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Analysis of determining superior vegetable commodities in Batu City in 2016-2020

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ABSTRACT

Introduction: Batu City is one of the largest vegetable supply cities in East Java. This is a concern of the government to continue to develop the existing potential considering that the agricultural sector plays a large role in agriculture development in Batu City. The research aims to identify superior vegetable commodities with high competitiveness to improve farmers' welfare. The research was conducted in Batu City from August to October 2022. **Methods:** The method used in the research was a Literature Study using secondary data obtained from the East Java Central Bureau of Statistics and Batu City as well as from various journals. The analysis tools use Microsoft Excel with the analysis method using Location Quotient (LQ). **Results:** The results showed that the superior commodity in Batu City was cauliflower with an average LQ value of 9.3957. Garlic 5.6996. Chayotes squash 5.2903. Chickpeas 3.6315. Carrots 3.0185. Petsai 2.8091. Tomatoes 2.7492. Peppers 2.6474. Eggplant 1.8262. Mushrooms 1.7588. Red beans 1.6610. Scallions 1.4679. Cucumber 1.4558. **Conclusion:** Commodities included in LQ>1 are leeks, garlic, string beans, mushrooms, red beans, cauliflower, cucumber, chayote, peppers, Chinese cabbage, eggplant, tomatoes, and carrots. The commodities of shallots, spinach, large chilies, bird's eye chilies, long beans, kale, potatoes, cabbage, and radishes are not included in the superior commodities. Determining the right superior vegetable commodities can have positive impacts on farmers' income, increase product supply to the market, and improve people's quality of life.

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INTRODUCTION

Batu City produces various kinds of vegetable crops which have the potential to become superior commodities. According to Suryantini *et al.* (2017), an analysis of superior commodities should be carried out so that a region can determine what kinds of commodities can be used as superior commodities that have high competitiveness. One way of identifying superior sectors can be done using the base economic method, namely the base sector which is the basis of the regional economy because it has quite high competitive advantages, while the non-base sector is a sector that has less potential but functions as a support for the base sector (Paramartha *et al.*, 2017). Witjaksono *et al.* (2021) said that Batu City has a very strategic land role because it is located in the upstream area of the Brantas River Basin which covers an area of cities and districts in East Java. Regions can be considered as organisms whose nature continues to develop. One of the aspects that can influence this is the ever-increasing population. This causes changes in land area which will affect the environment both physically and ecologically, water resources. This is in line with the opinion of Hidayat & Rofiqoh (2020) that population growth, development of the industrial sector, and housing cause an increase in the need for agricultural land. Batu City is located at an average altitude of 862 meters above sea level so most of the areas in Batu City are located on hills/slopes.

Superior commodities refer to types of agricultural products that have high economic value, usually because they have stable demand, good quality, and comparative and competitive advantages so they can compete strongly in the market with competing commodities. Comparative advantage can be in the form of natural resources and human resources (Rohma & Rahmawati, 2020). Iqbal *et al.* (2018) said that determining a commodity as a superior commodity in a region must be adjusted to the potential of natural resources and human resources in the region itself. Determining superior commodities wisely and based on this potential is the key to success in developing the agricultural or agribusiness sector in a region and improving community welfare.

In the research of Humaidi *et al.* (2020) stated that the potato vegetable commodity is the leading/basic commodity in the West Lampung area because the area is classified as a highland area. However, in the study that researchers are currently examining in Batu City, the potato commodity is not a superior commodity because the LQ

value is below 1. The potential between regions can differ due to area size, geographical location of the region, land use, and the state of natural resources (Soleh, 2017). Each commodity has different potential in the agricultural sector, but until now it is not yet known for certain the base commodities produced, so research is needed to find out which commodities are superior in Batu City. Considering the background, the purpose of this study is to analyze which commodities are the primary ones in Batu City. The goal is to make a valuable contribution to farmers by identifying the most suitable high-quality vegetable commodities. Determining the right commodities can have a positive impact on farmers' income, increase product supply to the market, and improve people's quality of life.

METHODS

The method for determining the sample area was carried out deliberately by selecting Batu City in East Java which is located in an area that has geographical and climatic characteristics that support vegetable production. This makes it an interesting location for research. Determining the sample commodities used the *purposive sampling method*, namely by deliberately selecting vegetable commodities with a sample size of 22 commodities. The research was carried out from August to October 2022 and secondary data was collected on the production of vegetable commodities.

The analytical tool used in this research is Microsoft Excel. Data materials were collected using the library study method. Literature study is a method of collecting data through information on documents, books, and journals related to writing. The data sources used in writing come from books, journals, previous research, and from the Central Statistics Agency for Batu City and East Java from 2015 to 2022.

The analysis technique uses LQ (Location Quotient). Location Analysis Quotient (LQ) is an analysis to determine the extent of specialization of economic sectors in a region that utilizes base sectors or leading sectors (R. Jumiyanti, 2018). The way to calculate LQ is:

$$LQ = \frac{\text{Xis}/\text{Xs}}{\text{Xin}/\text{Xn}}$$

1. Xis The value or results of certain agricultural sectors at the Batu City level
2. Xs Total value or yield of all commodities in Batu City
3. Xin Value or results of the agricultural sector in the East Java Province region
4. Xn Total value or yield of agricultural commodities in the East Java Province region

The following are the results of the LQ calculation which can be interpreted as follows:

1. LQ > 1, the sector in question is more specialized than the same sector at a certain level, so it is a superior sector. Exports can be carried out on these products because there is a surplus.
2. LQ < 1, the sector in question has a lower level of specialization than the same sector at a certain level, so it is not a superior or non-basic sector. This shows the need for imports because this sector is not yet able to meet regional needs.
3. LQ = 1, the sector in question has the same level of specialization as the same sector at a certain level. This means there is balanced productivity, which means this sector is still unable to be exported.

RESULTS AND DISCUSSION

Data on vegetable production results in Batu City for 2016-2020

The vegetable commodities studied in Batu City were spring onions, shallots, garlic, spinach, green beans, large chilies, cayenne peppers, mushrooms, red beans, long beans, kale, cauliflower, potatoes, cucumbers, cabbage, chayote, radishes, peppers, mustard greens, eggplant, tomatoes, and carrots. The following is the production amount (quintals) for each commodity according to data from the Batu City Central Statistics Agency.

Based on Figure 1 above, the graph that appears to always experience a good increase every year is tomato production in Batu City from 2016 to 2020. According to data in 2016, it was 49,350 quintals, in 2017 it was 53,561 quintals, in 2018 it was 65,149 quintals, in 2017 it was 76,811 quintals and in 2020 it experienced a large increase to 117,501 quintals. Meanwhile, the graph that seems to always experience a decline every year without any increase is beans and cucumbers. Data on bean production in 2016 was 38,727 quintals and continues to decline every year until 2020 reaching 26,832 quintals. The cucumber commodity in 2016 was 28,754 quintals, which also experienced a continuous decline every year until in 2020 it reached 15,680. For the commodities spring onions, shallots, garlic, spinach, large chilies, cayenne peppers, mushrooms, red beans, long beans, kale, cauliflower, potatoes, cabbage, chayote, radishes, paprika, Chinese cabbage, eggplant carrots graph Production results appear to fluctuate, namely sometimes experiencing increases and decreases.

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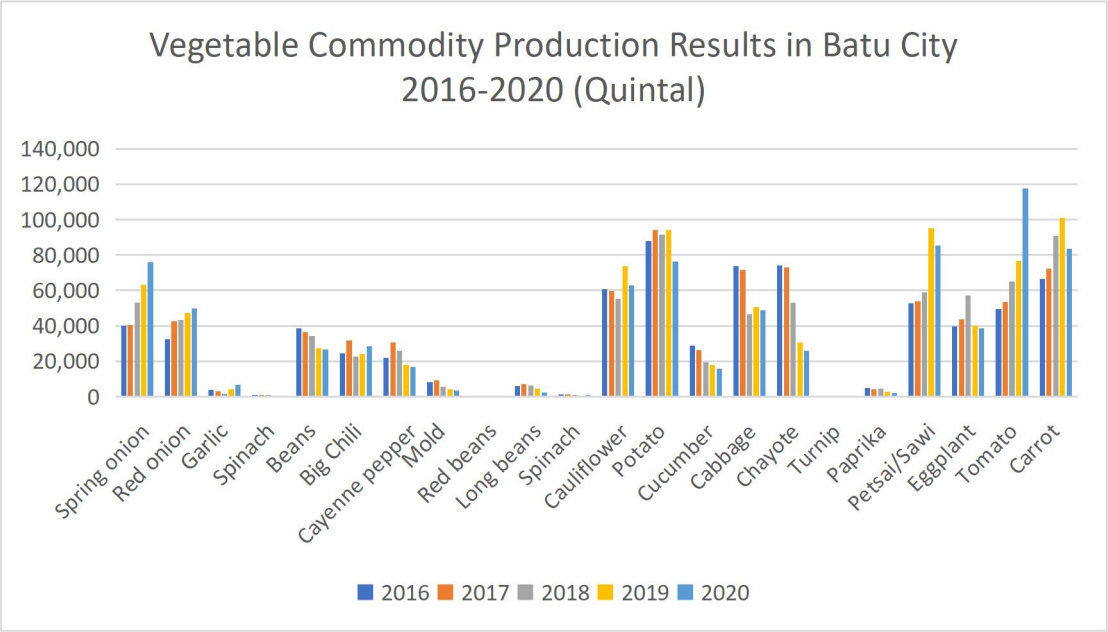

Figure 1. Graph of vegetable commodity production in Batu City 2016-2020 (quintals)

Table 1. Vegetable commodity production results in Batu City 2016-2020 (Quintal)

Commodity	Year				
	2016	2017	2018	2019	2020
Spring onion	40,059	40,419	52,984	63,126	75,828
Red onion	32,383	42,499	43,507	47,482	49,935
Garlic	3,884	3,013	1,857	4,080	6,696
Spinach	898	925	964	678	708
Beans	38,727	36,604	34,178	27,410	26,832
Big Chili	24,518	31,900	22,861	24,305	28,382
Cayenne pepper	21,902	30,720	26,065	17,856	16,760
Mold	8,080	9,329	5,581	4,063	3,651
Red beans	516	395	421	312	154
Long beans	5,898	7,073	6,266	4,527	2,336
Spinach	1,404	1,240	1,051	689	888
Cauliflower	60,836	59,762	55,364	73,714	62,951
Potato	87,910	93,878	91,377	94,014	76,428
Cucumber	28,754	26,466	19,559	17,936	15,680
Cabbage	73,692	71,624	46,634	50,526	48,600
Chayote	74,135	72,917	53,054	30,507	26,082
Turnip	-	-	-	-	-
Paprika	4,810	4,190	4,752	2,748	1,980
Petsai/Sawi	52,798	53,727	58,787	95,246	85,240
Eggplant	39,799	43,637	57,182	40,022	38,771
Tomato	49,350	53,561	65,149	76,811	117,501
Carrot	66,465	72,152	90,692	101.024	83,620
Amount	716,818	756,031	738,285	777,076	769,023

Source: Central Statistics Agency [BPS] (2016-2020)

Based on the data on the production of vegetable commodities in Batu City above, it can be seen that the commodities that experienced an increase in production in 2020 compared to the previous year were spring onions, shallots, garlic, spinach, large chilies, kale, and tomatoes. Meanwhile, the commodities of beans, cayenne pepper, mushrooms, red beans, long beans, cauliflower, potatoes, cucumbers, cabbage, chayote, paprika, eggplant, and carrots experienced a decline in production compared to the previous year.

Data on vegetable production results in East Java Province 2016-2020

The vegetable commodities studied in East Java are spring onions, shallots, garlic, spinach, green beans, large chilies, cayenne peppers, mushrooms, red beans, long beans, kale, cauliflower, potatoes, cucumbers, cabbage, chayote, radishes, peppers, mustard greens, eggplant, tomatoes, and carrots. The following is the production amount (quintals) for each commodity according to data from the East Java Province Central Statistics Agency. Embedding

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production data in East Java is necessary for comparing it with production data in Batu City to calculate LQ values. So that later you can determine whether vegetable commodities are superior or not by looking at the Location value Quotient (LQ) obtained.

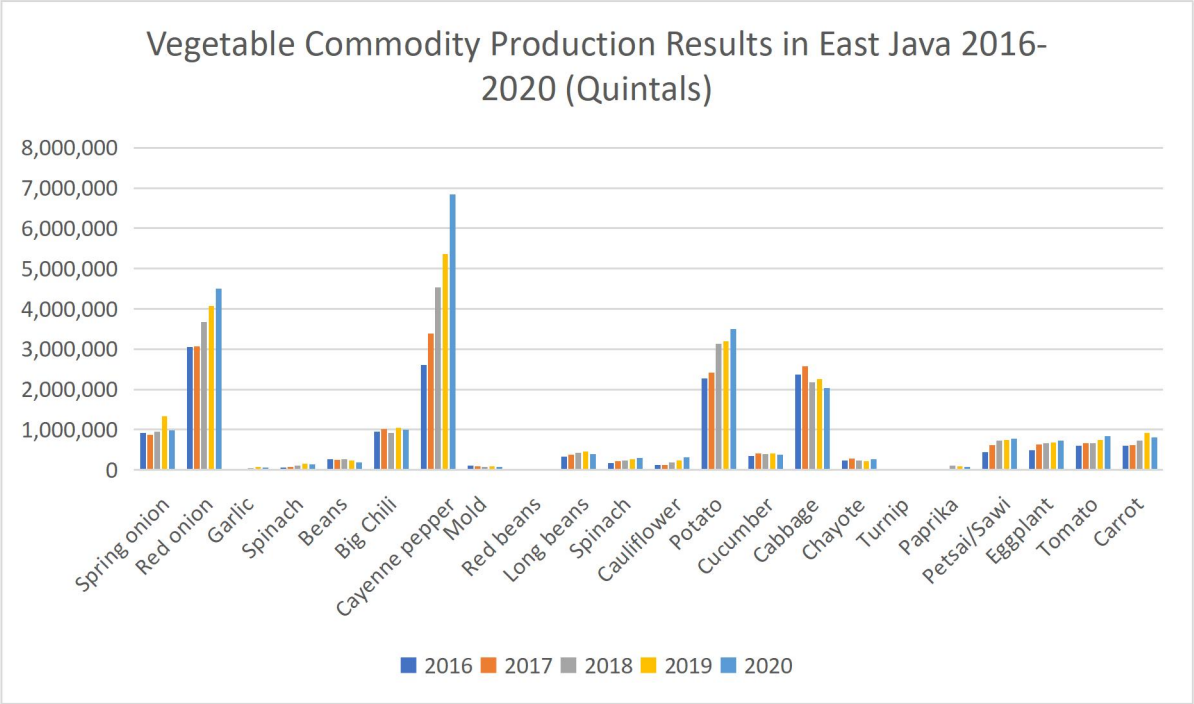

Figure 2. Graph of vegetable commodity production in East Java 2016-2020 (quintals)

Table 2. Vegetable commodity production results in East Java 2016-2020 (Quintals)

Commodity	Year				
	2016	2017	2018	2019	2020
Spring onion	913.620	869,990	952,900	1,336,690	988,537
Red onion	3,045,200	3,063,160	3,670,320	4,078,770	4,499,616
Garlic	7,770	6,530	35,080	69,350	58,980
Spinach	61,410	78,670	110,660	146,010	140,398
Beans	260,750	250,840	259,660	237,030	185,293
Big Chili	955,390	1,009,770	919,650	1,046,770	991,099
Cayenne pepper	2,608,030	3,390,220	4,533,380	5,360,980	6,849,249
Mold	108,734	95.154	80,718	86,058	70,805
Red beans	6,650	6,010	5,320	5,050	4,333
Long beans	328,000	380,160	421,030	450,150	398,778
Spinach	173,290	209,450	239,410	257,060	290,649
Cauliflower	114,320	124,170	178,980	226,530	320,425
Potato	2,279,960	2,411,800	3,129,660	3,202,090	3,491,510
Cucumber	340,590	407,740	392,280	413,710	381,764
Cabbage	2,366,570	2,568,360	2,175,070	2,258,190	2,037,079
Chayote	225,020	282,500	240,140	216,730	266,834
Turnip	340	1,300	1,800	1,490	1,527
Paprika	19,250	20,380	97,660	97,260	79,197
Petsai/Sawi	440,430	612,640	725,610	743,950	777,157
Eggplant	489,290	630,570	662,700	679,570	730,091
Tomato	607.190	667,590	655,850	745,580	839,196
Carrot	595,150	612,430	725,830	910.120	803.975
Amount	15,946,954	17,699,434	20,213,708	22,569,138	24,206,492

Source: Central Statistics Agency (2016-2020)

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Based on Figure 2 above, the vegetable production graph that appears to always experience a good increase every year in East Java is the production of shallots, cayenne peppers, potatoes, Chinese cabbage, kale, cauliflower, and eggplant. The highest production output and the best development each year is the cayenne pepper commodity, which in 2016 amounted to 2,608,030 quintals, in 2017 amounted to 3,390,220 quintals, in 2018 amounted to 4,533,380 quintals, in 2019 amounted to 5,360,980 quintals, and continues to increase until 2020 reaching 6,849,249 quintals. Meanwhile, the graphs that appear fluctuating, experiencing decreases and increases, are the commodity graphs for spring onions, garlic, spinach, beans, large chilies, mushrooms, red beans, long beans, cucumbers, cabbage, chayote, radishes, peppers, tomatoes, and carrots.

Based on the data on the production of vegetable commodities in East Java above, it can be seen that the commodities that experienced a good increase in production in 2020 compared to the previous year were shallots, cayenne peppers, kale, cauliflower, potatoes, cabbage, chayote, radish, eggplant, and tomatoes. Meanwhile, the commodities of spring onions, garlic, spinach, green beans, large chilies, mushrooms, red beans, long beans, cucumbers, peppers, Chinese beans, and carrots experienced a worse decline in production compared to the previous year.

Location analysis calculations Quotient (LQ) 2016-2020

Location analysis calculation results Quotient (LQ) of vegetable commodities in Batu City in 2016-2020 can be seen in Table 3. Based on Table 3, in 2020 it is known that fourteen leading commodities have an average LQ value > 1, namely spring onions, garlic, beans, mushrooms, red beans, cauliflower, cucumbers, chayote, bell peppers, Chinese cabbage, eggplant, tomatoes, and carrots. The Cauliflower commodity is considered superior with the largest average LQ value, namely 9.3957. In 2016 the LQ value of cauliflower was 11.7502, in 2017 it was 11.2165, in 2018 it was 8.4302, in 2019 it was 9.4175, and in 2020 it was 6.1640. The decrease and increase in the LQ value are caused by fluctuations in production results each year due to the erratic dry and rainy seasons so cauliflower production results fluctuate. This is in line with the opinion of Supriadi & Nurlenawati (2019) that the season influences the growth and yield of cauliflower planting. Cauliflower is considered superior in Batu City because this plant can grow well in the highlands with cool temperatures so the cauliflower production in Batu City meets the needs of its region and is also able to meet the needs of cauliflower from other areas in East Java and even outside the island. like Kalimantan. Apart from the effects of uncertain seasons, the reality on the ground is that many farmers are switching production to other vegetables.

Table 3. Location analysis value quotient (LQ) 2016-2020

Commodity	LQ calculation results					Average
	2016	2017	2018	2019	2020	
Spring onion	0.9681	1.0827	1.5153	1.3668	2.4067	1.4679
Red onion	0.2348	0.3233	0.3230	0.3369	0.3482	0.3132
Garlic	11.0373	10.7532	1.4427	1.7027	3.5621	5.6996
Spinach	0.3229	0.2740	0.2374	0.1344	0.1582	0.2254
Beans	3.2794	3.4008	3.5872	3.3467	4.5434	3.6315
Big Chili	0.5666	0.7362	0.6775	0.6720	0.8985	0.7102
Cayenne pepper	0.1854	0.2112	0.1567	0.0964	0.0768	0.1453
Mold	1.6408	2.2849	1.8843	1.3664	1.6178	1.7588
Red beans	1.7133	1.5317	2.1567	1.7880	1.1151	1.6610
Long beans	0.3970	0.4336	0.4056	0.2910	0.1838	0.3422
Spinach	0.1789	0.1380	0.1196	0.0776	0.0959	0.1220
Cauliflower	11.7502	11.2165	8.4302	9.4175	6.1640	9.3957
Potato	0.8514	0.9071	0.7957	0.8497	0.6868	0.8181
Cucumber	1.8641	1.5127	1.3588	1.2547	1.2887	1.4558
Cabbage	0.6876	0.6499	0.5843	0.6475	0.7485	0.6636
Chayote	7.2746	6.0153	6.0210	4.0737	3.0668	5.2903
Turnip	-	-	-	-	-	-
Paprika	5.5172	4.7914	1.3261	0.8177	0.7844	2.6474
Petsai/Sawi	2.6470	2.0438	2.2080	3.7052	3.4413	2.8091
Eggplant	1.7960	1.6128	2.3516	1.7044	1.6662	1.8262
Tomato	1.7946	1.8698	2.7072	2.9815	4.3931	2.7492
Carrot	2.4659	2.7456	3.4052	3.2125	3.2633	3.0185

Source: Central Statistics Agency (2016-2020)

The next commodity that is considered superior in Batu City is garlic with an average LQ value of 5.6996. The LQ value of garlic in 2016 was 11.0373, in 2017 it was 10.7532, in 2018 it was 1.4427, in 2018 it was 1.7027, and in 2020 it was 3.5621. The decline was caused by several obstacles, one of which was the obstacle in using planting material in the form of seed tubers was the relatively long seed dormancy period, namely 2 to 3 months. The existence of a

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dormancy period for garlic bulbs will hinder the smooth production and cultivation process because the seeds will not be able to grow, which will also impact the planting time which can only be done once a year (Siswadi *et al.*, 2019). Another factor in the field that caused the decline was the large number of consumers who chose imported onions over local ones. This is because imported garlic is larger in size than local garlic, even though the quality of local garlic is not inferior to imported ones. Even though it has experienced a decline due to several reasons, garlic production in Batu City has met its own regional needs and can meet the needs of other regions in East Java and even outside the island such as Sulawesi.

The chayote commodity is considered superior in Batu City with an average LQ value of 7.2746. The LQ value of chayote in 2016 was 6.0153, in 2017 it was 6.0210, in 2018 it was 4.0737, in 2018 it was 3.0668, and in 2020 it was 5.2903. Changes in chayote productivity are affected by the utilization of production factors. The use of different production factors results in different production. Apart from the use of production factors, farmer characteristics can also influence production. One of them is age, the older a person gets, the more productive the energy they have, and after a certain age limit their productivity will decrease. Research conducted by Abi *et al.* (2021) shows that chayote production is significantly influenced by land area, number of productive plants, and fertilizer, while labor factors are not significantly affected by chayote production. Apart from this, in 2018 chayote farmers in Batu City experienced a golden fly attack which caused chayote squash that was still young or ready to be harvested to rot, causing prices to plummet, and causing many farmers to suffer losses at that time. Even though it experienced a decline and strengthened again in 2020, chayote production in Batu City was finally able to meet the needs of its region and was able to meet the needs of other regions in East Java. Apart from East Java, many farmers in Batu City also send a significant portion of their chayote production to the Kalimantan area.

Beans are the next superior commodity in Batu City with an average LQ value of 3.6315. Based on Table 3, in 2016 the LQ value for beans was 3.2794, in 2017 it was 3.4008, in 2018 it was 3.5872, in 2019 it was 3.3467, and in 2020 it decreased to 3.6315. If we look at developments from year to year, the LQ calculation value for chickpeas in Batu City is relatively stable, namely at numbers 3 and 4. This means that the chickpea commodity in Batu City has met the needs of its region and can meet the needs of other regions in East Java, even also Kalimantan. Laily & Roidah (2020) said that the increase in bean production was not caused by increased land use or expansion of planting areas but was caused by farmers' success in carrying out planting intensification, namely increasing production per unit area of land cultivated. Apart from that, another thing that causes the LQ value to be stable is the price of beans on the market which is also stable and affordable. So many consumers are still loyal to consuming beans.

The next commodity that is considered superior in Batu City is carrots with an average LQ value of 3.0185. Based on Table 3, in 2016 the LQ value of carrots was 2.4659, in 2017 it was 2.7456, in 2018 it was 3.4052, in 2019 it was 3.2125, and in 2020 it decreased to 3.2633. If you look at developments from year to year, the LQ calculation value for carrots in Batu City is relatively stable and is always at LQ>1. The calculation of the stable LQ value is because carrot plants are suitable for production in hills or highlands with loose and fertile soil conditions (Nurhaliza *et al.*, 2021), which is to the conditions of agricultural land in Batu City, namely being in the highlands and having fertile soil conditions. The success of farmers in maintaining carrot production and prices is due to the role of farmer groups in Batu City which actively conduct learning classes and outreach to farmers. The carrot commodity in Batu City has met the needs of its region and can meet the needs of other regions in East Java. Most farmers in Batu City send carrots to Kalimantan and Sulawesi.

Petsai is the next superior commodity in Batu City with an average LQ value of 2.8091. Based on Table 3, in 2016 the LQ value of Chinese cabbage was 2.6470, in 2017 it was 2.0438, in 2018 it was 2.2080, in 2019 it was 3.701, and in 2020 it decreased to 3.2633. If you look at developments from year to year, the LQ calculation value for domestic Chinese in Batu City is relatively stable and is always at LQ>1. This is because many farmers in villages join farmer groups. As in research conducted by Ariyanto *et al.* (2020) in Sumberbrantas Village, Batu City, farmers who join farmer groups will get several benefits, namely an easy marketing process, higher output selling prices, and cheaper input prices. This is due to subsidies and getting fixed prices from parties who have collaborated with farmer groups in Sumberbrantas Village. Chinese cabbage commodities in Batu City have met the needs of their region and can meet the needs of other regions in East Java. Apart from sending them outside the island such as Kalimantan, Chinese cabbage farmers in Batu City also send their products abroad, namely Taiwan.

Tomatoes are a superior commodity in Batu City with an average LQ value of 2.7492. Based on Table 3, in 2016 the LQ value for tomatoes was 1.7946, in 2017 it was 1.8698, in 2018 it was 2.7072, in 2019 it was 2.9815, and in 2020 it rose to 4.3931. If we look at developments from year to year, the calculated value of LQ for tomatoes in Batu City is relatively stable and is always at LQ>1. This is because many farmers, especially in the Bumiaji area, use local microorganism organic fertilizer (MOL). MOL influences the growth and productivity of tomato plants because it contains macro and micronutrients and contains various microbes that are beneficial to plants (Abadi *et al.*, 2022). The tomato commodity in Batu City has met the needs of its region and can meet the needs of other regions in East Java and even Kalimantan.

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Paprika is a superior commodity in Batu City with an average LQ value of 2.6474. Based on Table 3, in 2016 the LQ value of paprika was 4.7914, in 2017 it was 1.8698, in 2018 it was 1.3261, in 2019 it was 0.8177, and in 2020 it fell to 0.7844. If we look at developments from year to year, the calculated LQ value of paprika in Batu City continues to decline. This shows that the paprika commodity in Batu City in 2020 has not met the needs of its region and has not been able to meet the needs of other regions. The drastic decline in paprika production in 2017 was due to thrips pests which attack young leaves and pistils and was exacerbated by the often cloudy and rainy weather in Batu City. Paprika plants need sufficient sunlight throughout the day to grow and produce well and paprika plants cannot be exposed to high rainfall because it can cause the plants to be susceptible to disease, therefore paprika plants need shade to produce well (Febrica *et al.*, 2021).

Eggplant is a superior commodity in Batu City with an average LQ value of 1.8262. Based on Table 3, in 2016 the LQ value for eggplant was 1.7960, in 2017 it was 1.6128, in 2018 it was 2.3516, in 2019 it was 1.7044, and in 2020 it fell to 1.6662. If we look at developments from year to year, the LQ calculation value for eggplant in Batu City is relatively stable because it always has LQ results> 1. This shows that the eggplant commodity in Batu City has met the needs of its region and can meet the needs of other regions such as Kalimantan. Stable eggplant production can be done in several ways. Ludihargi *et al.* (2019) stated that increasing eggplant production can be achieved by providing goat manure and the application of PGPR bacteria which can increase nutrient availability for plants. The fluctuation in the LQ value of eggplant each year is due to the reduction in people's purchasing power, causing eggplant selling agents to reduce orders from farmers in Batu City for marketing.

Mushrooms are a superior commodity in Batu City with an average LQ value of 1.7588. Based on Table 3, in 2016 the LQ value for mushrooms was 1.6408, in 2017 it was 2.2849, in 2018 it was 1.8843, in 2019 it was 1.3664, and in 2020 it rose to 1.7588. If you look at developments from year to year, the calculated LQ value for mushrooms in Batu City is relatively stable because it always has LQ results> 1 even though it fluctuates every year. The decrease in mushroom LQ in Batu City in 2018 and 2019 was caused by extreme hot weather. Mushroom cultivation can be optimal in highland conditions such as the city of Batu which has cool temperatures. This is supported by research by Kosasih *et al.* (2022) stated that air temperature in oyster mushroom cultivation plays an important role in obtaining optimal fruit body growth. In general, the optimal temperature for the growth of oyster mushrooms is divided into two phases, namely the incubation phase which requires an air temperature ranging between 22 -28 OC with a humidity of 60 -70% and the fruiting body formation phase requires an air temperature of between 16 -22 OC. The mushroom commodity in Batu City has met the needs of its region and can meet the needs of other regions such as other regions in East Java and even Kalimantan.

Red beans are a superior commodity in Batu City with an average LQ value of 1.6610. Based on Table 3, in 2016 the LQ value of red beans was 1.7133, in 2017 it was 1.5317, in 2018 it was 2.1567, in 2019 it was 1.7880, and in 2020 it fell to 1.1151. Even though the LQ value fluctuates, it is classified as stable because it is at LQ>1. This shows that the red bean commodity in Batu City can meet the needs of its region and can meet the needs of other regions in East Java. The decline in the LQ value of red beans in Batu City in 2020 was caused by leafminer pests and the abundance of insects that attack intercropping plants. Red bean production needs to be increased considering the high market demand and the many benefits of red beans for humans. Because of this, cultivation techniques are needed that can be used to increase red bean production, for example regulating plant spacing. Research conducted by Driyunitha (2015) concluded that planting distance influences the growth and production of red beans. A planting distance of 25 x 20 cm has a good effect on the plant growth rate, leaf area, plant dry weight, number of pods planted, and seed weight.

Scallions are a superior commodity in Batu City with an average LQ value of 1.4679. Based on Table 3, in 2016 the LQ value of spring onions was 0.9681, in 2017 it was 1.0827, in 2018 it was 1.5153, in 2019 it was 1.3668, and in 2020 it rose to 2.4067. The decline that occurred in 2019 in Batu City was caused by daily rain, resulting in many rotten leeks. Even though the LQ value of spring onions fluctuates, it is considered stable because it is always at LQ>1. This shows that the leek commodity in Batu City can meet the needs of its region and can meet the needs of other regions. Agricultural production is very dependent on nature as its main resource, so the income obtained is unstable, as is the case with leek farming production. In business development, the level of production and income earned by farmers is greatly influenced by several things, including land, weather, capital, and knowledge about the farming business (Welang *et al.*, 2020)

Cucumbers are one of the superior commodities in Batu City with an average LQ value of 1.4558. Based on Table 3, in 2016 the LQ value for cucumbers was 1.8641, in 2017 it was 1.5127, in 2018 it was 1.3588, in 2019 it was 1.2547, and in 2020 it was 1.2887. The continuing decline is caused by continuous rain. This causes cucumbers that are submerged in water to wilt and rot. Even though the LQ value fluctuates, it is classified as stable because it is at LQ>1. This shows that the cucumber commodity in Batu City can meet the needs of its region and can meet the needs of other regions such as Kalimantan and Sulawesi. Cucumber plant production is influenced by the provision of goat manure and cow manure. In their research, Haedar *et al.* (2022) concluded that administering goat manure of 150 g/

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polybag and cow manure of 75 g/ polybag had the best effect on the vegetative growth of cucumber plants.

For commodities, onions, spinach, large chilies, cayenne peppers, long beans, kale, potatoes, cabbage, and radishes are unfortunately not among the leading commodities. The average LQ value for these commodities is always below the LQ <1 result. This shows that not all vegetable commodities can produce good results in Batu City. One example is red onions which have an average LQ value of only 0.3132 or below 1, this is because red onions are not suitable for planting in the highlands which have high rainfall, otherwise, red onions will produce good production if planted in the lowlands where the weather is relatively hot. Batu City's development and strategy to increase production and sales of vegetable commodities includes the formation of farmer groups in several villages such as Bumiaji which are active in learning and innovating. The construction of a large stone market is estimated to be completed in 2023 as an effort to support the economy of farmers and the community. Apart from that, the government is also making efforts to empower and improve the quality of MSME vegetable and fruit chip products so that the wheels of the economy can continue to turn. The government continues to strive to increase agricultural yields of vegetable commodities in Batu City by mobilizing young farmers who are members of combined farmer groups (GAPOKTAN) to supply products to other cities. To support this business, young farmers have established a business partnership with the Batu City Independent Rural Agriculture Training Center (P4S), Bumiaji Sejahtera, which operates in the field of organic fruit and vegetable horticulture. Modern marketing systems are in the form of retail such as Indomaret, supermarkets, and digital platforms such as Taniluh, Sayurbox, and Segari. It is hoped that commodities that are not yet superior will not be inferior to superior commodities.

CONCLUSION

Based on the research results, thirteen vegetable commodities in Batu City are included in the superior commodities with an LQ value>1. Namely cauliflower, garlic, chayote, green beans, carrots, Chinese cabbage, tomatoes, peppers, eggplant, mushrooms, red beans, spring onions and cucumbers. For commodities, onions, spinach, large chilies, cayenne peppers, long beans, kale, potatoes, cabbage, and radishes are unfortunately not among the leading commodities. The average LQ value for these commodities is always below the LQ <1 result. This shows that not all vegetable commodities can produce good results in Batu City. Based on the results of the Location Analysis Quotient (LQ) several suggestions can be given, namely that commodities that are considered superior in Batu City should be sought so that production increases every year. The government's current efforts to increase vegetable commodity production include empowering farmers' human resources by forming a combination of farmer groups that are active in conducting research and learning. Investments in research and innovation can improve quality, productivity, and competitiveness. This includes the development of superior varieties and more efficient agricultural techniques.

Suggestions that the author can convey to the Batu City Government to increase vegetable commodities include improving agricultural infrastructure, including an efficient irrigation system so that there are no more vegetables that wither or rot in the rainy season, improving storage facilities, as well as modern processing to support vegetable production and distribution. Go outside the area so that the vegetables remain in good condition and fresh when they arrive at the destination area. Pay greater attention to the implementation of effective pest and disease control programs, including monitoring and timely control actions. The government is expected to always participate in helping farmers market their products to local, regional, or national markets by identifying market opportunities and developing a strong distribution network.

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