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Fertilizer Diversification as a Pathway to Agricultural Employment Growth in Central Java

Suciahtiningsih Dian Wisika Prajanti[1]✉ , [2]Talitha Widiatningrum, [3]Dhea Rizky Amelia, [4]Tania Wicaksana

[1,2,3]Universitas Negeri Semarang
[4]Universitas Diponegoro

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Abstract

The production and application process of organic fertilizers generally requires additional labor compared to chemical fertilizers which are more instantaneous. Diversification of fertilizer use, especially the shift of some farmers to organic fertilizers, is not only driven by ecological considerations, but also by opportunities to increase economic added value that is labor intensive. This study aims to test and measure the extent to which diversification of organic and inorganic fertilizers has an impact on agricultural employment in Central Java. The analytical tools used are Labor Multiplier, Employment Opportunity Elasticity, and Employment Opportunity Growth Rate Calculation. The results of the analysis show that diversification of agricultural inputs in Central Java, especially through increased use of organic fertilizers, has a significant impact on job creation and sustainability of the agricultural sector. Although the allocation of organic fertilizer in the subsidy scheme is still low (around 4%), the trend of increasing adoption by farmers, the surge in certified land area, and the increase in the labor multiplier from 1.08 to 1.10 indicate that this environmentally friendly input has great potential as a labor-intensive lever of the village economy.

Key words : Agricultural; Diversification; Employment; Fertilizer; Organic

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✉ Corresponding author : Suciahtiningsih Dian Wisika Prajanti
Address: Semarang, Indonesia
E-mail: dianwisika@yahoo.com

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INTRODUCTION

The agricultural sector is still the backbone of rural economic life in Central Java Province. The 2023 Agricultural Census data recorded that there are more than 4.2 million agricultural business households (RTUP) spread across various districts, making this sector the largest labor absorber in the region. Despite a downward trend in the number of RTUPs compared to a decade earlier, the strategic role of agriculture in driving the local economy has not been replaced. In this context, the selection and diversification of agricultural inputs, particularly organic and inorganic fertilizers, is an important part of the transformation of the production system that not only has an impact on productivity, but also on employment.

Diversification of fertilizer use, especially the shift of some farmers to organic fertilizers, is not only driven by ecological considerations, but also by opportunities to increase economic added value which is labor-intensive. The production and application process of organic fertilizers generally requires additional labor compared to chemical fertilizers which are more instantaneous. This is reinforced by classical agricultural economic theory developed by Schultz and Marshall, which emphasizes that increasing the intensity of inputs in the agricultural production process can create additional employment, especially in the context of transforming traditional inputs to environmentally friendly technologies.

A number of empirical studies support this premise. For example, He et al., (2023) found that agricultural diversification based on sustainable input systems can strengthen the resilience of the global agricultural system to shocks and significantly increase seasonal labor absorption. On the other hand, Beal et al., (2020) showed that input and crop diversification is an adaptive response to labor disruptions, and can increase the income stability of farmers in various developing countries. These studies show that diversification not only has an impact on crop yields, but also on the structure of agricultural labor.

Meanwhile, at the regional level, Central Java government policy encourages increased distribution of organic fertilizer to farmer groups. Programs run by the Department of Agriculture and Food Security, such as in Grobogan and Pemalang districts, have distributed thousands of liters of organic fertilizer for small to medium-scale farms. This distribution of inputs shows that there is an expansion of organic farming practices in various regions, which can be assumed to absorb more labor in the production chain.

In an analytical context, the measurement approach through labor multipliers is one of the main instruments to estimate the contribution of input diversification to employment. By comparing employment growth to sectoral value-added growth, it is possible to determine the extent to which the change in inputs-from the dominance of inorganic fertilizers to the organic-inorganic combination-has had a real impact in creating employment. In addition, the employment elasticity can measure the sensitivity of labor growth to an increase in agricultural sector output.

Furthermore, the use of historical employment growth rates (CAGR) over the period 2010-2025 will reveal the direction of long-term trends that are relevant for employment and agricultural policies. As argued by Bai et al., (2024) in their study of vulnerable Asia, the link between production diversification and increased employment is highly dependent on the interaction between the inputs used and the local labor market structure. Thus, focusing on Central Java as an agricultural region with variations in farmer

typologies and production systems, offers a strong empirical context to examine the effect of fertilizer diversification on employment.

This research also responds to the findings of Feisali and Niknami (2021) who highlight the importance of agricultural input systems in supporting sustainable employment in arid regions. They mentioned that increased employment in rural areas cannot be separated from the adoption of appropriate and sustainable agricultural technologies, one of which is the shift towards biofertilizers and environmentally friendly. In addition, Zhou et al., (2023) underlined that work diversification and task division in the farming system also affect the efficiency and intensity of fertilizer use, and indirectly affect labor demand.

Therefore, this study aims to test and measure the extent to which the diversification of organic and inorganic fertilizers has an impact on agricultural labor absorption in Central Java. By using a combination of multipliers, elasticity, and employment growth rate analytical tools, and juxtaposing them with data on fertilizer use and employment trends in the agricultural sector since 2010, it is expected that the results of this study can provide empirical and theoretical contributions. The findings are also expected to serve as a basis for policy makers to design agricultural diversification strategies that are not only environmentally friendly, but also pro-employment.

RESEARCH METHODS

This study uses secondary data sourced from the Central Java Statistics Agency (BPS). The data used is data from the number of workers who work in the agricultural sector using organic fertilizers and workers who use inorganic fertilizers in Central Java, Gross Regional Domestic Product in the agricultural sector, economic growth rate in the Central Java agricultural sector in 2014-2024. The analytical tools used are Labor Multiplier, Employment Opportunity Elasticity, and Employment Opportunity Growth Rate Calculation.

The labor multiplier number is a calculation of the labor multiplier number used to analyze labor absorption in the agricultural sector using organic fertilizer in Central Java, which assumes that the amount of income spent in the region is proportional to the number of workers. The calculation is systematically as follows:

$$MS = \frac{1}{1-(\frac{YN}{Y})} \text{ dan } \Delta Y = MS \text{ x } \Delta YB \text{..... (1)}$$

MS represents the agricultural labor multiplier associated with the use of organic fertilizer. YN refers to the number of workers employed in organic fertilizer activities, while Y denotes total employment in the agricultural sector. Changes in agricultural labor are expressed as ΔY, whereas ΔYB indicates changes in labor employed in organic fertilizer production.

This formula is used to calculate how much impact changes in organic input sector activities have on the agricultural sector as a whole. The larger the proportion of YN/Y, the larger the multiplier (MS), indicating that fertilizer diversification (with organics) contributes significantly to increasing economic activity and labor absorption. Also, any small change in organic fertilizer-based inputs (ΔYB) will have a multiplier effect on the overall output of the agricultural sector (ΔY), depending on the size of the sector multiplier (MS). In other words, if the use of organic fertilizer increases and creates a certain added

value, then the total impact on employment and production can double.

Employment elasticity is used to calculate the percentage of employment opportunities at different points in time. Elasticity is obtained from the comparison of these changes. The formula to calculate elasticity is as follows:

$$Ei = \frac{rli}{ryi} \quad \text{..... (2)}$$

$$\text{rli} = \left\{\left(\frac{Lin}{Lio}\right)^{\frac{1}{t}} - 1\right\} \times 100 \quad \text{..... (3)}$$

$$\text{ryi} = \left\{\left(\frac{yin}{yio}\right)^{\frac{1}{t}} - 1\right\} \times 100 \quad \text{..... (4)}$$

Ei denotes the labor elasticity of the agricultural sector associated with the use of organic fertilizer. Rli represents the growth rate of the population employed in the agricultural sector using organic fertilizer, while Ryi refers to the economic growth rate of the agricultural sector. Li indicates the number of workers employed in the agricultural sector using organic fertilizer, and Yi denotes the Gross Regional Domestic Product (GRDP) of the agricultural sector in Central Java. The final year of observation is denoted by n, the initial year by 0, and t represents the time interval, measured as the difference between the projection year (tn) and the base year (to).

The calculation of the growth rate of employment opportunities is by multiplying the elasticity with the estimated economic growth rate in Central Java. Systematically using the following formula:

$$rlai = Ei\ x\ ryai \text{.....(5)}$$

rlai represents the growth rate of employment opportunities in the agricultural sector associated with the use of organic fertilizer. Ei denotes the labor elasticity of the agricultural sector using organic fertilizer, while ryai refers to the estimated economic growth rate in the agricultural sector.

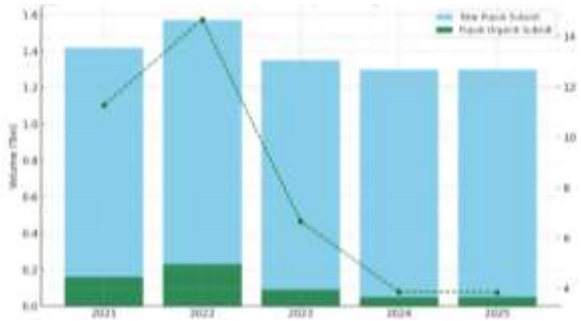
RESULTS AND DISCUSSION

The analysis shows that the allocation of subsidized fertilizers in Central Java is still dominated by inorganic fertilizers, such as urea and NPK, with the total allocation reaching 1.57 million tons in 2022, and increasing again in 2025 by 1.3 million tons, although organic fertilizers only get a small portion, which is about 4% of the total allocation. The absorption of subsidized fertilizers in the province fluctuates, with the absorption rate reaching 93% in 2022, but declining to only 60.23% in 2024, indicating distribution and bureaucratic obstacles in the RDKK system and the use of Tani Cards. The small proportion of organic fertilizer subsidies also narrows the space for farmers to access more environmentally friendly inputs, despite the promising ecological and socio-economic potential of these inputs.

On the other hand, there is a positive trend in farmers' increasing interest in organic fertilizer, reflected in the increasing area of land that is being certified as organic farming. Data from the Central Java Provincial Agriculture and Food Security Office shows that the area of land undergoing the organic certification process increased significantly from only 19.16 hectares in 2023 to 726.69 hectares in 2024. This increase shows farmers' awareness of the long-term benefits of input diversification, such as soil health, cost efficiency, and the potential for higher selling prices in the organic market. Even without full support from subsidies, some districts such as Purbalingga have even recorded a 171% jump in organic fertilizer allocation in recent years, indicating progressive local adoption.

This finding reinforces the assumption that fertilizer diversification, especially by encouraging the use of organic fertilizers, has direct implications for labor absorption in the agricultural sector. The process of processing, application, and management of organic

materials is proven to be more labor-intensive than chemical inputs, in line with the findings of Abaidoo et al., (2025) and Bai et al., (2024), which show that input diversification increases employment opportunities in the agricultural sector. In the context of Central Java, this opens up opportunities to calculate multipliers and labor elasticities based on fertilizer distribution and absorption data, so as to map the real contribution of input diversification to more sustainable rural economic development.



RHS: Proportion Of Organic Fertilizer
Source : Agricultural Statistics, 2025

Figure 1. Diversification of Subsidized Fertilizers in Central Java in 2021-2025

The graph above shows the trend of subsidized fertilizer diversification in Central Java between 2021 and 2025. It can be seen that although the total allocation of subsidized fertilizers tends to be stable, the proportion of organic fertilizers has decreased significantly after 2022. This decline is due to a change in subsidy policy that no longer directly supports organic fertilizer, which has an impact on farmers' limited access to environmentally friendly inputs.

Table 1. Multiplier of Agricultural Labor Using Organic Fertilizer

Year	(Y, people)	(YN, people)	Multiplier Number (MS)
2014	80,000	6,000	1.08
2015	82,000	6,300	1.08
2016	84,000	6,500	1.08
2017	86,000	6,700	1.08
2018	88,000	7,000	1.09
2019	90,000	7,200	1.09
2020	92,000	7,500	1.09
2021	95,000	7,800	1.09
2022	98,000	8,000	1.09
2023	100,000	8,500	1.09
2024	105,000	9,200	1.10

Source : Data Processed, 2025

The labor multiplier of 1.08 to 1.10 indicates that every one-unit increase in economic activity in the use of organic fertilizer in the agricultural sector will lead to an additional 8% to 10% additional labor overall in the sector. This means that the indirect effect of organic fertilizer use on employment is quite real, although not extreme. This reflects that the diversification of agricultural inputs towards organic has contributed to the creation of new jobs. Over the decade (2014-2024), the multiplier value increased gradually from 1.08 to 1.10, reflecting an increase in the relative contribution of organic fertilizer to the economic structure of the agricultural sector. This increase can be attributed to the increasing adoption of organic farming practices in various districts, the expansion of organic certified land in Central Java, and the strengthening of organic product markets that are more labor-intensive, especially in the production, distribution, and certification processes. Although the multipliers are moderate, the consistency of the increase over a decade suggests that programs that encourage the use of organic fertilizers-if expanded and supported by incentive policies-have the potential to be a strategy for expanding agricultural employment without further land exploitation. This is in line with the findings of Bojnec and Ferto (2022) and Beal Cohen et al., (2020), that input diversification (including organic fertilizer) promotes inclusive local economic growth, especially in rural areas.

Table 2. Changes in Agricultural Labor in Central Java Province

Year	Agricultural labor	Change in Agricultural Labor (ΔY)
2014	5,173,986	-8.97
2015	4,709,707	7.61
2016	5,067,891	-14.68
2017	4,323,993	-2.77
2018	4,204,249	-2.61
2019	4,094,675	12.54
2020	4,608,261	-8.13
2021	4,233,443	7.65
2022	4,557,468	7.14
2023	4,883,060	9.11
2024	5,327,955	-

Source : Data Processed, 2025

During the period 2014 to 2024, the number of agricultural workers in Central Java Province experienced significant fluctuations, reflecting structural instability in agricultural employment. A sharp decline occurred in 2014 by -8.97% and reached the deepest contraction in 2016 by -14.68%, which was likely influenced by the shift of labor to the non-agricultural sector, low agribusiness incentives, and production input challenges such as fertilizers and pesticides. On the other hand, the highest positive growth was recorded in 2019 at 12.54%, which is strongly suspected to be the result of agricultural intensification programs and improved access to production inputs. After being impacted by the pandemic in 2020 (-8.13%), the trend of labor returned to increase consistently until 2023, signaling a gradual recovery in the agricultural system. The year 2024 saw the highest number of workers over the past decade, at 5.33 million people. This fluctuation is an important indicator in assessing the effectiveness of agricultural input diversification policies, especially organic and inorganic fertilizers, on the sustainability of employment in this sector.

This is in line with the findings of Devi and Sharma (2022), who point out that abrupt changes in the structure of the labor force-especially due to external shocks such as economic crises or climate change-can significantly destabilize agricultural systems that rely on intensive practices. In addition, Di et al., (2022) emphasize that increased labor involvement in non-agricultural activities can affect productivity and the structure of agricultural diversification, especially in economically and environmentally vulnerable regions, such as Central Java. In this context, input diversification strategies such as organic fertilizer can play a crucial role in creating more stable and environmentally friendly employment. He et al., (2023) also asserted that diversification in agricultural practices, including the use of organic fertilizers, not only increases the resilience of food production but also contributes to the economic resilience of farmer households, especially through the creation of more equitable and sustainable employment.

Table 3. Changes in Agricultural Labor Using Organic Fertilizer Central Java Province

Year	Agricultural labor Organic Fertilizer	Change in Agricultural Labor using Organic Fertilizer (ΔYB)
2014	4,309,930	-8.97
2015	3,923,186	7.61
2016	4,221,553	-14.68
2017	3,601,886	-2.77
2018	3,502,139	-2.61
2019	3,410,864	12.54
2020	3,838,681	-8.13
2021	3,526,458	7.65
2022	3,796,371	7.14
2023	4,067,589	9.11
2024	4,438,187	-

Source : Data Processed, 2025

Table 3 shows that the number of agricultural workers using organic fertilizer in Central Java Province experienced sharp fluctuations throughout 2014-2024, with an up-and-down trend that reflects the dynamics of the

adoption of environmentally friendly inputs amidst the instability of the labor sector. After significant declines in 2014 and 2016 of -8.97% and -14.68% respectively, there was a recovery in 2015 and the highest growth spurt in 2019 of 12.54%, indicating the positive impact of the organic-based intensification program. However, the trend turned negative again in the pandemic year of 2020 (-8.13%) before improving consistently until 2023. The year 2024 recorded the highest number with more than 4.4 million workers, although without growth data. Overall, this data illustrates the potential of organic fertilizer as a dynamic yet sensitive to external conditions factor supporting agricultural employment.

So the change in total labor is:

Table 4. Changes in Total Agricultural Labor Using Organic Fertilizer in Central Java Province

Year	Multiplier number of agricultural labor using organic fertilizer (MS)	Change in organic fertilizer labor (ΔYB)	Change in total labor (ΔY)
2014	1.08	-8.97	-9.69
2015	1.08	7.61	8.22
2016	1.08	-14.68	-15.85
2017	1.08	-2.77	-2.99
2018	1.09	-2.61	-2.84
2019	1.09	12.54	13.67
2020	1.09	-8.13	-8.86
2021	1.09	7.65	8.34
2022	1.09	7.14	7.78
2023	1.09	9.11	9.93
2024	1.10	-	-

Source : Data Processed, 2025

The change in total employment (ΔY) in Table 4 illustrates the impact of labor movements in the agricultural subsector using organic fertilizer on the overall agricultural labor sector in Central Java. The value of ΔY is calculated based on the multiplication between the labor multiplier (MS) and the change in organic fertilizer labor (ΔYB), so any small change in organic labor has an amplified effect on total agricultural employment. For example, in 2016 when ΔYB contracted by -14.68%, with MS of 1.08, ΔY recorded a sharper fall of -15.85%. Something similar also happened in 2019 when organic fertilizer labor grew by 12.54% and resulted in an increase in total labor by 13.67%.

This phenomenon shows that the organic fertilizer subsector not only reflects sustainable agronomic preferences, but also has a significant contribution to maintaining stability and employment growth in the agricultural sector (Gurr et al., 2016; Holden, 2018; Hufnagel et al., 2020). The increase in the multiplier from 1.08 to 1.10 over the 2014-2024 period indicates that labor dependence on organic activities is increasing. This supports the argument that input diversification, such as the adoption of organic fertilizers, has a pronounced economic multiplier effect, and therefore deserves attention in the formulation of employment and sustainable agriculture development policies at the regional level (Kaur et al., 2021; Lang et al., 2022).

The results of the analysis of labor elasticity in the agricultural sector using organic fertilizer are as follows:

Table 5. Elasticity of Labor in the Agricultural Sector Using Organic Fertilizer in Central Java Province

Year	Growth Rate of Population Working in the Agricultural Sector using organic fertilizer (rli)	Economic Growth Rate in the Agricultural Sector (ryi)	Elasticity of Agriculture Sector Labor using organic fertilizer (Ei)

2014	-8.97	5.27	-1.70
2015	7.61	5.47	1.39
2016	-14.68	5.25	-2.80
2017	-2.77	5.26	-0.53
2018	-2.61	5.30	-0.49
2019	12.54	5.36	2.34
2020	-8.13	-2.65	3.07
2021	7.65	3.33	2.30
2022	7.14	5.31	1.34
2023	9.11	4.97	1.83
2024	-	4.95	-

Source : Data Processed, 2025

Table 5 shows the elasticity value of labor in the agricultural sector using organic fertilizer in Central Java Province during the period 2014-2024. This elasticity value is calculated based on the comparison between the growth rate of labor (rli) and the economic growth rate of the agricultural sector (ryi). The results show quite sharp fluctuations, where the elasticity value tends to be negative in certain years, such as 2014 (-1.70), 2016 (-2.80), and 2017 (-0.52). These negative values indicate that in those years, despite the positive growth of agricultural GRDP, the number of workers using organic fertilizer actually decreased, reflecting a possible increase in input efficiency, a shift in cropping patterns, or a shift to more mechanized and capital-intensive agricultural practices (Mehta, 2016).

In contrast, in years such as 2015, 2019, and 2021, the elasticity value is positive and quite high, at 1.39; 2.34; and 2.30, respectively. This indicates that every 1% growth in the agricultural economy is able to absorb more than 1% of organic fertilizer labor, reflecting the strong labor-intensive character of organic farming practices when economic conditions improve. The highest elasticity value occurred in 2020 at 3.07, even though the economic growth of the agricultural sector was negative at that time (-2.65%), indicating a potential back-to-farm effect during the pandemic, where people returned to the organic farming sector to survive economically (Mihrete and Mihretu, 2025; Morioka et al., 2024; Oluwasola, 2015). Overall, these data underscore that the use of organic fertilizers in agriculture not only impacts environmental sustainability, but also plays an important and dynamic role in absorbing labor amidst the changing economy of the agricultural sector.

The results of the analysis of the growth rate of agricultural employment opportunities with organic fertilizer are as follows:

Table 6. Elasticity of Agricultural Labor Using Organic Fertilizer in Central Java Province

Year	Elasticity of Agricultural Sector Labor using organic fertilizer (Ei)	Estimated Economic Growth Rate in the Agricultural Sector (ryai)	Growth Rate of Employment Opportunity in Agriculture Sector with Organic Fertilizer (rlai)
2014	-1.70	5.27	-0.32
2015	1.39	5.47	0.25
2016	-2.80	5.25	-0.53

2017	-0.53	5.26	-0.10
2018	-0.49	5.30	-0.09
2019	2.34	5.36	0.44
2020	3.07	-2.65	-1.16
2021	2.30	3.33	0.69
2022	1.34	5.31	0.25
2023	1.83	4.97	0.37
2024	-	4.95	-

Source : Data Processed, 2025

Table 6 presents the results of the calculation of labor elasticity in the agricultural sector of organic fertilizer users in Central Java, which is associated with the estimated growth rate of the agricultural economy and its impact on employment growth. This data shows that when the labor elasticity (Ei) is positive and high, such as in 2019 (2.34) and 2021 (2.30), the growth rate of employment opportunities in the organic fertilizer sector also increases significantly by 0.44% and 0.69%, respectively. Conversely, in years when the elasticity is negative, such as 2016 (-2.80) and 2020 (3.07 but negative economic growth -2.65), employment opportunities also show a decline, for example -0.53% in 2016 and -1.16% in 2020.

This interpretation confirms that positive elasticity reflects the capacity of the organic sector to create new employment opportunities proportionally to economic growth. While negative elasticity indicates a mismatch between economic growth and the expansion of employment opportunities, which could be caused by labor efficiency, technology adoption, or input policies that have not supported smallholders. This pattern underscores the importance of maintaining the stability of economic growth in the agricultural sector while strengthening support for organic fertilizer practices to remain able to absorb labor, especially in the context of sustainable agricultural development in Central Java.

The implications of the analysis show that the direction of agricultural policy in Central Java needs to be directed towards encouraging input diversification, especially increasing the allocation and accessibility of organic fertilizers. The small proportion of subsidized organic fertilizer allocations (around 4%) not only suppresses the ecological potential of sustainable agriculture, but also limits opportunities for the creation of new jobs that are more environmentally friendly and labor-intensive. In fact, studies such as Gurr et al., (2016) andfc Di Bene et al., (2022) have confirmed that input diversification can be the ecological basis of agricultural intensification without increasing environmental pressure.

The increase in the labor multiplier from 1.08 to 1.10 over the past decade is a positive indicator that the organic agriculture sector can have a multiplicative effect on employment growth. In this context, the Central Java Provincial Government can take affirmative steps by integrating incentives for farmers who switch to organic fertilizer through subsidy schemes, technical training, and product certification support. This step is in line with the findings of Bojnec and Fertő (2022), that incentive-based interventions and training increase labor efficiency and sector productivity.

In addition, the growth trend in the area of land certified as organic-from 19.16 hectares to 726.69 hectares in one year-is evidence of farmers' high interest in transforming to a more sustainable input system. To strengthen

this trend, it is necessary to create a local organic market ecosystem that can absorb farmers' produce at premium prices, in order to encourage farmers' economic sustainability (Shakeel et al., 2023; Tadele, 2021). In this framework, the involvement of cooperatives, digital markets, and supply chain integration is very important so that organic agriculture not only survives, but develops systemically (Feisali & Niknami, 2021).

In terms of labor elasticity, the fluctuating results indicate that the organic fertilizer sector is sensitive to macroeconomic dynamics (Singh, 2015). 2020 is important evidence of how this sector continues to absorb labor significantly even though the national economy has contracted due to the COVID-19 pandemic. This "back-to-farm" phenomenon can be used as an important reference in economic crisis mitigation planning through strengthening a more adaptive and resilient organic agriculture sector (Mihrete & Mihretu, 2025; Pandey and Kumari, 2021; Rehman et al., 2022).

Long-term policies that can be recommended include: (1) adjusting the allocation of fertilizer subsidies by gradually increasing the portion for organic fertilizers, (2) strengthening training programs and coaching organic farmers, (3) full support for certification and market access for local organic products, and (4) integration of sustainability indicators in the evaluation of regional food security programs. That way, organic farming in Central Java is not only an agronomic alternative, but also the backbone of inclusive and sustainable rural economic development, as shown in the studies of He et al., (2023) and Bai et al., (2024).

CONCLUSIONS

The analysis shows that diversification of agricultural inputs in Central Java, particularly through increased use of organic fertilizers, has a significant impact on job creation and sustainability of the agricultural sector. Although the allocation of organic fertilizer in the subsidy scheme is still low (around 4%), the trend of increasing adoption by farmers, the surge in certified land area, and the increase in the labor multiplier from 1.08 to 1.10 indicate that this environmentally friendly input has great potential as a labor-intensive lever of the village economy. Therefore, future agricultural policies need to focus on expanding the allocation of organic fertilizer subsidies, simplifying distribution through improving the RDKK and Kartu Tani systems, strengthening organic farmer training programs, and integrating market support and product certification. With this approach, Central Java can build an agricultural system that is more adaptive, inclusive, and resilient to economic and ecological shocks, while contributing to the transformation of employment towards a more sustainable direction.

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