MODIFICATION OF LOCATION QUOTIENT (LQ) METHOD IN MAPPING CONDITIONS OF FOOD SECURITY IN WEST JAVA PROVINCE

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ABSTRACT. West Java Province, according to Indonesia's statistical data, is a province with a large population and area of food crop production in Indonesia. So that, it becomes a national strategic food barn. The development of food security planning in this province is important and will also have an impact on national food security. In planning, many regional approaches have been used, for example, the commodity-based approach which is used as a reference in zoning-based development planning, or commonly known as the Location Quotient (LQ) approach. The LQ method in this study was slightly modified by changing the main commodity variables with variables from the existing Food Security dimensions based on the original LQ value ≥ 1 with a range of 0 to 0.75 based on the average value of food security measurement standards with the example of West Java. The basic formula for LQ after the modified one can provide an overview of the condition of food security that occurs in urban districts in West Java Province. The results of the Modified Food Security Quotient in West Java showed that from the Food Availability Aspect with 13 measurement variables, then from the Food Access Aspect with 11 measurement variables, and from the Food Quality/Utilization Aspect with 13 measurement variables. The condition of food security in general is very safe (30% of West Java) and safe (70% of West Java), although in several districts and cities, there are still measuring variables that still need improvement, such as the area of land receiving irrigation water , production of sweet potatoes, corn, rice, harvested area of corn, rice, and cassava production, then total working population, road length and road conditions (state, province, district/city), number of health workers, number of hospitals and number of clinics.

Keyword: food security; food availability; food access; food utilization; modified LQ

MODIFIKASI METODE LOCATION QUOTIENT (LQ) DALAM PEMETAAN KONDISI KETAHANAN PANGAN DI PROVINSI JAWA BARAT

ABSTRAK. Provinsi Jawa Barat sebagaimana data statistik di Indonesia merupakan provinsi dengan jumlah penduduk dan luas produksi tanaman pangan yang besar di Indonesia sehingga menjadi lumbung pangan strategis nasional. Sehingga perencanaan pembangunan ketahanan pangan di provinsi ini penting dan akan berdampak pula pada ketahanan pangan nasional. Dalam perencanaanya, telah banyak pendekatan wilayah yang digunakan misalnya pendekatan berbasis komoditas yang dijadikan acuan dalam perencanaan pembangunan berbasis zonasi, atau umum dikenal dengan pendekatan Location Quotient (LQ). Metode LQ pada penelitian ini sedikit dimodifikasi dengan mengubah variabel komoditas pokok dengan variabel dari dimensi Ketahanan Pangan yang ada berdasarkan nilai LQ yang semula ≥ 1 dengan rentang angka 0 sampai 0,75 berdasarkan nilai rata-rata standar ukur ketahanan pangan dengan contoh Jawa Barat. Rumus dasar LQ setelah yang dimodifikasi tsb. dapat memberikan gambaran kondisi ketahanan pangan yang terjadi di kabupaten kota di Provinsi Jawa Barat. Hasil analisis Modifikasi LQ Ketahanan Pangan (Modified Food Security Quotient) di Jawa Barat menunjukkan dari Aspek Ketersediaan Pangan dengan 13 variabel pengukuran, kemudian dari Aspek Akses Pangan dengan 11 variabel pengukuran, dan dari Aspek Kualitas Pangan /Aspek Pemanfaatan dengan 13 variabel pengukuran. , Kondisi ketahanan pangan secara umum sangat aman (30% wilayah Jawa Barat) dan aman (70% wilayah Jawa Barat), meskipun di beberapa kabupaten dan kota masih terdapat variabel-variabel pengukur yang masih perlu perbaikan seperti dalam hal luas lahan yang mendapat air irigasi, produksi ubi jalar, Jagung, Padi, Luas Panen Jagung, Padi, dan Produksi Ubi Kayu, kemudian Jumlah Penduduk Kerja, Panjang Jalan dan Kondisi Jalan (Negara, Provinsi, Kabupaten/kota), Jumlah Tenaga Kesehatan, Jumlah Rumah Sakit dan Jumlah Klinik.

Kata kunci: akses pangan; ketahanan pangan; ketersediaan pangan; modifikasi LQ; pemanfaatan pangan

INTRODUCTION

Food security is one of the major challenges being faced by the fast-rising of the human population (Ejeromedoghene et al., 2020), and becomes an important issue since fast development in the industrial sector. Indonesia is the fourth largest country in the world, with about 280 million population (Worldmeter, 2023). National development planning is an important step in realizing the State Goals as contained in the 1945 Constitution, especially those related to promoting The general welfare and educating the nation's life. Therefore, development planning must be carried out properly and directed in Indonesia, specifically in the West Java province. In this regard, to achieve this goal, optimizing the use of available resources should be based on the strength of the available resources.

Several previous studies have been directed at extracting superior potential resources and the ability to explore the potential in the region. In terms of regional planning, development planning often uses an approach to area-based excellence, which is based on the measurement results of what is called the Location Quotient (LQ) as stated by Aditia et al. (2021); Jumiyanti et al. (2018); Tb. Munandar et al (2017); Yolamalinda, (2015). EMSI (2007); InContext (2006) and Rahmat Hendayana, (2003). However, the previous research focused on selecting leading sectors based on the industrial sector and the regional economy. The study that focus on food security zoning in West Java is still limited.

Location Quotient is one of the efficient methods to analyze and determine the diversity of local economic basic. Many scholars have used this method in various degrees of research (Berawi et al., 2017). Some of the research on regional development using the LQ method was then tried out to be used as a measuring tool in development planning in other sectors, for example, in the field of food security. The previous research that focused on selecting variables to measure resilience dimensions, then continued with the research of Muhammad Fauzi et al. (2019); and Rakha et al. (2020), which emphasizes determining how to calculate the range of numbers to determine the categorization of food-vulnerable and food-safe areas from modifying the LQ values of the areas analyzed.

The use of the LQ method for determining regional zoning in the development of food security is based on the consideration that the regional zoning can be divided according to regional dimensions from the aspect of food availability, access to food and aspects of quality or food utilization (Kastaman, 2013). The main problem in this study is how to map food security zoning using the LQ modification model to FSQ for conditions in West Java using existing data in West Java. Therefore, this study aims to identify the food security condition zoning in West Java using the modified LQ.

METHOD

The data is collected by using the secondary data provided by Indonesia Statistical Center (BPS). This study concentrated in West Java Province area, which included 27 regencies and cities.

Research Stage
The stage of this study is presented by the following:
1. Data collections.
2. Data analysis includes variable identification, grouping variable, standardized data, FSQ calculation, zoning food security.
3. Interpretation.

The data was collected by study literature that provided by the Indonesian Statistic Center (BPS) regarding the agriculture development. This study used two data according to the period. The initial data used was the data from 2018 – 2019 (BPS Propinsi Jawa Barat. 2018; BPS Propinsi Jawa Barat. 2019; BPS Propinsi Jawa Barat. 2020). However, for further analysis, this study also provided the analysis from 2020 - 2021 (Badan Ketahanan Pangan Kementerian Pertanian RI. 2020; Badan Ketahanan Pangan Kementerian Pertanian RI. 2021) considering the post covid situation. In the end, we compare the pre-covid (2008) and post-covid (2021). The data was analyzed using a regional basis approach, namely the Location Quotient (LQ) method. The data analysis is started with the aspect and variable identification that has closely related to the food security aspect. There are three aspects identified: food availability, food access, and food quality. The aspect of food availability consists of 13 variables, the aspect of food access 11 variables and the aspect of food quality/utilization of 13 variables. The measurement variables are determined based on the availability of data and assumptions that determine each of these aspects of food security in West Java. The aspect and variables of this study are presented in the following table:

Table 1. Variable Aspects of Food Security

Food availability Variables	Food Access Variables	Food Quality Variables
Rice Production	(%) Productive Population (15 - 64)	Number of Health Centers
Corn Production	(%) Number of Working People	Toddlers served by health facilities
Cassava Production	Average length of community schooling	(%) Elementary school children served by health facilities
Soybean Production	(%) Population that Economically capable 2017	(%) Elementary school children served by health facilities
Sweet Potato Production	(%) Households with access to electricity 2016	Life Expectancy Figures 2017
Rice Harvested Area	Average Share of Food Expenditures	(%) Healthy Living Households
Corn Harvested Area	Working Residents	Number of Health Workers
Soybean Harvested Area	Human Development Index	Number of Hospitals
Cassava Harvested Area	Adjusted spending per Capita	Number of Clinics
Sweet Potato Harvested Area	Length of Road (Country, Province, District)	(%) of the population with access to proper drinking water
West Java Population Density/ District/City/Km	Length of well paved roads (Country, Province, District)	(%) Toddlers that nutritionally sufficient
Area of Land getting Irrigation Water		(%) Toddlers Not Stunted (very short/short)
(%) households are engaged in agriculture		(%) girls 15 years and over that well educated

Source: BPS West Java Province (2018 - 2020)

After the aspect and variable were identified, the data will be processed using the food security quotient (FSQ) according to LQ calculation. The undergoes a slight modification in the section on determining the justification for zoning grouping according to the results of the analysis of calculating the LQ data, not based on the comparison of commodity variables but variables that affect the three aspects of resilience food then the next modification is the base LQ value which was originally between $1 \geq LQ > 1$ with an interpretation for $LQ > 1$ or an object that has a base or source of growth, while $1 \geq LQ$ has an object interpretation that is not a basis or does not have comparative growth (Rahmat Hendayana, 2003). Then it is converted into a range between values $0 \leq LQ < 1$.

The LQ method can determine the basic commodities; choose and sort out prioritized and non-prioritized variables that are used as cumulative so that comparisons can be seen between one regency/city and West Java Province. With the term LQ being changed to Food Security Quotient (FSQ) (Rakha et al., 2020) with the FSQ equation being:

$$FSQ = \frac{Xr/RVr}{Xn/RVn} \quad (1)$$

Or

$$FSQ = \frac{Xr/Xn}{Xr/RVn}$$

Xr = Specialization Variable Value in District/City
Xn = Specialization Variable Value in Province
RVr = Reference Variable Value in District/City
RVn = Reference Variable Value in Province

After FSQ of the three aspects and all variables were determined, the zoning will be identified directly by using FSQ value. The FSQ values are then divided into 5 zoning categories of food security conditions in each region, with the 5 zoning assessment criteria divided as follows:

1. FSQ value of ≤ 0.25 is very vulnerable
2. FSQ value of $> 0.25 - 0.5$ is classified as vulnerable
3. FSQ value of $> 0.5 - 0.75$ is classified as moderate
4. FSQ value of $> 0.75 - 1$ is classified as safe
5. FSQ value of > 1 is classified as very safe

The final stage of data analysis is interpretation. The data interpretation follows the study result and consists of the suggestion for further improvement to achieve food security in West Java.

RESULT AND DISCUSSION

This study provided the analysis of three aspects that affected the food security level, namely: Food availability, food access, and food quality.

Food Availability Aspects
Detailed study result is presented in the following figure.

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(Roni Kastaman, Moehammad Fauzi, Besthari D. A. Pambudi, Shinta A. Permatasari, and Rakha Zahra Raihan)
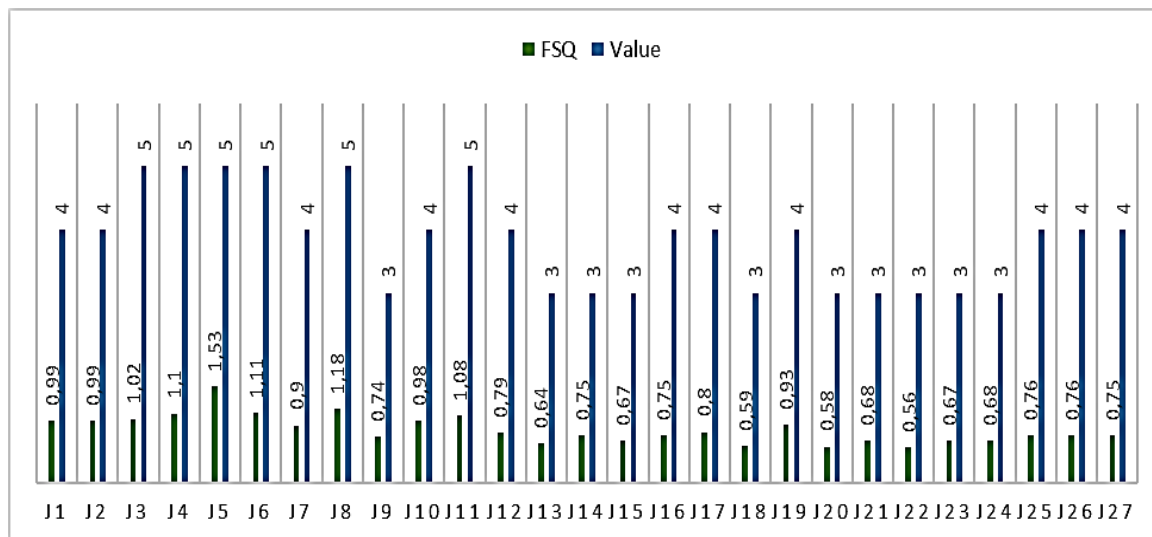
Figure 1. Conditions Aspects of Food Availability in West Java

Note of figure scale:
J1-27 = Code Distric/city in West Java (see: Table 2)
5 = very safe; 4 = safe; 3 = moderate; 2 = less safe; 1 = not safe

The FSQ value shows that the higher the FSQ index, the more secure the regional food security index which is interpreted that the food supply being sufficient for the community. When referring to Figure 1, there are 6 districts/cities identified with the category "very safe" for food availability, namely: Cianjur, Bandung, Garut, Tasikmalaya, Kuningan, and Sumedang. The "safe" category is determined in 11 districts: Bogor, Sukabumi, Ciamis, Majalengka, Indramayu, Bekasi, West Bandung, Bogor, Cimahi, Tasikmalaya, Banjar. However, a lower level of food security according to food availability is categorized as a "medium" status. In comparison 10 districts/cities were identified by the status of moderate food availability, namely Cirebon, Subang, Purwakarta, Karawang, Pangandaran, Sukabumi, Bandung, Cirebon, Bekasi, and Depok. The overall results show that in general in safe conditions, 22% in very safe conditions, 41% in safe, and 37% in moderate conditions.

According to the data, it can be concluded that the average regency/city in West Java is included in safe conditions, seen from several aspects such as the area of land that is quite extensive so that it can produce food well, the irrigation area is quite large. Therefore, it supports the area in providing the good access to food. However, the process of production of food for each region needs to be observed and examined in certain variables that are categorized as vulnerable conditions. For example, around 26 regencies/cities are categorized as very vulnerable for the variable land area that gets irrigation water, except Bogor Regency.

There are some indicators that will affect the food availability situation in the city, namely: Rice production, corn production, cassava production, soybean production, sweet potato production, rice harvested area, corn harvested area, cassava harvested area, soybean harvested area, and sweet potato area. Population density per kilometer, irrigated water area, a household that engages in agriculture.

The summary of the total of cities/districts that categorized as the vulnerable in some aspect need to be observe more further based on this category are as follow: 26 District/City in the variable of Irrigated land; 15 District/City in the the variable of Sweet Potato Production; 14 District/City in the variable of Corn Production; 13 District/City in the variable of Rice Production; 12 District/City in the variable of Rice Harvested Area; 11 District/City in the variable of Cassava Production.

All of the aspects above indicate that there would be a potential problem occur in the future related to irrigated land if there is no action to improve this condition. According to the relation that food is resulted by agricultural activity, the irrigation condition is an important input to provide sustainable agriculture production. Therefore, irrigation will contribute significantly to food security in that area. The good system of irrigation land can be a solution to overcome the extremely dry weather that occurs in Indonesia, the irrigated land can still produce food well in the worst situation. Irrigation is also related to water resistance, where the soil with good irrigation will affect land fertility. If agricultural land is fertile, it will affect the quality of agricultural products. The irrigated land becomes more threatened by the massive production activity. The availability of ground water, and the potion on the air, land, air and water, undoubtedly affected the irrigation condition. Therefore, the effort should be conducted by all stake holder to mitigates the

environmental damage that will affect the irrigation situation.

Irrigation is considered the most successful supporting the increase in food production, especially for rice production, although there is a tendency to increase the expenditure of the financing of extensive unity that is quite prominent. The large area of irrigation makes the land contained in each district can be easily flowed by water and multiply the planting season in a year. The others variable that should be more concern is: Steet potato production, corn production, rice production, rice harvested area, and cassava production.

According to Figure 1, some cities are still categorized as the moderate situation on food availability. It will become a problem in the future if there is no action from all stakeholders

to improve its availability. Some efforts can be conducted: Developing the strategic planning for agriculture production development; mapping the focus activity and location that significantly provide the improvement in the future; encouraging farmer practice sustainable agriculture production; intensive assistance program for the farmer; and supporting farmers in many aspects while practicing good agriculture practice. But scientifically, the proper strategies to improve the food availability status should be conducted to achieve a good model of its application.

Food Access Aspects

The food access is the second aspect that will effect food security in the area. By using the same analytical method, the following figure indicates the result of food access status in West Java Province.
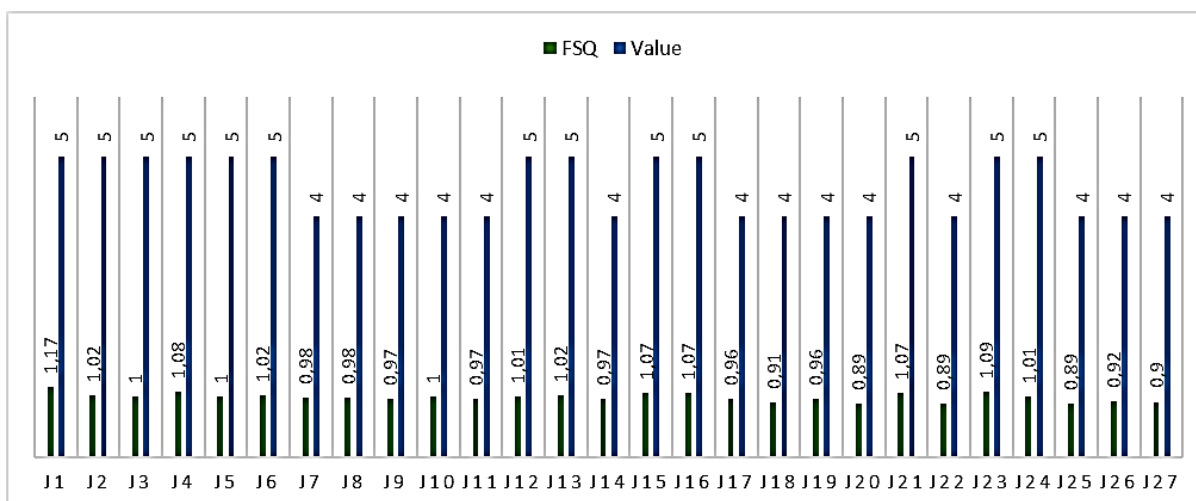

Figure 2. Conditions of Food Access Aspects in West Java
Note of figure scale:
J1-27 = Code Distric/city in West Java (see: Table 2)
5 = very safe; 4 = safe; 3 = moderate; 2 = less safe; 1 = not safe

According to Figure 2, Bogor Regency provided the higher performance for food access aspect in West Java as revealed by the highest FSQ score at 1.17. It categorized as the very safe category. The higher performance on food access indicated the easier people to reach the food. The road, transportation facility, and its availability will impact to food access category. The easier condition to reach the food impacted the lower cost to provide the food. Inversely, there are three cities/regencies that shows the lowest FSQ value, namely: Sukabumi, Cirebon, Cimahi with 0.89 FSQ value. However, even these three cities/districts have the lowest value of FSQ, it is still categorized as safe access to food access. There are some variables that indicate the food access, namely: Productive population, Average school period, The population that is categorized

as economically capable, the number of households that have good access to electricity, the average share of food expenditure, the number of working residence, human development index, Adjusted spending per capita, Length of road, and length of well paved road.

Although, all city categorized as safe and very safe, there ise some highlighted point related to aspects that should be improved according to access to food. The following table presents the variable that need to be observed continuously.

The Observed food access variables in a Number of Regions spread in three districs/cities in the variable of working residents. It indicated that there would be a potential problem occur in the future related to working residents if there is no action to improve this condition. According to the relation of working residents with food

utilization and quality, the more working resident, the more requirement for food availability. For example, the utilization of food and its quality in the city where a lot of people working there, the demand and supply (food availability) also increase. The other is two districs/cities in variable of Road Length. It is undoubtedly that road as the main infrastructure that affected a lot of food distribution. And the last is one districs/cities in the variable of the road quality. The all area that needs to more concern on food availability is located in the district area. It indicated that the working resident, the length of the road, and the quality of the road in the district area still need improvement to support the food availability in the district area. Simultaneously will affect food security.

Food Quality Aspects/Food Utilization

The third aspect that significantly affected food security is Aspects of Food Quality/Food Utilization. There are some variables that affect to the food quality and utilization, namely: Number of Health Centers; Toddlers served by health facilities; Elementary school children served by health facilities; Life Expectancy; Healthy Living Households; Number of Health Workers; Number of Hospitals; Number of Clinics; the population with access to proper drinking water; Toddlers that nutritionally sufficient; Toddlers Not Stunted (very short/short); girls 15 years and over that well educated.

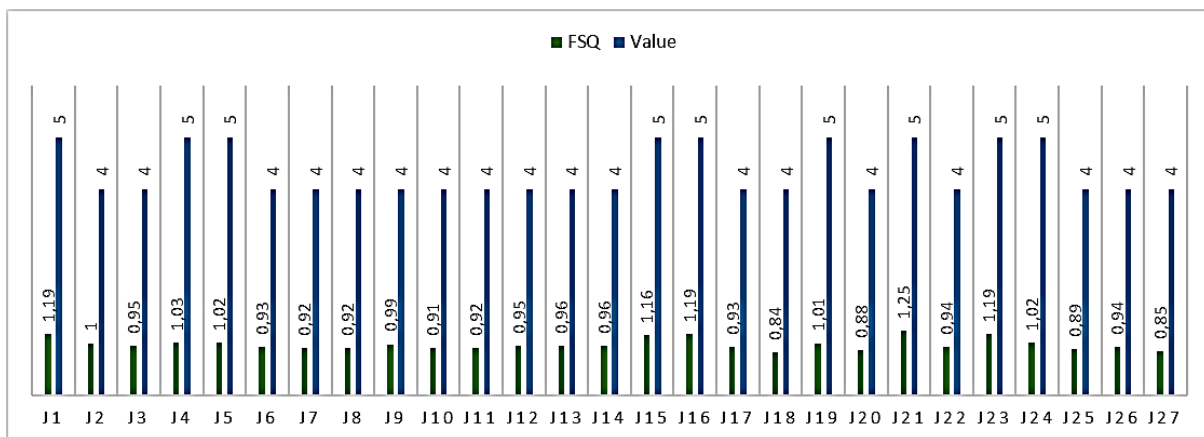The following figure indicates the food quality status in West Java.

Figure 3. Conditions Aspects of Quality/Food Utilization in West Java
Note of figure scale:
J1-27 = Code Distric/city in West Java (see: Table 2)
5 = very safe; 4 = safe; 3 = moderate; 2 = less safe; 1 = not safe

Figure 3 indicated that there were 33% (score value 5) of cities/districts in West Java categorized as the very safe conditions and 67% (score value 4) were in safe conditions. According the Figure 4, Pangandaran was identified as the lowest value of FSQ as showed by 0.88 FSQ value. Inversely, the city that has the highest FSQ value is Bandung city which indicated with 1.25 of FSQ value. The development of the city significantly affected its food quality. Even though is generally in a Safe and Very Safe condition in West Java and some variables still need to be observed. The following table presents a resume of variables that need to be improved.

Variables of Food Quality/Utilization that need to be observed in a number of regions spread in 1 districs/cities in variable of Number of Health Workers; 4 districs/cities in the variable of the number of hospitals; and 4 districs/cities in the variable of Number of Clinics.

The Overall of FSQ Result

After all aspects is calculated, the overall FSQ result is provided by its average of all aspect. This study also performs the comparative evaluation of food security pre (2008) and post covid 19 (2019-2022) as presented by the following table.

According to Table 2, the overall food security status in 2018 considers three aspects: The food availability, access, and quality indicated that 6 cities or 22% of cities are performed excellent food security condition. It was indicated by a "VERY SAFE" status. The 6 cities are: Bogor, Garut, Bandung Regency, Tasikmalaya, Kuningan, dan Bekasi. Whereas, 21 districts is categorized as the Food Safe condition. The city/district that has the highest FSQ score is Garut Regency which has the FSQ score of 1.18 and is classified as very safe. The highest FSQ value in Garut Regency.

Table 2. Comparative FSQ result in 2018 and 2019-2021

Code	Regency/City	2018		2019-2021		Margin	Margin Condition
		FSQ	Status	FSQ	Status		
J1	Bogor	1.12	VERY SAFE	0.81	SAFE	-0.314	decrease
J2	Sukabumi	1	SAFE	0.90	SAFE	-0.102	decrease
J3	Cianjur	0.99	SAFE	0.89	SAFE	-0.099	decrease
J4	Bandung	1.07	VERY SAFE	0.92	SAFE	-0.152	decrease
J5	Garut	1.18	VERY SAFE	0.90	SAFE	-0.285	decrease
J6	Tasikmalaya	1.02	VERY SAFE	0.87	SAFE	-0.149	decrease
J7	Ciamis	0.93	SAFE	0.93	SAFE	0.000	stable
J8	Kuningan	1.03	VERY SAFE	0.94	SAFE	-0.092	decrease
J9	Cirebon	0.9	SAFE	0.92	SAFE	0.021	increase
J10	Majalengka	0.96	SAFE	0.94	SAFE	-0.020	decrease
J11	Sumedang	0.99	SAFE	0.98	SAFE	-0.009	decrease
J12	Indramayu	0.92	SAFE	0.97	SAFE	0.048	increase
J13	Subang	0.87	SAFE	0.96	SAFE	0.094	increase
J14	Purwakarta	0.89	SAFE	0.92	SAFE	0.032	increase
J15	Karawang	0.97	SAFE	1.00	SAFE	0.027	increase
J16	Bekasi	1.01	VERY SAFE	0.99	SAFE	-0.016	increase
J17	Bandung Barat	0.9	SAFE	0.88	SAFE	-0.023	increase
J18	Pangandaran	0.78	SAFE	0.95	SAFE	0.175	increase
J19	Bogor	0.97	SAFE	0.87	SAFE	-0.098	decrease
J20	Sukabumi	0.79	SAFE	0.80	SAFE	0.010	increase
J21	Bandung	1.00	SAFE	0.99	SAFE	-0.015	increase
J22	Cirebon	0.8	SAFE	0.86	SAFE	0.060	increase
J23	Bekasi	0.98	SAFE	1.00	SAFE	0.020	increase
J24	Depok	0.9	SAFE	1.00	SAFE	0.096	increase
J25	Cimahi	0.85	SAFE	0.95	SAFE	0.095	increase
J26	Tasikmalaya	0.88	SAFE	0.75	MODERATE	-0.128	decrease
J27	Banjar	0.83	SAFE	0.72	MODERATE	-0.106	decrease

Source: Results of data processing.

The superiority of Garut Regency is caused by the large area of Garut Regency that can potentially produce food to meet the food demand. When compared to 2019-2021, the food security status of cities and districts in West Java tends to be the same. However, the FSQ value was slightly higher in 2018.

There were 15 cities/regencies that experienced a decrease in the FSQ score or 55% of the total cities and districts in West Java. Meanwhile, 12 other cities/regencies experienced a decrease. Including Garut Regency, which in 2018 ranked at the top in food security, experienced the biggest decline in 2019-2021, but the status of Garut Regency is still categorized as food safe.

Several elements of novelty in this research, if compared to previous food security analysis studies are:

- The use of the modified Location Quotient (LQ) as Food Security Quotient (FSQ) to measure food security, a new contribution to the methodology of food security research.
- The research focus on West Java Province provides unique insights into variations in food security within different regional contexts.
- The study reveals the impact of the COVID-19 pandemic on food security in West Java, offering a deeper understanding of this changing situation.
- The identification of variables influencing food security becomes the subject of further research, indicating the potential for more in-depth studies in this field.
- Policy recommendations for improving food security, such as sustainable agricultural strategic planning and farmer support programs, are an essential part of this research and need periodic evaluation in different regional contexts.

CONCLUSION

In general, the results of the analysis show that the food security zoning map in West Java, in all aspects: Food availability, Food Access and

Food Quality/Utilization, is in a Safe and Very Safe condition. However, there are some variables that still need to be concerned by all stakeholder in order to improve safety related to road quality, medical facilities, and working people. In all aspects, some cities are still categorized as the moderate situation in food availability. It will become a problem in the future if there is no action from all stakeholders to improve the availability, access, and quality of food. Some efforts can be conducted: Developing the strategic planning for agriculture production development; mapping the focus activity and location that significantly provide improvement in the future; encouraging farmer practice sustainable agriculture production; intensive assistance program for the farmer; and supporting farmers in many aspects while practicing good agriculture practice. But scientifically, the proper strategies to improve the food availability status should be conducted to achieve a good model of its application.

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REFERENCES

Aditia Nugraha Rusli, Angelalia Roza., Andi Mulya Rusli. (2021) Analisis Sektor Basis dan Sektor Non-Basis dalam Upaya Peningkatan Sarana dan Prasarana Perkotaan di Kota Padang. *Jurnal Saintis*, 21, (1), April 2021: 45-52.

Badan Ketahanan Pangan Kementerian Pertanian RI. (2020). INDEKS KETAHANAN PANGAN 2020. Pusat Ketersedian dan Kerawanan Pangan. Badan Ketahanan Pangan. Kementerian Pertanian. Retrieved from http://repository.pertanian.go.id:8080/server/api/core/bitstreams/27474b6b-636d-4f39-84bd-27276f93fc19/content

Badan Ketahanan Pangan Kementerian Pertanian RI. (2021). INDEKS KETAHANAN PANGAN 2021. Pusat Ketersedian dan Kerawanan Pangan. Badan Ketahanan Pangan. Kementerian Pertanian. Retrieved from http://repository.pertanian.go.id:8080/server/api/core/bitstreams/0700d4be-634a-4f89-820c-dbd06fe686b5/content

Berawi, M.A., Zagloel, T.Y., Miraj, P., Mulyanto, H. (2017). Producing Alternative Concept for the Trans-sumatera Toll Road Project Development using Location Quotient Method. *Procedia Eng*. 171, 265–273. https://doi.org/10.1016/j.proeng.2017.01.334

BPS Provinsi Jawa Barat. (2018). *Provinsi Jawa Barat Dalam Angka 2018*. Retrieved from https://jabar.bps.go.id/publication/2018/08/16/d8b96de222796402938666e4/provinsi-jawa-barat-dalam-angka-2018.html

BPS Provinsi Jawa Barat. (2019). *Provinsi Jawa Barat Dalam Angka 2019*. Retrieved from https://jabar.bps.go.id/publication/2019/08/16/b0a6b953b76cbe2239dc912d/provinsi-jawa-barat-dalam-angka-2019.html

BPS Provinsi Jawa Barat. (2020). *Provinsi Jawa Barat Dalam Angka 2020*. Retrieved from https://jabar.bps.go.id/publication/2020/04/27/cfab9a400cf304f800182a5f/provinsi-jawa-barat-dalam-angka-2020.html

Ejeromedoghene, O., Tesi, J.N., Uyanga, V.A., Adebayo, A.O., Nwosisi, M.C., Tesi, G.O., Akinyeye, R.O. (2020). Food security and safety concerns in animal production and public health issues in Africa: A perspective of COVID-19 pandemic era. *Ethics, Med. Public Heal*.15.https://doi.org/10.1016/j.jemep.2020.100600

EMSI (Economic Specialist Inc.). (2007). Understanding Location Quotient. Retrieved from https://www.economicmodeling.com/wpcontent/uploads/2007/10/emsi_understandinglq.pdf

Hendayana, R. (2003). Aplikasi Metode Location Quotient dalam Penentuan Komoditas Unggulan Nasional. *Jurnal Informatika Pertanian,* 12.

InContext. (2006). Location Quotient: A Tool for Comparing Regional Industry Composition. Retrieved from https://www.incontext.indiana.edu/2006/march/1.asp

Jumiyanti., Kalzum R. (2018). Analisis Location Quotient dalam Penentuan Sektor Basis dan Non Basis di Kabupaten Gorontalo. *Gorontalo Development*, 1, (1), April 2018.

Moehammad Fauzi, Roni Kastaman, Totok Pujianto. (2019). Pemetaan Ketahanan Pangan Pada Badan Koordinasi Wilayah I Jawa Barat. *Jurnal Industri Pertanian*, 1, (1), 1-10.

Rakha Zahra Raihan, Roni Kastaman, Tensiska. (2020). Menentukan Kondisi Ketahanan Pangan Jawa Barat Wilayah IV Menggunakan *Food Security Quotient* (FSQ). *Jurnal Ekonomi Pertanian dan Agribisnis (JEPA)*, 4, (1), 68-76.

Roni Kastaman, Entang Sastraatmadja, Asep Dedi Sutrisno., (2013). Perancangan Model Rencana Induk Pengembangan Bidang Ketahanan Pangan di Kota Bandung. *Jurnal Teknotan*, 7, (3).ISSN 1978-1067.

Tb. Munandar, Azhari, Aina Musdholifah., Lincolin Arsyad. (2017). Modified Agglomerative Clustering With Location Quotient For Identification Of Regional Potential Sector. *Journal of Theoretical and Applied Information Technology*, 15th March 2017, 95, (5).

Yolamalinda, (2015). Analisis Pembangunan Wilayah Berbasis Komoditi Unggulan Kabupaten Pasaman, Sumatera Barat. *Journal of Economic and Economic Education,* 3 , (2), 213-227.