	171,01
Sragen	992,17	-512,45	-82,49	397,23	535,06	-376,25	-15,64	143,18
Grobogan	1318,22	-680,86	-12,7	624,66	738,65	-519,41	102,76	322,01
Blora	935,97	-483,43	34,45	486,99	528,65	-371,73	18,74	175,65
Rembang	886,41	-457,83	-125,28	303,3	477,08	-335,47	10,11	151,71
Pati	1727,77	-892,39	487,74	1323,12	1040,7	-731,8	47,81	356,71
Kudus	418,04	-215,92	62,51	264,64	239	-168,06	36,66	107,6
Jepara	703,43	-363,32	-101,34	238,77	386,12	-271,51	-68,49	46,12
Demak	997,25	-515,08	-151,25	330,92	539,29	-379,22	-315,39	-155,32
Semarang	924,6	-477,55	63,61	510,66	516,54	-363,22	51,23	204,55
Temanggung	834,59	-431,07	47,55	451,07	473,79	-333,16	30,32	170,95
Kendal	1519,45	-784,8	183,74	918,39	851,69	-598,89	243,8	496,6
Batang	776,16	-400,89	-134,59	240,68	423,67	-297,92	-96,5	29,25
Pekalongan	650,43	-335,95	-119,76	194,72	343,71	-241,69	41,5	143,52
Pemalang	1069,8	-552,55	76,44	593,69	628,75	-442,13	130,08	316,71
Tegal	816,05	-421,49	-138,47	256,09	437,82	-307,87	-57,93	72,02
Brebes	2851,2	-1472,64	-122,53	1256,03	1608,94	-1131,37	-281,12	196,44
Magelang	29,08	-15,02	3,24	17,3	16,55	-11,64	47,32	52,23
Surakarta	37,8	-19,52	0,27	18,55	21,2	-14,91	13,28	19,57
Salatiga	111,6	-57,64	-5,81	48,14	59,63	-41,93	16,88	34,58
Semarang	291,67	-150,65	-36,28	104,75	157,38	-110,66	31,35	78,06
Pekalongan	88,55	-45,74	194,27	237,08	50,25	-35,34	-16,26	-1,34
Tegal	125,63	-64,89	21,46	82,2	71,4	-50,21	39,18	60,38

Source: Secondary data processed 2024.

Shift-Share analysis was also used to examine shifts in the economic structure of the agricultural sector in the regencies and cities of Central Java Province both before and during the COVID-19 pandemic. The discussion on shifts in the agricultural sector's economic structure indicates that changes in the agricultural sector's GRDP in the regencies and cities of Central Java Province before and during the COVID-19 pandemic were influenced by the reference region's (province) economic growth component (Nij), the industrial mix (Mij), and competitive advantage (Cij). The impact of these three components on the economic structure of the agricultural sector and the total growth of the agricultural sector in the regencies and cities of Central Java Province can be seen in Table 9 above.

Table 9 shows that growth in the agricultural sector both before and during the COVID-19 pandemic in the regencies and cities of Central Java Province was influenced by provincial-level economic growth. This is evident in the Nij value for the agricultural sector, which declined after the COVID-19 pandemic relative to the period before the pandemic. The largest decline in the Nij value occurred in Brebes Regency, from 2,851.20 billion rupiah to 1,608.94 billion rupiah, a decrease of 1,242.27 billion rupiah. Next was Cilacap Regency, where the Nij value dropped from 1,786.14 billion rupiah before the COVID-19 pandemic to 981.44 billion rupiah after the pandemic. The Nij value for the agricultural sector in Wonogiri Regency before the COVID-19 pandemic was 1,561.63 billion rupiah and decreased after the pandemic to 857.50 billion rupiah. The Nij value for the agricultural sector in Rembang Regency, which was 1,727.77 billion rupiah, decreased after the COVID-19 pandemic to 1,040.70 billion rupiah.

All regencies in Central Java Province experienced a decline in their Nij values following the COVID-19 pandemic. This decline in Nij values was caused by a slowdown in GRDP growth in the agricultural sector in Central Java Province during the COVID-19 pandemic.

Based on the proportional shift (Mij) during the COVID-19 pandemic, there was a slight increase across all regencies and cities in Central Java Province. However, Mij remained negative both before and after the pandemic. This was due to an increase in GRDP after the COVID-19 pandemic compared to before the pandemic.

The proportional shift effect (Mij) in Cilacap Regency increased by 232.42 billion rupiah; the Mij value before the COVID-19 pandemic was recorded at negative 922.54 billion rupiah, then became negative 690.13 billion rupiah. The Mij value in Banyumas Regency also increased by 137.22 billion rupiah. In Purbalingga Regency, the Mij value increased by 123.74 billion rupiah. The Mij value in Banjarnegara Regency increased by 112.70 billion rupiah following the COVID-19 pandemic. The Mij value in Kebumen Regency before the pandemic was negative 598.63 billion rupiah and increased by 192.84 billion rupiah to negative 405.79 billion rupiah following the COVID-19 pandemic. The Mij value in Purworejo Regency before the pandemic was negative 382.14 billion rupiah and increased by 106.33 billion rupiah to negative 405.79 billion rupiah after the COVID-19 pandemic.

The proportional shift (Mij) in Magelang City increased by 3.38 billion rupiah; it was recorded at negative 15.02 billion rupiah before the COVID-19 pandemic and rose to 11.64 billion rupiah after the pandemic. The Mij value in Surakarta City before the pandemic was negative 19.52 billion rupiah and increased by 4.62 billion rupiah to negative 14.91 billion rupiah after the COVID-19 pandemic. The Mij value in Salatiga City before the pandemic was negative 57.64 billion rupiah and increased by 15.71 billion rupiah to negative 41.93 billion rupiah after the COVID-19 pandemic. The Mij value for the City of Semarang before the COVID-19 pandemic was negative 150.65 billion rupiah and increased by 39.99 billion rupiah to negative 110.66 billion rupiah after the COVID-19 pandemic. The Mij value in Pekalongan City before the COVID-19 pandemic was negative 45.74 billion rupiah and increased by 10.40 billion rupiah to negative 35.34 billion rupiah after the COVID-19 pandemic. The Mij value for Tegal City before the COVID-19 pandemic was negative 64.89 billion rupiah and increased by 14.68 billion rupiah to negative 50.21 billion rupiah after the COVID-19 pandemic.

The increase in the Mij value, or the proportional shift effect, was due to an increase in GRDP from pre-COVID-19 levels across every regency and city in Central Java Province. The competitiveness of the agricultural sector can be determined through a *shift-share* analysis of the *differential shift* (Cij) component. An agricultural sector with a positive Cij value indicates that the competitiveness of that sector in the regencies and cities of Central Java Province is higher than the competitiveness of the agricultural sector in Central Java Province as a whole. Conversely, an agricultural sector with a negative Cij value indicates that the competitiveness of that sector in the regencies and cities of Central Java Province is lower than the competitiveness of the agricultural sector in Central Java Province as a whole. Based on the results of the *differential shift* analysis in the regencies and cities of Central Java, there were 13 (thirteen) regencies and 4 (four) cities in Central Java Province that possessed a competitive advantage before the COVID-19 pandemic. Meanwhile, following the COVID-19 pandemic, there were 20 (twenty) regencies and 5 (five) cities in Central Java Province that possessed a competitive advantage.

In the post-COVID-19 period, there were 7 (seven) regencies and 2 (two) cities that possessed a competitive advantage but did not have one before the COVID-19 pandemic, namely Kebumen Regency, Purworejo Regency, Wonosobo Regency, Wonogiri Regency, Grobogan Regency, Rembang Regency, Pekalongan Regency, Salatiga City, and Semarang City. 13 (thirteen) regencies possessed a competitive advantage both during and after the COVID-19 pandemic: Banyumas Regency, Purbalingga Regency, Banjarnegara Regency, Boyolali Regency, Sukoharjo Regency, Karanganyar Regency, Blora Regency, Pati Regency, Kudus Regency, Semarang Regency, Temanggung Regency, Kendal Regency, and Pemalang Regency. In addition, 4 (four) cities in Central Java Province possess competitive advantages: Magelang City, Surakarta City, Pekalongan City, and Tegal City.

3.3. Growth of the Agricultural Sector's Economic Structure Before and During the COVID-19 Pandemic in Central Java Province

Klassen Typology analysis was used to obtain a more detailed overview of the patterns and structure of economic growth in the agricultural sector and its subsectors in Central Java Province. This analysis classifies sectors by examining the growth and contribution of agricultural sectors and subsectors to the total Gross Regional Domestic Product (GRDP) of Central Java Province. Using Klassen's typology analysis, a sector can be classified into four categories: advanced sector, advanced but under pressure sector, developing sector, and lagging sector. The classification of a sector into these four categories is based on the growth rate of the agricultural sector's contribution and the average contribution of the agricultural sector to the GRDP. The growth of the economic structure of agricultural sectors and subsectors in Central Java Province can be seen in Table 10 below:

Table 10 Results of the Klassen Typology Analysis of Agriculture Before and During the COVID-19 Pandemic in Central Java Province

Agriculture Sector/Subsector	Klassen Typology	
	Before Covid-19	After Covid-19
Agriculture	Advanced Sectors but Under Pressure	Advanced Sectors but Under Pressure
Food Crops	Advanced Sectors but Under Pressure	Advanced Sectors
Horticultural Crops	Advanced Sectors but Under Pressure	Advanced Sectors
Plantation Crops	Lagging Sectors	Lagging Sectors
Livestock	Advanced Sectors	Advanced Sectors but Under Pressure
Forestry	Lagging Sectors	Lagging Sectors
Fisheries	Lagging Sectors	Lagging Sectors

Source: Secondary data processed 2024.

Based on Table 10, the results of the Klassen typology analysis show that the agricultural sector in Central Java Province, both before and after the COVID-19 pandemic, falls into the "Advanced but Under Pressure" category. This classification indicates that the agricultural sector makes a significant contribution to the region's gross regional domestic product (GRDP), but a high growth rate does not accompany it. The COVID-19 pandemic is believed to be the primary factor causing pressure on the sector's growth rate, as supply chains, distribution, and labor mobility in the agricultural sector were disrupted. Upon further examination by subsector, there are some interesting dynamics in the typological shifts. Before the pandemic, the food crops and horticulture subsectors were classified as "Advanced but Under Pressure," but after the pandemic, both were reclassified as "Advanced." This shift reflects that these two subsectors not only maintained their high contribution to the RDP but also demonstrated an increasing growth rate. This performance was supported by high demand for local food products during the pandemic, increased public awareness of healthy eating, and the adoption of agricultural technologies such as organic farming and digital farming which have begun to be implemented in several regions.

The livestock subsector did not change classification and remained in the "Advanced but Under Pressure" category. This indicates that although the livestock subsector's contribution to the regional economy remains significant, its growth has not yet reached its full potential. Factors such as rising feed prices, a decline in public purchasing power for animal products, and distribution restrictions during the pandemic may be the primary reasons this subsector has not yet overcome its growth constraints.

Meanwhile, the plantation, forestry, and fisheries subsectors have consistently been classified as “Lagging Sectors” both before and after the pandemic. This means that these three subsectors not only make a low contribution to the Regional Gross Domestic Product (PDRB) but also exhibit slow growth rates. This may be due to low productivity, technological limitations, limited market access, and a lack of investment and innovation in these subsectors. In the context of the pandemic, the fisheries and forestry subsectors also faced challenges with distribution and exports and limited production due to social and economic restrictions.

Table 11 Results of the Klassen Typology Analysis of the Agricultural Sector Before and During the COVID-19 Pandemic in Regencies and Cities in Central Java Province

Regencies/Cities In Central Java Province	Klassen Typology	
	Before Covid-19	After Covid-19
Cilacap	Advanced but Stagnant Sector	Advanced but Stagnant Sector
Banyumas	Advanced Sector	Advanced Sector
Purbalingga	Advanced Sector	Advanced Sector
Banjarnegara	Advanced Sector	Advanced Sector
Kebumen	Advanced but Stagnant Sector	Advanced Sector
Purworejo	Advanced but Stagnant Sector	Advanced Sector
Wonosobo	Advanced but Stagnant Sector	Advanced Sector
Magelang	Advanced but Stagnant Sector	Advanced but Stagnant Sector
Boyolali	Advanced Sector	Advanced Sector
Klaten	Lagging Sector	Lagging Sector
Sukoharjo	Developing Sector	Developing Sector
Wonogiri	Advanced but Stagnant Sector	Advanced Sector
Karanganyar	Advanced Sector	Advanced Sector
Sragen	Advanced but Stagnant Sector	Advanced but Stagnant Sector
Grobogan	Advanced but Stagnant Sector	Advanced Sector
Blora	Advanced Sectors	Advanced Sectors
Rembang	Advanced but Under Pressure Sectors	Advanced Sectors
Pati	Advanced Sectors	Advanced Sectors
Kudus	Developing Sectors	Developing Sectors
Jepara	Advanced but Under Pressure Sectors	Lagging Sectors
Demak	Advanced but Under Pressure Sectors	Advanced but Under Pressure Sectors
Semarang	Developing Sectors	Developing Sectors
Temanggung	Advanced Sectors	Advanced Sectors
Kendal	Advanced Sectors	Advanced Sectors
Batang	Advanced but Under Pressure Sector	Lagging Sector
Pekalongan	Advanced but Under Pressure Sector	Advanced Sector
Pemalang	Advanced Sector	Advanced Sector
Tegal	Advanced but Stagnant Sector	Advanced but Stagnant Sector
Brebes	Advanced but Stagnant Sector	Advanced but Stagnant Sector
Magelang	Developing Sector	Developing Sector
Surakarta	Developing Sector	Lagging Sector
Salatiga	Lagging Sector	Developing Sector
Semarang	Lagging Sector	Developing Sector
Pekalongan	Lagging Sector	Lagging Sector
Tegal	Developing Sector	Developing Sector

Source: Secondary data processed 2024.

Overall, the results of this analysis indicate that the food crops and horticulture subsectors have great potential to become the main drivers of the agricultural sector in the future, as they have proven to be adaptive and resilient to crises. Conversely, other subsectors such as plantations, forestry, and fisheries require stronger policy interventions to drive improvements in productivity, value added, and market access. Therefore, future agricultural development strategies in Central Java Province need to be more specifically directed toward strengthening high-growth subsectors and improving underperforming ones. In addition to analyzing the provincial level of Central Java, this Klassen Typology analysis is also used to obtain a more detailed and comprehensive picture of the patterns and structure of economic growth in the agricultural sector of regencies and cities within Central Java Province. This analysis classifies agricultural sectors based on their growth and contribution to the total GRDP (Gross Regional Domestic Product) of regencies and cities in Central Java Province, as shown in Table 11 above.

Table 11 shows that most regions in Central Java Province fall into the “advanced but under pressure” classification. In Klassen’s typology, the “advanced but under pressure” sector refers to a situation where the agricultural sector makes a significant contribution to the region’s GRDP (meaning it is vital to the regional economy). Yet, its growth rate is low (meaning the sector’s development is stagnant or even declining). This can occur due to various factors, such as dependence on commodities with fluctuating prices, limited agricultural infrastructure, a lack of innovation or investment in technology, and external impacts such as a pandemic (e.g., disruptions to the distribution of agricultural products).

3.4. Contributions of the Agricultural Sector and Subsectors to the Economy of Central Java Province Before and After the COVID-19 Pandemic

It is important to understand the contribution of the agricultural sector to the economy of Central Java Province and the contribution of agricultural subsectors to the agricultural sector’s GRDP before and after the COVID-19 pandemic. This can serve as a benchmark to determine whether the agricultural sector’s contribution particularly during the COVID-19 pandemic increased or decreased. The value of the agricultural sector’s contribution to the economy of Central Java Province and the contribution of agricultural subsectors to the agricultural sector’s GRDP are shown in Table 12.

Table 12 Contributions of Agricultural Sectors and Subsectors Before and After the COVID-19 Pandemic in Central Java

Agricultural Sectors and Subsectors Agriculture	Agriculture	Food	Horticulture	Plantation	Livestock	Forestry	Fisheries
2016	13,4	35,7	24,9	10,3	18,6	3,4	7,1
2017	13,0	34,8	24,9	10,2	19,4	3,5	7,2
2018	12,6	33,7	25,4	10,2	20,0	3,4	7,2
2019	12,2	31,8	25,9	10,6	20,9	3,3	7,4
2020	12,8	31,5	27,8	10,3	19,6	3,3	7,6
2021	12,5	31,3	27,6	10,1	20,4	3,3	7,3
2022	12,2	30,3	28,6	10,1	20,3	3,1	7,6
2023	11,7	30,1	27,5	10,4	20,9	3,1	7,9

Source: Secondary data processed 2024.

Table 12 shows that the contribution of the agricultural sector to the economy of Central Java Province and the contribution of all agricultural subsectors to the agricultural sector’s GRDP have fluctuated from year to year.

The agricultural sector’s contribution has shown a downward trend, falling from 13.4 percent (2016) to 11.7 percent (2023). However, in 2020, it rose to 12.8 percent due to efforts to boost food security during the pandemic. The agricultural sector’s contribution to Central Java’s economy has declined due to several factors, such as the conversion of agricultural land and a slowdown in the growth of certain subsectors. Nevertheless, the agricultural sector remains a vital part of Central Java’s economy and holds significant potential for development. The government needs to pay greater attention to this sector, including by supporting farmers, increasing productivity, and preserving agricultural land.

The food crops subsector has experienced a decline since 2016. Several factors contributing to this decline include changes in consumption patterns, a reduction in cultivated land area, and the impact of extreme weather phenomena

such as El Niño. According to a study by Bistok (2025), rice production in Central Java averaged 9,723,902 metric tons from 2018 to 2022. Production fluctuated, with a significant 27.84% decline in 2020 due to a reduction in harvested area. To boost rice production, productivity must be enhanced by increasing the cropping index, expanding rice cultivation in swampy, low-lying, and other potential lands, and adopting more efficient rice cultivation technologies tailored to local conditions.

The horticultural crops subsector has remained relatively stable at 24.9–28.8% and even experienced an increase following the pandemic. This reflects the rise in consumption of local vegetables and fruits during and after the pandemic, as well as the growing trend of urban farming.

The pandemic did not significantly impact the Plantation subsector and has tended to stagnate. This is because Central Java is not a major producer of national plantation commodities, such as palm oil, rubber, or coffee. Prices of plantation commodities are also highly dependent on global markets, and price fluctuations mean that income in this sector does not always rise even when production volumes remain stable. Additionally, the local government's focus is more on food and horticulture.

The Livestock subsector has experienced steady growth. This is due to the development of smallholder and micro-scale livestock farming, driven by intensive government assistance programs in this subsector including livestock seedlings, feed, housing, and vaccinations. Furthermore, the growth of the livestock processing industry which relies on raw materials and relatively stable prices compared to the plantation subsector allowed this subsector to recover quickly after a temporary decline in 2020 due to the pandemic, as it is considered of essential sector.

The forestry subsector has not experienced any significant changes. Similar to the plantation subsector, this subsector plays a minor role in the Regional Gross Domestic Product (PDRB). Factors contributing to its limited growth include the limited area of forest land, restricted management of production forests, a lack of diversification in forestry products, and insufficient regulations and permitting processes. Consequently, the role of forestry in Central Java tends to be more as an ecological buffer rather than a driver of the agricultural economy.

The fisheries subsector has shown an upward trend, albeit a slight one. The contributing factors include the strengthening of freshwater and brackish water fish farming, increased marine capture fisheries production, and the growth of the fish processing industry. However, this growth did not continue significantly after 2020 due to limited industrialization and innovation in this subsector.

4. Conclusion

The agricultural sector remained the backbone of the economy before and during the COVID-19 pandemic, although the LQ value decreased by 0.04. Leading subsectors include food crops, horticulture, and livestock, while plantations, forestry, and fisheries are classified as non-leading. Analysis of the LQ and DLQ indices indicates that the agricultural sector, food crops, and horticulture are classified as leading, while plantations and forestry are classified as lagging.

The shift in the agricultural sector's economic structure before and after the pandemic is positive. This suggests that the growth of the agricultural sector and all its subsectors in Central Java is positively influenced by national economic growth and the national agricultural sector.

The growth of the agricultural sector before and after the pandemic is classified as advanced but lagging, or Quadrant II. Before the pandemic, the livestock subsector was classified as advanced, whereas after the pandemic, this classification was occupied by the food crops and horticulture subsectors.

Growth trends in the agricultural sector and its subsectors did not change significantly but tended to decline during the pandemic. The largest declines occurred in the horticulture subsector (-1.180) and the food crops subsector (-1.160). The agricultural sector's contribution to Central Java's economy also declined from 13.4% in 2016 to 11.7% in 2023, although it briefly rose to 12.8% in 2020. Therefore, support for farmers, increased productivity, and the protection of agricultural land are necessary to ensure this sector's potential continues to grow.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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