Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

Analysis of Superior Vegetable Horticultural Commodities in Karo Regency, North Sumatra Province

Monica Indah Br. Lumban Batu[1], Angga Dwi Kelana Putra[2], Matius Bangun[3]
[1,2,3]*Universitas Darma Agung, Medan, Indonesia*
Corresponding email: monicaindahlb@gmail.com[1], anggahrp2806@gmail.com[2], mbresearch28@gmail.com[3]

Received: 2026-10-26
Accepted: 2026-11-04
Publication: 2026-11-09

Abstract
Developing leading horticultural commodities is an important strategy for improving agribusiness competitiveness, farmers' income, and regional economic growth. Karo Regency, North Sumatra Province, has substantial vegetable production potential; however, a comparative assessment is needed to identify commodities with relative advantages and competitive strength. This study aimed to identify base commodities, assess their relative advantages, and evaluate the competitiveness of vegetable horticultural commodities in Karo Regency. The research was conducted from June to August 2026 using secondary production data for the 2019–2025 period obtained from the Central Statistics Agency of Karo Regency and North Sumatra Province. Data were analysed using the Location Quotient (LQ) method to identify base commodities and Shift-Share Analysis (SSA), particularly the Differential Shift (DS) component, to assess relative competitiveness. The results revealed that shallots, curly chilli peppers, carrots, cabbage, tomatoes, potatoes, mustard greens, cauliflower, green beans, and eggplants were classified as base commodities across various subdistricts. The DS analysis indicated positive competitiveness for potatoes, shallots, and tomatoes. Integrating the LQ and DS results identified potatoes and tomatoes as the most consistent priority commodities because they demonstrated both base advantages and positive competitiveness. Therefore, prioritise their development through productivity improvements, more efficient farming practices, and stronger marketing systems to support sustainable horticultural development and regional agribusiness competitiveness.

Keywords: Competitiveness; Differential Shift; Leading Commodities; Location Quotient

Introduction

The agricultural sector plays a strategic role in the economy because it creates a large number of jobs, increases farmers' household income, and supports regional economic growth through the production of key commodities. This demonstrates that the agricultural sector serves not only as a production sector but also as a key driver of the local economy, particularly in rural areas that still depend on agricultural activities (Arafah, 2025).

Horticulture, particularly vegetable production, is one agricultural subsector with considerable potential for development. Vegetables contribute to food and nutritional needs, provide income for farmers, and generate economic activity through production, collection, distribution, and marketing. Nevertheless, horticultural production potential does not automatically translate into higher farm income. Farm scale, seasonal production, market access, input-use efficiency, and marketing channels can influence the economic benefits farmers receive from cultivation. Maspaitella et al., (2018) , in their study of smallholder vegetable farmers in Indonesia, highlighted the importance of connecting farmers with high-value markets. Similarly, Karo-Karo et al., (2021) , examining cabbage farming in Karo Regency, found that the farmers included in their study had not achieved allocative and economic efficiency. These findings indicate that

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

horticultural development requires consideration not only of production potential but also of farm economics and efficiency.

Data from the Karo Regency Central Statistics Agency, published in Karo Regency in Figures 2024, shows that the horticulture subsector plays a significant role in the region's agricultural potential. This is evident from the high production levels of several highland vegetable commodities, particularly cabbage, tomatoes, carrots, and potatoes, which are key commodities in Karo Regency. In 2023, cabbage production totaled 1,460,215 quintals, while tomato production reached 1,424,025 quintals. Meanwhile, carrot production reached 1,297,350 quintals and potato production amounted to 844,910 quintals. The high production levels of these various commodities demonstrate that Karo Regency possesses strong horticultural production capacity and has the potential to become one of the leading regions in vegetable production within North Sumatra Province.

Table 1 Production of Annual Vegetables and Fruits by Crop Type in Karo Regency, 2023

No	Comodity	Production 2023 (Quintals)
1.	Cabbage	1.460.215
2.	Tomato	1.424.025
3.	carrot	1.297.350
4.	Potato	844.910
5.	Curly Chilli	702.897
6.	Cabbage/Chinese cabbage	561.275
7.	Cauliflower	492.827
8.	Bawang Merah	217.984
9.	Green Beans	215.946
10.	Aubergine	204.020

Source : BPS Of Karo Regency 2024

For regional agricultural planning, identifying leading commodities is essential because regions differ in their production structures, resources, and growth patterns. A commodity with a high production volume does not necessarily have a relative advantage over the reference region, while a commodity with a relative advantage may not exhibit more progressive growth. Therefore, commodity assessment should not rely solely on current production volume or contribution; it should also consider relative specialization and performance over time. Azmi et al., (2025) identified leading vegetable commodities in West Sumatra using the Location Quotient (LQ) and Shift-Share Analysis (SSA), while Hikmah et al., (2025) applied these approaches to map priority horticultural commodities in South Sulawesi. These studies demonstrate the relevance of data-driven analysis for distinguishing commodities with a strong production base from those with more favorable relative growth dynamics.

Saragi et al., (2025) also identified agriculture, forestry, and fisheries as a leading sector in Karo Regency's economic structure. However, identifying a leading sector at an aggregate economic level does not automatically establish which vegetable commodities have both a relative production advantage and progressive growth. The central research problem is how to distinguish commodities that merely have high production volumes from those that should be prioritized based on their relative position and growth dynamics. If local policy relies exclusively on production volume, it may overlook whether a commodity has strong relative specialization or whether its growth outperforms that of the same commodity at the provincial level. Conversely, if policy considers growth alone, a rapidly growing commodity may still lack a strong production base in Karo Regency. An analytical approach that combines relative advantage and commodity

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

growth is therefore needed. LQ can identify commodities whose share in the local production structure exceeds their share in the reference region, while SSA can assess differences in commodity performance across regions (Azmi et al., 2025; Hikmah et al., 2025)

Methodologically, Location Quotient measures a commodity's relative specialization by comparing its share in the production structure of the study area with its share in the reference area. An LQ value greater than one indicates that the commodity has a stronger relative concentration or production base in the study area. However, LQ is a measure of relative position; it does not directly demonstrate high productivity, profitability, or guaranteed market competitiveness. To complement this information, Shift-Share Analysis examines changes in commodity performance in relation to growth in the reference area and the differential growth component. A positive Differential Shift (DS) indicates that the commodity's growth in the study area exceeds the growth of the same commodity in the reference area, subject to the specific model and observation period used. Methodological research emphasizes that shift-share results must be interpreted according to the components calculated and should not be treated as a single measure that fully explains the causes of regional growth (Montanía et al., 2023)

The urgency of this study lies in the need to identify leading vegetable horticultural commodities as an empirical basis for establishing regional agricultural development priorities in Karo Regency, North Sumatra, Indonesia. Although previous studies have applied Location Quotient (LQ) and Shift-Share analysis to identify leading commodities, they differ in geographical coverage, commodity focus, and analytical approaches (Azmi et al., 2025; Hikmah et al., 2025; Dwiyantoro et al., 2023). Therefore, an empirical assessment that specifically integrates production specialization and relative growth performance of vegetable commodities in Karo Regency remains necessary. This gap provides the rationale for the present study, whose novelty lies in integrating Location Quotient (LQ) and Differential Shift (DS) analyses within a single analytical framework to classify commodities according to their production-base status and relative growth advantage.

Accordingly, the study entitled “Analysis of the Potential of Leading Vegetable Horticultural Commodities in Karo Regency, North Sumatra Province” aims to: (1) identify vegetable horticultural commodities classified as base commodities in Karo Regency using LQ analysis; (2) analyze the relative growth dynamics of vegetable commodities using the Differential Shift component of SSA; and (3) integrate the two sets of results to identify commodities with both a strong relative production base and progressive growth. The findings are expected to provide more targeted information for local governments, agricultural extension officers, and other stakeholders in establishing data-driven development priorities. Further investment and policy decisions should (Talita Ardhini, 2026) nevertheless consider additional information on productivity, production costs, prices, marketing, and farm sustainability (Azmi et al., 2025; Hikmah et al., 2025; Montanía et al., 2023)

Literatur Review

Regional economic specialization provides an analytical basis for identifying agricultural commodities with relatively strong production positions in a particular region. The economic base approach distinguishes base commodities from non-base commodities according to their relative concentration compared with a broader reference region. In agricultural development, identifying specialized commodities is important for establishing regional development priorities and allocating resources based on local production potential. However, production specialization alone does not necessarily indicate higher profitability, efficiency, or market competitiveness.

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

The Location Quotient (LQ) method measures the relative concentration of a commodity in a region compared with a reference region. An LQ value greater than one indicates a base commodity, whereas a value below one indicates a non-base commodity. Nevertheless, LQ captures relative production specialization rather than commodity growth dynamics. Therefore, it can be complemented by Shift-Share Analysis (SSA), particularly the Differential Shift (DS) component, which evaluates whether a commodity's proportional production growth in a region exceeds that of the same commodity in the reference region. A positive DS indicates relatively favorable differential growth, whereas a negative value indicates comparatively weaker growth.

Previous studies have applied these methods in different regional contexts. Azmi et al. (2025) analyzed leading vegetable commodities across regencies and cities in West Sumatra using LQ and Shift-Share Analysis. Hikmah et al. (2025) integrated both approaches to identify priority horticultural commodities in South Sulawesi, while Dwiyantoro et al. (2023) combined LQ, Dynamic Location Quotient (DLQ), and Shift-Share Analysis to examine horticulture-based regional development in Banyuwangi Regency. These studies demonstrate the value of combining specialization and growth indicators to classify regional agricultural commodities.

Despite these contributions, differences in geographical coverage, commodity composition, observation periods, and analytical specifications limit the generalization of previous findings to Karo Regency. This study addresses the need for a location-specific assessment by integrating LQ and DS to identify vegetable commodities that combine relative production specialization with positive differential growth. The empirical results identify potatoes and tomatoes as base commodities with positive DS values, indicating relatively strong production specialization and favorable differential growth compared with the reference region. These findings provide an empirical basis for prioritizing vegetable horticulture development in Karo Regency, although profitability, production efficiency, and market competitiveness require further investigation using complementary economic analyses.

Research Method

Horticulture is one of the agricultural sub-sectors, encompassing vegetables, fruit, floriculture and biopharmaceuticals. Horticultural commodities play a vital role in food security, meeting the nutritional needs of the population, and enhancing the added value and competitiveness of the agricultural sector. In terms of development, vegetables are one of the horticultural commodity groups receiving particular attention, as they are linked to meeting food needs and the rising consumer demand for fresh vegetable products (Ardhini, 2026).

This study employed a quantitative method with a descriptive approach to analyse the potential of key vegetable horticultural commodities in Karo Regency, North Sumatra Province. The research location was selected purposively, given that Karo Regency is one of the vegetable production centres in North Sumatra Province, supported by geographical and agroclimatic conditions suitable for the development of horticultural crops. The data used were secondary data in the form of vegetable production figures for Karo Regency and North Sumatra Province for the period 2019–2025. The data were obtained from publications by the Central Statistics Agency (BPS) of Karo Regency and the BPS of North Sumatra Province, specifically Karo Regency in Figures, North Sumatra Province in Figures, and relevant horticultural statistics publications.

A descriptive approach was used to describe the status and development of vegetable crops in Karo Regency based on the secondary data obtained. Location Quotient (LQ) analysis was used to identify staple commodities by comparing production proportions in Karo Regency and North Sumatra Province. An LQ value > 1 indicates a staple commodity, whilst an LQ value < 1 indicates a non-staple commodity (Hendayana, 2003).

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

Shift-Share Analysis (SSA) is used to analyse the growth and competitiveness of vegetable crops in Karo Regency compared with North Sumatra Province. The results of the LQ and SSA analyses are interpreted together to identify commodities that possess a comparative advantage and competitiveness. This study utilises LQ and SSA to analyse leading vegetable commodities and their competitiveness (Azmi et al., 2025)

Data collection was carried out using documentation and literature review techniques. The documentation technique involved collecting and compiling production data by commodity type, region and year of observation. The literature review was conducted by examining books, scientific articles and previous research relevant to the key commodities and the analytical methods used. The commodities analysed included potatoes, cabbages, carrots, tomatoes, chillies, spring onions and other vegetable commodities for which comparable production data were available in both regions during the study period.

The LQ and DS results were interpreted jointly to classify commodities according to their production specialization and relative growth performance. Commodities with LQ values greater than one and positive DS values were identified as base commodities with favourable differential growth, making them potential priorities for further development. However, this classification represents an initial assessment of regional production specialization and relative growth rather than definitive evidence of economic competitiveness.

The interpretation of DS is subject to several limitations. First, the results depend on the selected observation period and the provincial reference area. Second, positive DS indicates that a commodity's proportional production growth in Karo Regency exceeded that of the same commodity in North Sumatra Province; it does not independently establish higher productivity, profitability, production efficiency, or market competitiveness. Third, changes in production may reflect several factors, including cultivated area, weather conditions, input availability, technology adoption, and changes in agricultural practices. Therefore, the combined LQ–DS analysis provides a comparative basis for identifying potential leading commodities, while a more comprehensive assessment of competitiveness would require additional indicators, such as production costs, farm income, productivity, prices, and market performance.

Data analysis was carried out using the Location Quotient (LQ) method and the Differential Shift (DS) component of the Shift-Share analysis. The LQ method was used to identify vegetable commodities falling into the ‘base’ category by comparing the proportion of production in Karo Regency with the proportion of production of the same commodities in North Sumatra Province. The LQ formula used refers to the approach by (Hendayana, 2003) , namely:

$$LQ = \frac{\left(\frac{p_i}{p_t}\right)}{\left(\frac{P_i}{P_t}\right)}$$

Keterangan:

(p_i) = production of the (i)-th vegetable commodity in Karo Regency;

(p_t) = total production of all vegetable commodities analysed in Karo Regency;

(P_i) = production of the (i)-th vegetable commodity in North Sumatra Province; and

(P_t) = total production of all vegetable commodities analysed in North Sumatra Province.

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

An LQ value > 1 indicates that the commodity is classified as a base commodity because it has a relatively higher concentration of production compared to the provincial level. An LQ value = 1 indicates an equivalent concentration of production, whilst an LQ value < 1 indicates that the commodity is classified as a non-base commodity ((Hendayana, 2003).

Furthermore, the Differential Shift (DS) analysis was used to determine the relative growth advantage of vegetable production in Karo Regency compared with the growth of the same commodities in North Sumatra Province. The formula used is:

$$DS = Yij\ (rij - rin)$$

Keterangan:

(DS) adalah nilai *Differential Shift*;

(Y_{ij}) = production of the i-th vegetable commodity in Karo Regency in the base year;

(r_{ij}) = the rate of growth in production of the i-th commodity in Karo Regency; and

(r_{in}) = the rate of growth in production of the i-th commodity in North Sumatra Province.

A DS value > 0 indicates that the growth in production of the commodity in Karo Regency is higher than that of the same commodity at the provincial level. A DS value = 0 indicates equivalent relative growth, whilst a DS value < 0 indicates lower production growth compared to the provincial level.

The results of the LQ and DS analyses were then interpreted jointly to identify vegetable commodities with relatively high production concentrations and relative growth advantages. These results were used as the basis for formulating development guidelines for priority horticultural vegetable commodities in Karo Regency, North Sumatra Province.

Operational definitions of variables provide a detailed description of the variables used in the study so that each variable can be clearly measured, identified and analysed in the form of quantitative data. In this study, variables were used to identify priority horticultural vegetable commodities in Karo Regency using a Location Quotient (LQ) approach based on secondary data obtained from the Central Statistics Agency (Abdullah et al., 2021)

The formulation of operational definitions for variables is essential to prevent differences in interpretation of the variables used in the research. Furthermore, operational definitions also form the basis for data processing, analytical calculations and the interpretation of research findings, ensuring that all stages of the analysis can be carried out systematically, consistently and in line with the research objectives.

Results and Discussion

The identification of leading horticultural commodities in Karo Regency was carried out to determine which commodities possess a comparative advantage over similar commodities in North Sumatra Province. The analysis was conducted using the Location Quotient (LQ) method, based on production data for the period 2019–2025. Commodities with an LQ value greater than one (LQ > 1) were categorised as base commodities as they exhibit a relatively higher level of production specialisation compared to the reference region. Based on the results of the 2025

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

analysis, ten sub-districts with the highest LQ values were selected to illustrate the potential for horticultural commodity development in Karo Regency.

The analysis results show that there are variations in LQ values between sub-districts and across years, indicating differences in the potential and level of horticultural agribusiness development in each area. These differences demonstrate that each sub-district has distinct production characteristics and flagship commodities. Location Quotient (LQ) analysis can be used to identify base commodities based on a region's relative level of specialisation compared to a reference region (Judhaswati, 2025).

Based on the LQ analysis of 17 sub-districts in Karo Regency over the 2019–2025 period, leading horticultural commodities exhibit different patterns across regions and vary from year to year. Commodities with an LQ value greater than one indicate a relatively higher level of production specialization than the reference region and can therefore be classified as base or leading commodities (Azmi et al., 2025)

Overall, ten horticultural commodities were identified as base commodities in several sub-districts: shallots, curly red chili peppers, carrots, cabbage, tomatoes, potatoes, Chinese cabbage/mustard greens, cauliflower, green beans, and eggplant. Shallots and curly red chili peppers tend to be prominent in Mardingding, Laubaleng, Tigabinanga, Kuta Buluh, Payung, and Tiganderket. Meanwhile, carrots, cabbage, potatoes, Chinese cabbage/mustard greens, and cauliflower are more frequently identified as base commodities in highland areas, including Simpang Empat, Naman Teran, Merdeka, Kabanjahe, Berastagi, Tigapanah, and Barusjahe. These differences indicate the presence of regional specialization in horticultural production, which can serve as a basis for determining priority areas for the development of leading commodities (Hikmah et al., 2025).

The relative advantages of several commodities are also reflected in their high LQ values. In 2025, the highest LQ value was recorded for green beans in Simpang Empat Sub-district, at 43.45, followed by shallots in Laubaleng Sub-district, at 13.63; curly red chili peppers in Tigabinanga Sub-district, at 6.45; and carrots in Barusjahe Sub-district, at 3.99. These values indicate a strong degree of production specialization for specific commodities in their respective sub-districts. Accordingly, these areas have the potential to be developed as production centers for the corresponding commodities.

However, a high LQ value does not necessarily indicate that a commodity has high competitiveness. LQ measures the relative advantage or degree of production specialization of a commodity within a particular region, whereas Shift-Share Analysis is used to identify commodity growth and relative competitive performance compared with the reference region.

Following the identification of leading commodities through LQ analysis, a further analysis was conducted to assess the potential advantages of horticultural commodities in Karo Regency by examining production growth in Karo Regency relative to that in North Sumatra Province. The results of this analysis are presented in Table 2 berikut:

Table 2 Sub-districts with the Highest LQ Scores for Horticultural Commodities in Karo Regency in 2025

No.	Sub District	Key Commodities	Nilai LQ
1.	Simpang Empat	Green Beans	43,45
2.	Laubaleng	Red Onion	13,63
3.	Tiga Binanga	Curly Chilies	6,45

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

4.	Tiganderket	Green Beans	5,94
5.	Kuta Buluh	Curly Chilies	5,80
6.	Payung	Red Onion	5,38
7.	Munte	Green Beans	4,44
8.	Barus Jahe	Carrot	3,99
9.	Berastagi	Potatoes	3,47
10.	Merdeka	Cauliflower	3,38
11.	Naman teran	Cauliflower	2,54

Source: Processed research data, 2026

Based on Table 2 Simpang Empat Sub-district recorded the highest LQ value for green beans, at 43.45. This value indicates that green beans have a very high degree of relative production specialization in this sub-district compared with the reference region. Laubaleng Sub-district ranked second, with an LQ value of 13.63 for shallots. Meanwhile, Tiganderket Sub-district recorded an LQ value of 5.94 for green beans, followed by Kuta Buluh Sub-district, with an LQ value of 5.80 for curly red chili peppers, and Payung Sub-district, with an LQ value of 5.38 for shallots.

These findings indicate that base commodities vary across sub-districts. Green beans are prominent in Simpang Empat, Tiganderket, and Munte Sub-districts. Shallots are notable base commodities in Laubaleng and Payung Sub-districts, whereas curly red chili peppers have a high LQ value in Kuta Buluh Sub-district. Meanwhile, carrots, potatoes, and cauliflower are prominent base commodities in Barusjahe, Berastagi, Merdeka, and Naman Teran Sub-districts.

The differences in LQ values indicate that horticultural development in Karo Regency should consider the characteristics and production specialization of each sub-district. Sub-districts with high LQ values may be considered priority areas for developing the corresponding commodities. However, LQ only reflects relative advantage or production concentration and does not directly indicate farm profitability or market competitiveness. Therefore, the identification of base commodities should be complemented by Differential Shift (DS) analysis to determine the relative growth of commodities in Karo Regency compared with North Sumatra Province.

Potential Competitive Advantages of Horticultural Commodities in Karo Regency

The potential competitive advantages of horticultural commodities are analyzed using LQ and Differential Shift (DS) values. LQ analysis is used to determine the base status of each commodity, while DS analysis assesses whether the production growth of a commodity in Karo Regency was relatively faster or slower than that of the same commodity in North Sumatra Province during the 2019–2025 period. The combined results of these two analyses provide a basis for distinguishing base commodities with positive relative growth from those that still require further development.

Table 3 Results of the LQ and Differential Shift Analyses of Horticultural Commodities in Karo Regency

No.	Comodity	Value LQ	State LQ	Value DS	Interprestasi
1.	Red Onion	0,5251	Nonbasis	160.963,85	Relatively positive growth
2.	Cirly Chilies	0,5382	Nonbasis	0,00	There is no difference in relative growth

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

3.	Carrot	1,4564	Basis	-20.723,34	Relatively negative growth
4.	Cabbage	1,0325	Basis	-706,14	Relatively negative growth
5.	Tomato	1,1285	Basis	109.991,61	Relatively positive growth
6.	Potato	1,1502	Basis	178.168,09	Relatively positive growth
7.	Cabbage/Chinese cabbage	1,0672	Basis	-38.215,29	Relatively negative growth
8.	Cauliflower	1,3749	Basis	-31.261,30	Relatively negative growth
9.	Green Beans	0,7451	Nonbasis	-142.356,43	Relatively negative growth
10.	Aubergine	0,5609	Nonbasis	-190.860,92	Relatively negative growth

Source: Processed research data, 2026.

The combined Location Quotient (LQ) and Differential Shift (DS) results reveal distinct patterns of production specialization and relative growth among vegetable commodities in Karo Regency. These differences indicate that a commodity's established position within the regional production structure does not necessarily correspond to stronger growth relative to North Sumatra Province. Therefore, interpreting the results requires consideration of both the existing production base and the commodity's relative growth performance.

The results reveal different patterns of production specialization and relative growth among vegetable commodities in Karo Regency. Potatoes and tomatoes demonstrate the strongest combined position, with LQ values of 1.1502 and 1.1285 and positive DS values of 178,168.09 and 109,991.61, respectively. These results indicate that both commodities are relatively specialized in Karo Regency and experienced faster proportional production growth than the provincial benchmark. Their combined position suggests that they should receive priority consideration in regional horticultural development, particularly through productivity improvement, postharvest management, and market access enhancement.

Shallots exhibit a different pattern, with an LQ value of 0.5251 and a positive DS value of 160,963.85. Although they are not classified as a base commodity, their positive differential growth indicates an emerging opportunity for development. In contrast, carrots, cabbage, Chinese cabbage, and cauliflower have LQ values above one but negative DS values. This indicates that these commodities maintain production specialization but experience relatively slower growth than the provincial benchmark. Meanwhile, green beans and eggplant have both LQ values below one and negative DS values, reflecting comparatively weak specialization and relative growth performance. Curly chilies also have an LQ value below one, while their reported DS value of zero indicates no measured differential growth.

These findings are consistent with the analytical approach adopted in previous regional horticultural studies, including Azmi et al. (2025), Hikmah et al. (2025), and Dwiyantoro et al. (2023), which demonstrate the importance of combining regional specialization and growth indicators to identify development priorities. The present study extends this approach by providing a commodity-level assessment specifically for Karo Regency, distinguishing commodities with established production specialization from those demonstrating favorable relative growth.

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

Nevertheless, the findings should be interpreted within the limitations of LQ and DS analysis. These indicators measure relative production specialization and differential growth but do not directly capture productivity, profitability, production efficiency, price stability, or market competitiveness. Therefore, further research incorporating farm-level economic indicators, production costs, yields, and market conditions is necessary to evaluate the long-term feasibility of horticultural development priorities in Karo Regency.

Implications for Regional Horticultural Development

The differences in LQ and DS values demonstrate that vegetable development priorities in Karo Regency should not be determined solely by production specialization or growth performance. The joint interpretation of the two indicators provides a more differentiated basis for regional planning.

Potatoes and tomatoes represent the most prominent initial priorities because both combine base-commodity status with positive differential growth. Shallots warrant further assessment as a potential growth-oriented commodity because their positive DS value contrasts with their non-base status. Meanwhile, carrots, cabbage, Chinese cabbage or mustard greens, and cauliflower may require interventions aimed at improving growth performance while maintaining their established production position. Green beans and eggplant require further evaluation to identify whether their relatively weaker specialization and growth reflect structural constraints or unrealized development opportunities.

These classifications have practical implications for the design of agricultural development programmes. For potatoes and tomatoes, interventions could emphasize productivity, quality management, postharvest infrastructure, and market coordination. For shallots, a preliminary feasibility assessment could examine the potential for sustainable production expansion. For base commodities with negative DS values, research should investigate yield gaps, production costs, cultivation practices, and market constraints. Commodities with both LQ and DS below their respective thresholds should be assessed against local demand, farmer profitability, agroecological suitability, and alternative land-use opportunities before receiving substantial development support.

Importantly, DS measures differential production growth rather than comprehensive market competitiveness. Positive DS does not independently establish higher profitability, production efficiency, or stronger market power. Likewise, negative DS does not necessarily imply declining production in absolute terms; it indicates that proportional growth is lower than the corresponding growth rate in the reference region. Consequently, the LQ–DS classification should be interpreted as a tool for identifying regional production specialization and relative growth patterns, rather than as a definitive measure of economic superiority.

Overall, the findings provide an empirical basis for differentiating vegetable development strategies in Karo Regency according to each commodity's production specialization and relative growth performance. The principal contribution is the identification of potatoes and tomatoes as commodities that combine both characteristics, alongside the identification of shallots as a potential growth-oriented commodity. Future research incorporating productivity, profitability, price dynamics, and market-access indicators would provide a more comprehensive assessment of their long-term development potential.

Conclusion

Potatoes and tomatoes are priority commodities for horticultural development in Karo Regency due to their production specialization and positive relative growth. Local government should

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

prioritize productivity improvement, post-harvest management, and market access for these commodities. Shallots warrant further feasibility assessment before expansion, while commodities with negative relative growth require evaluation of production constraints, input efficiency, and marketing conditions. At the sub-district level, agricultural support should be tailored to local commodity specialization. Integrating LQ and DS results into regional planning can improve the targeting of agricultural programs. However, investment decisions should also consider profitability, market demand, and production efficiency, which are not directly measured by these indicators.

For future research, additional analyses should incorporate farm-level economic indicators, including production costs, farm income, profitability, and technical efficiency, to assess the economic feasibility of the identified priority commodities. Further studies should also examine market demand, price fluctuations, supply chains, and marketing efficiency to evaluate their market competitiveness. Moreover, incorporating Dynamic Location Quotient (DLQ), productivity analysis, and time-series data could provide a more comprehensive understanding of changes in regional commodity specialization and growth patterns. These extensions would strengthen the empirical basis for formulating sustainable and evidence-based horticultural development policies in Karo Regency.

References

Abdullah, K., Jannah, M., Aiman, U., Hasda, S., Fadilla, Z., Taqwin, M. K. N. A., & Sar, M. E. (2021). *Metodologi Penelitian Kuantitatif*. Yayasan Penerbit Muhammad Zaini. https://api.ikippgribojonegoro.ac.id/drive/pti/esource/ebook-metodelogi-penelitian-kuantitatif-1756904288.pdf

Arafah, M. (2025). *Analisis Sektor Unggulan di Kabupaten Karo Menggunakan Pendekatan Location Quotient (LQ)*. https://repository.uir.ac.id/12760/1/155110648.pdf

Arsanti, I. W., Sayekti, A. L., & Adhitya Marendra Kiloes. (2018). Analisis Rantai Nilai Komoditas Kubis (Brassica oleracea L): Studi Kasus di Sentra Produksi Kabupaten Karo. Jurnal Hortikultura, 27(2), 269.

Azmi, A., Hadiguna, R. A., & Jonrinaldi, J. (2025). Pemetaan Komoditas Hortikultura Subsektor Sayur-sayuran di Provinsi Sumatra Barat. *Jurnal Agrica*, *18*(2). https://doi.org/10.31289/agrica.v18i2.13883

Badan Pusat Statistik Kabupaten Karo. (2025). *Kabupaten Karo dalam angka 2025*. https://karokab.bps.go.id/id/publication/2025/02/28/c5bba62b056e5cf7069341da/kabupaten-karo-dalam-angka-2025.htmlDwiyantoro, R., Jumiati, A., & Prianto, F. (2023). Analisis Pengembangan Ekonomi Daerah Melalui Subsektor Hortikultura di Kabupaten Banyuwangi. Jurnal Perencanaan Wilayah Dan Pembangunan, 1, 37–47. https://doi.org/10.19184/jpwp.v1i1.10440

Hendayana, R. (2003). Aplikasi metode Location Quotient (LQ) dalam penentuan komoditas unggulan nasional. *Jurnal Informatika Pertanian*, *12*, 1–21.

Hikmah, A. N., Astaman, P., Maharani, I. M., Rosyita, D., & Leilasariyanti, Y. (2025). Analisis penentuan komoditas unggulan hortikultura di Provinsi Sulawesi Selatan berdasarkan Location Quotient (LQ) dan Shift Share. *Jurnal Ilmiah Membangun Desa Dan Pertanian*, *10*(6), 643–657. https://doi.org/10.37149/jimdp.v10i6.2451

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Journal of Agriculture (JoA)
Volume: 05 | Number 03 | November 2026
E-ISSN: 2829-2421
https://doi.org/10.47709/JoA.v5n03.9905

Judhaswati, R. D. (2025). Analisis komoditas unggulan hortikultura di Provinsi Jawa Timur dengan pendekatan Location Quotient (LQ). *Prosiding Seminar Nasional Pembangunan Dan Pendidikan Vokasi Pertanian*, *6*(1), 898–920. https://doi.org/10.47687/snppvp.v6i1.1839

Karo-Karo, E. F., Priyarsono, D. S., & Hartoyo, S. (2021). Efisiensi teknis usahatani kubis di Kabupaten Karo. *Jurnal Agro Ekonomi*, *39*(1), 51–68.

Maspaitella, M., Garnevska, E., Siddique, M. I., & Shadbolt, N. (2018). Towards high value markets: A case study of smallholder vegetable farmers in Indonesia. *International Food and Agribusiness Management Review*, *21*(1), 73–88. https://doi.org/10.22434/IFAMR2017.0011

Montanía, C. V., Márquez, M. A., Núñez, T. F., & Hewings, G. J. D. (2023). Toward a more comprehensive shift-share analysis: An illustration using regional data. *Growth and Change Journal of Urban and Regional Policy*, *55*(1), 1–23. https://doi.org/https://doi.org/10.1111/grow.12693

Saragi, J. B., Sianturi, Y. M., Yusuf, M., Zai, B., Silalahi, N. E. L., Malau, C. O., & Sibarani, A. (2025). Analisis sektor unggulan di Kabupaten Karo menggunakan pendekatan Location Quotient (LQ). *Jurnal Ekuilnomi*, *7*(3), 693–702. https://doi.org/10.36985/g60syh89

Talita Ardhini, A. W. (2026). *Analisis Strategi Pengembangan Usahatani Sayur Organik pada Kelompok Wanita Tani Mukti Asih Sejahtera di Desa Mojorejo Kota Batu* [Universitas Islam Malang]. https://repository.unisma.ac.id/handle/123456789/14186

This is an Creative Commons License This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License