WJARR

(RESEARCH ARTICLE)

Analysis of Hot Pepper (*Capsicum frutescens* L.) Vertical Market Integration in Gorontalo Province

Rahayu Nangsi Paramata, Asda Rauf and Ria Indriani *

Agribusiness Department, Universitas Negeri Gorontalo Province.

Abstract

This research gives 1) an identification of hot pepper prices in Gorontalo Province, 2) an analysis of hot pepper price fluctuation in Gorontalo Province, and 3) an analysis of hot pepper vertical market integration in Gorontalo Province. It was undertaken in April-June 2022. The data used were secondary. The method was descriptive-quantitative, with analyses of IMC (Index of Market Connection), Coefficient of Variation (CV) by finding the standard deviation, and price fluctuation. The results demonstrated the highest price of hot pepper around IDR67,708.00/kg prevalent at the consumer level in 2019. The lowest one, that was around IDR26,392.00/kg came about at the producer level in 2018. The price mostly fluctuated at the consumer level with a coefficient of the standard deviation of 17,281.52. At the producer level, it came with a standard deviation of 12,202.82. Price stability was relatively small at the producer level with a low-price fluctuation but was relatively high at the consumer level that, accordingly, had a high price fluctuation. The IMC (Index Market of Connection) was 0.76. The market integration grew higher or stronger. That is, price changes at the consumer level could be significantly perceived by producers. It exhibited how prices at the retailer level affected prices at the farmer and consumer levels.

Keywords: Vertical Market Integration; Hot Pepper; *Capsicum frutescens;* Market Integration

1. Introduction

A horticultural commodity is potential for continuous development and is highly-economic valuable. In terms of offering or production, the vast area of Indonesia and its agroclimatic diversity allows the development of a variety of horticultural plant species. One of the horticultural products popular in Indonesian society is hot pepper. Society consumes it on a daily basis as household or food industry needs. Hot pepper commodity can impact horticultural commerce because of a high demand to fulfill both household and food industry needs. The commodity is the primary feedstock in making certain products, e.g., sambal, or acting as a side dish. Its consumers come from all levels, resulting in high demand for hot pepper commodities. It encourages farmers to cultivate hot pepper and sellers to supply the pepper to household and food industry consumers (Sustiyana & Iswahyudi, 2020:129).

In tandem with the increased population, the demand for hot pepper is also increasing In Indonesia, 57% of hot pepper produced is used for household consumption, 27% for staple materials used by (processed) food industries, 15% was considered scattered, and the rest was used for seedlings at a very small percentage. The household need for hot pepper in Indonesia in 2017-2021 was considered very fluctuative. The need amounted to 1,490 tons in 2017 and increased to 1,835 tons in 2018 and 1,990 tons in 2019. And yet, it decreased to 1,769 in 2020 yet increased to 1,854 tons in 2021 (Buletin Konsumsi Pangan, 2021:44). Household consumption need in Gorontalo was reportedly decreasing and increasing on a yearly basis. The data indidcated that in 2017, the average household consumption was 0.28 kg/month.

---

* Corresponding author: Ria Indriani

It increased to 0.33 kg/month in 2018 and 0.38 kg/month in 2019. However, it decreased to 0.34 kg/month in 2020 (Statistics Indonesia, 2022).

Hot pepper farming in Gorontalo Province is prospective and very competitive. Hot pepper commodity has a higher competitiveness than corn and rice. Hot pepper in Indonesia has an R/C Ratio of 2.15 and a B/C ratio of 1.87, both of which are higher than corn's: 2.11 and 1.83, respectively, and rice's: 2.03 and 1.77, respectively (Indriani et al., 2019). Hot pepper in Gorontalo Province was very fluctuated in 2017-2020, and the harvested area both increased and decreased annually. Hot pepper production reaced 251,258 tons in 2017, and the harvested area was 2,625 ha. The production increased to 256,946 tons in 2018 with a harvested area of 2,785 ha. Nevertheless, it decreased to 205,798 tons with a harvested area of 2,610 ha in 2019 and to 147.292 tons with a harvested area of 1,997 ha in 2020 (Statistics Indonesia in Gorontalo, 2022.

Inflation levels in Gorontalo Province is inflected by volatile food groups. In the last three years, hot pepper is one of the volatile food commodities largely contributing to inflation levels in Gorontalo Province. To control inflation levels due to volative food, especially hot pepper, Gorontalo Provincial Government, in collaboration with the Representative Office of Bank Indonesia (BI) in Gorontalo and all institutions concerned, has carried out some programs, such as developing and producing Malita local hot pepper seedling, building a hot pepper green house and MA-11 breeding laboratory, and implementing the Gerakan Tanam Cabai program. In addition to develop a local hot pepper variety, the Local Inflation Control Team (TPID) of Gorontalo Province makes a collaboration agreement involving three provinces, i.e., Gorontalo, North Sulawesi, and Central Sulawesi. The collaboration aims to maintain the availability of volatile food commodity supply, particularly hot pepper (Rahim, 2020:1).

Marketing is a series of thorough marketing activities conducted based on market analysis to serve the market or market segment as a target of entrepreneurs (agribusiness actors and producer farmers). In Indonesia, Hot pepper marketing institutions highly engaged in marketing activities are farmers as producers, collectors, retailers (market), wholesalers, and consumers. Marketing institutions are anxious to earn profits, requiring different prices paid to them. The difference greatly varies, depending on the net profit determined by each marketing institution. The longer the marketing conduit, the higher the price at the final consumer level (Foat et al., 2019:93).

The price of an agricultural commodity, specifically horticultural, is always fluctuating and tends to increase. It brings about food price volatility and inflation. Among the causes of fluctuated prices are natural disasters, seasonal production, and storage facility out of kilter with price information. An auspicious price excites higher production. Nonetheless, most farmers suffer from capital constraints to response price changes (Kustiari et al., 2018:39). Hot pepper price increases on a weekly basis. The increase is a result of low hot pepper supply distributed in the market because of some disturbances from weather to distribution. Uncertain weather factors may lead to uncertain number of production and influence hot pepper price (Indriani et al., 2019:32).

Hot pepper price in Indonesia in 2018-2021 experienced fluctuation. In 2018, the average price of hot pepper was IDR20,542/kg but decreased to IDR36,351.00/kg in 2019. Notwithstanding the decrease, it significantly increased to IDR56,125.00/kg in 2020 and IDR78,366.00/kg in 2021. Meanwhile, the average price of hot pepper in Gorontalo Province in 2019 was IDR58,000.00/kg and decreased to IDR35,000.00/kg in 2020. In April 2021, it increased to IDR70,000.00/kg. Whilst, according to the Center for Information for Strategic Food Price (PIHPS) Representative Office of Ban Indonesia in Gorontalo Provice, hot pepper price indicated an increasing trend. On December 9th, 2021, the price reportedly achieved IDR80,000.00/kg (Ministry of Trade, 2019 & Center for Information for Strategic Food Price.

Price fluctuation is a condition that is unstable, varied, and unpredictable. Moreover, a price is a value created after a demand and bidding in a certain number in a market mechanism. Accordingly, agricultural price fluctuation is an agricultural commodity price condition that is unstable and varied, and as such, is hard to predict by different parties, such as farmers, sellers, or the government. The fluctuation affects both farmers and sellers. And yet, the first party often suffers from negative effects. The fluctuation is a product of the weak bidding position of farmers to participate in market price determination mechanisms (Daud et al., 2018:236).

Market integration is a merger between several marketing institutions that functionally and economically becomes a single marketing institution. Factors impacting market integration highly vary between agricultural commodities. In general, factors determining the integration appear as the characteristics of available products, production location, and transportation facilities. Hot pepper price transmission is one of the requirements to realize market integration of the hot pepper commodity and define the degree to which price changes of an item in a location or level inflect price changes of the same item in another location or level. Market integration is classified into two: horizontal and vertical. Horizontal

market integration ensues in the producer market, whereas vertical market integration happens between producer and consumer levels (Indriani et al., 2019:57-58).

The frequent issue concerning this hot pepper commodity is fluctuating prices. Hot pepper price upsurges, either increasing or decreasing, making the commodity contribute to yearly inflation. The upsurge underlies the issuance of Ministry of Trade Regulation Number 63/M-DAS/PER/9/2016 Year 2016 concerning hot pepper commodity reference prices at consumer and farmer levels. The referential price: the red hot pepper and curly red chili have referential prices of IDR15,000.00/kg at the farmer level and IDR28,500.00/kg at the consumer level. Meanwhile, hot pepper has reference prices of IDR17,000.00/kg at the farmer level and IDR29,000.00/kg at the consumer level (Ministry of Trade, 2022:8). Based on the explanation, hence, producers and consumers often confront price changes (price fluctuation) in hot pepper marketing. In so doing, we need to perform in-depth research on vertical price market integration of hot pepper to maintain hot pepper price stability in Gorontalo Province.

2. Method

2.1. Area and Time

This research was undertaken in Gorontalo Province in April-June 2022.

2.2. Type

This was descriptive research using a quantitative approach.

2.3. Data Type and Source

The data used were secondary from relevant institutions. The secondary data were data on monthly prices at producer and consumer levels for four years (2018-2022) and collected from relevant institutions, e.g., Statistics Indonesia in Gorontalo Province, Agricultural Office, Ministry of Agriculture (SIMHARGA, National PIHPS), and research journals.

2.4. Data Collection Technique

The following are our data collection techniques.

2.4.1. Interview

The interview was a data collection technique enabling the interviewer to interface with informants.

2.4.2. Documentation

Documentation was a data collection technique through which we observed charts, organizational structures, graphs, archives, pictures, and others.

2.4.3. Observation

The observation was observing an object directly and carefully to acquire valid information about the object observed.

2.5. Data Analysis Technique

2.5.1. Price Formation Analysis

We used a descriptive analysis with a quantitative approach to obtain a description of hot pepper price formation processes. The information was grouped and presented in the form of numbers and graph tabulation aligned with the results acquired.

2.5.2. Price Fluctuation Analysis

We analyzed hot pepper price fluctuation using mean and standard deviation (S). The coefficient of variation was obtained by dividing the standard deviation of a variable by the mean. The formula was:

$$S^2 = \text{Standard Deviation}$$

2.5.3. Market Integration Analysis

The data analysis was carried out to examine the extent to which commodity price integration at an institutional or market level was influenced by the price at another institutional level using IMC (Index of Market Connection). The method, with the Autoregressive Distributed Lag model, was allegedly the ordinary least square or OLS method. The formula and criteria were:

$$P_t = b1\ (P_{t-1}) + b2\ (P^*_t - P^*_{t-1}) + b3\ (P^*_{t-1})$$

Description

P_t = Hot pepper price at the farmer level at time t

$⟦P^*⟧\_t$ = Hot pepper price at the retailer level at time t

$P\_{(t-1)}$ = Hot pepper price at the farmer level at time t-1

$⟦P^*⟧\_{(t-1)}$ = Hot pepper price at the retailer level at time t-1

b1 = Coefficient of regression $P\_{(t-1)}$

b2 = Coefficient of regression $⟦P^*⟧\_t - ⟦P^*⟧\_{(t-1)}$

b3 = Coefficient of regression $⟦P^*⟧\_{(t-1)}$

IMC (Index of Market Connection) was a comparison between the coefficient of the local market in the previous period and the coefficient of the reference market in the previous period. The formula is:

$$IMC = \frac{b1}{b3}$$

Criteria

If IMC < 1, the market integration was increasingly higher. It pointed out that price at the retailer level was the main factor of price formation at the farmer level.

If IMC ≥ 1, the market integration was low. It showed that price at the retailer level was partly transmitted at the farmer level. The main factor of price formation at the farmer level was the farmer's condition (Indriani et al., 2019:135-136).

3. Results and discussion

3.1. Price Formation Analysis

Two critical factors of price formation were demand and bidding. Demand and bidding would meet in an equilibrium of market price when the amount demanded were equal to the amount bid. The market price is the level of price determined based on agreement between producers or bidding with consumers or demand. We performed an analysis of hot pepper market price formation at farmer and consumer levels. The information was collected from retailers or market sellers. The price data used were montly data on hot pepper in 2018-2022. Figure 2 presents the trend of hot pepper price formation in Gorontalo Province.

From Figure 2, hot pepper price formation from 2018-2022 remained fluctuated every year. It was a consequence of low hot pepper production that could not meet consumer needs, bringing on ardently fluctuating market prices. Building on the results, the highest hot pepper price was around IDR67,708.00/kg in 2019, but the highest amounted to IDR108,500.00/kg in October at the consumer level. Meanwhile, the lowest prices, IDR26,392/kg, occurred in January

and February. In those months, hot pepper was sold at IDR25,300.00/kg at the producer level and IDR36,350.00/kg at the consumer level. At the consumer level, the lowest price of hot pepper, IDR34,600.00/kg was prevalent in January. Hot pepper, that being so, its production as well, was seasonal. It caused hot pepper price to be fluctuative in the market. In a great harvest, hot pepper could be abundantly produced, engendering a low price. However, in a small harvest, the price would spike.
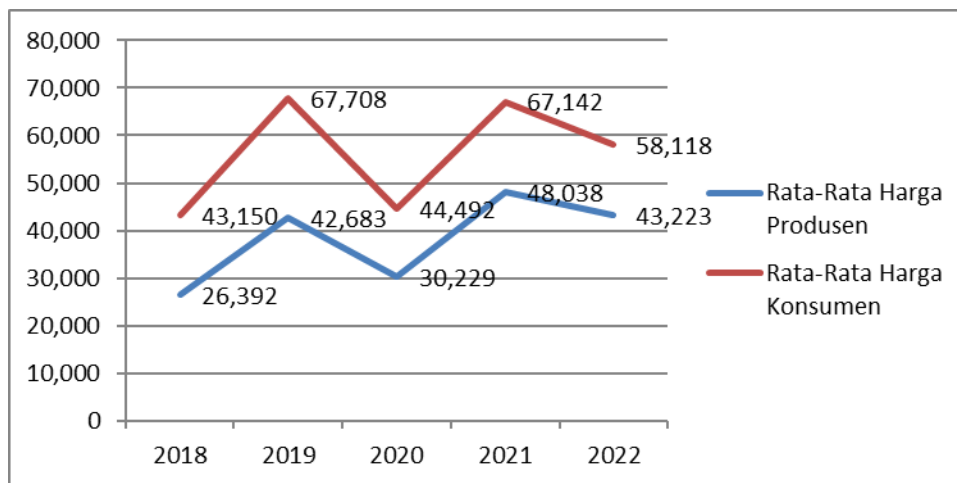
Data Source: Secondary Data Analysis, 2022

Figure 1 The Average Hot Pepper Price in Gorontalo Province in 2022

3.2. Price Fluctuation Analysis

Agricultural price fluctuation was an agricultural commodity price condition that was unstable and varied, and therefore, was unpredictable for a range of parties, e.g., farmers, sellers, or the government. The fluctuation affected farmers, sellers, or the government, with farmers suffering from its negative effects. Thus, we conducted research on price fluctuation at both farmer and producer levels. From the results, we could identify which level had higher price fluctuation. Using analysis of the coefficient of variance of data on price in a certain period, we investigated the price fluctuation (standard deviation toward the mean) used to identify price stability of a commodity. The smaller the coefficient of variance, the more stable the price or the lower the fluctuation (Eliyatiningsih & Financia, 2019:57).

Table 4 The Result of Hot Pepper Price Fluctuation Analysis in Gorontalo Province in 2018-2022

| Name	Producer	Consumer
S	IDR12,202.82/kg	IDR17,281.52/kg

Data Source: Secondary Data Analysis, 2022

As stated in Table 4, price fluctuation at the consumer level was higher and had the coefficient of standard deviation of 17,281.52, while at the producer level, the coefficient was 12,202.82. It took place due to a long marketing chain and higher consumption demand that production of hot pepper, generating a more fluctuative hot pepper price at the consumer level than that at the producer level. Price stability at the producer level was relatively small or the price fluctuation was low. Meanwhile, the consumer level had relatively high price stability or high fluctuation.

3.3. Market Integration Analysis

Market integration transpired when price changes in a market were realized with the same response in another market. We undertook an analysis of vertical market integration between prices at the farmer and consumer levels. The data used were data on monthly price of hot pepper in 2018-2022. Figure 3 suggests the trend of hot pepper prices.

As exhibited in Figure 3, the average price of hot pepper in 2018-2022 was fluctuated annually. The average price of hot pepper at the consumer level reached the highest price of IDR67,708.00/kg in 2019. At the producer level, the highest price of IDR48,038.00/kg turned up in 2021. The lowest price of IDR26,392.00/kg broke out at the producer level in 2018, and at the consumer level, the lowest price of IDR43,150.00/kg also came about the same year. Hot pepper was seasonal, and so was the production. It bred fluctuative hot peper price in the market. During a great harvest, hot pepper

was in abundant production, bringing about price cheapness. And yet, low production would bring on price spiking as the production could not meet consumer demands.
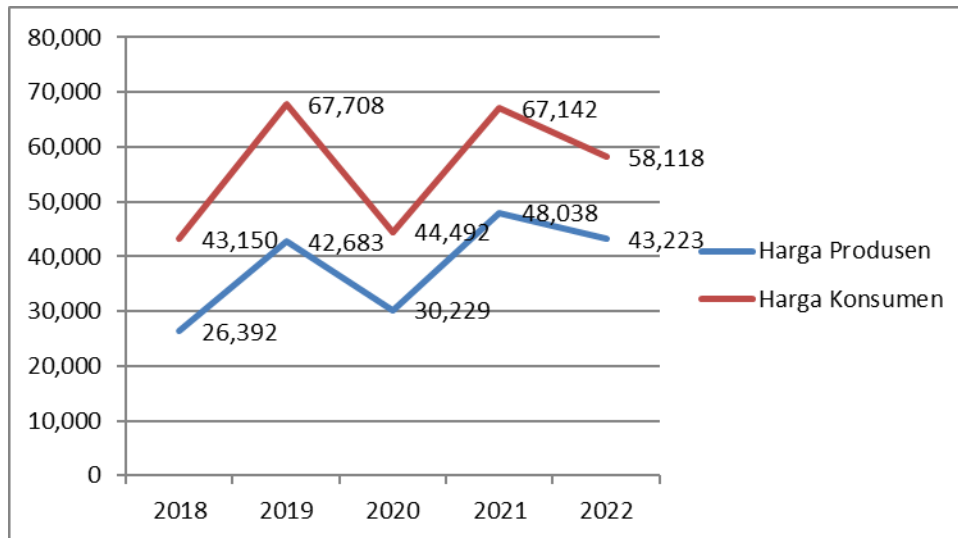
Source: Secondary Data Analysis, 2022

Figure 2 The Average Hot Pepper Price in 2018-2022

Data processing was analyzed using Index of Market Connection (IMC) with Autoregressive Distributed. The results of double linear regression analysis are exihibited in Table 2.

Table 2 The Results of the Analysis of Hot Pepper Commodity Market Integration between Farmers and Consumers in Gorontalo Province

Free Variable	Coefficient	T	Significance
Hot pepper at the farmer level at time t-1 (b1)	0.367	3.534	0.000
The difference in hot pepper price at the consumer level between times t and t-1(b2)	0.202	2.891	0.003
Hot pepper at the farmer level at time t-1 (b3)	0.447	6.914	0.000
Constant	3.308.119	0.805	0.424
F	38.461		0.000[b]
R	0.823[a]		
R^2	0.677		
IMC	0.76		

Data Source: Secondary Data Analysis, 2022

Based on Table 2, hot pepper price at the farmer level at time t-1 came with a coefficient of 0.367 with a T value of 3.534 and a 0.000 significance level. The difference in hot pepper price at time t-1 had a coefficient of 0.202 and a T value of 2.891 and a 0.005 significance level. Hot pepper price at the consumer level at time t-1 came with a coefficient of 0.477 and a T value of 6.914 and a 0.005 significance value and a constant of 3,308,119 and a T value of 0.805.

- Coefficient of Determination (R2)

The coefficient of determination was measuring to what extent a model could define the variation of the dependent variable (hot pepper price at the farmer level). The regression analysis of price at the farmer and consumer levels resulted in a coefficient of determination (R2) of 0.677 or 67.7%. That is, the price variable at the farmer level in the previous month, the difference of price at the consumer level from the price at the consumer level in the previous month, and the price at the consumer level in the previous month were considered to strongly affecting the variable of hot

pepper price at the farmer level in the current month. The price variable at the farmer level in the previous month, the difference of price at the consumer level from the price at the consumer level in the previous month, and the price at the consumer level in the previous month impacted the price at the farmer level by 67.7%, and the rest 32.3% was caused by other factors unaddressed in this research analysis model.

- F-Test

An F-test aimed to observe if the previous price variable at the farmer level, the difference of price at the consumer level from previous price at the consumer level, and previous price at the consumer level simultaneously and significantly inflected the variable of hot pepper price at the farmer level in the current mont at a certain significance (α) level. From Table 2, the F-count was 38,461 at a 0.000 significance level. The regression model was significant if the p-value was smaller than a 1% significance level. That is, the price variable at the farmer level in the previous month and price at the consumer level in the previous month simultaneously and significantly influenced the variable of hot pepper price at the farmer level in the current month.

- T-Test

An F-test aimed to observe if the previous price variable at the farmer level, the difference of price at the consumer level from the previous price at the consumer level, and the previous price at the consumer level simultaneously and significantly inflected the variable of hot pepper price at the farmer level in the current month at a certain significance (α) level. In table 2, the variable of hot pepper price at the farmer level in the previous month had a T-count of 3,185 significant at a 95% confidence level and a coefficient of regression of 0.367. It indicated a positive correlation between hot pepper price at the farmer level in the current month and that in the previous mont.

As pointed out by the results, the regression equation of market integration at the producer and consumer levels in Gorontalo Province was:

$$Pt = 0.367 (Pt-1) + 0,202 (p*t-p t-1) + 0.477 (p*t-1)$$

Building on the results of the regression analysis of hot pepper prices at the farmer level and at the consumer level in Gorontalo Province, we could identify the market integration level by studying IMC (Index Market of Connection).

$$IMC=b1/b3=0.367/0.477=0.76$$

From the coefficient of regression of the hot pepper price variable at the farmer level on the previous day (b1) and that at the consumer level on the previous day (b3), IMC (Index Market of Connection) was 0.76. It presented growing market integration. That is, the price at the retailer level was the main factor impacting price at the farmer and consumer levels. The market was an oligopoly, so there was only one commodity sold and dominated by several people. It was due to a lack of hot pepper farmers in accessing price at the consumer level, causing them to accept price unilaterally decided by retailers.

4. Conclusion

Predicated on the results and discussion, we drew some following conclusions.

- Hot pepper prices annually fluctuated in 2018-2022. The highest price of hot pepper of IDR67,708.00/kg ensued at the consumer level in 2019, whereas the lowest of IDR26,392.00/kg happened at the producer level in 2018.
- The highest fluctuation of hot pepper in the market in Gorontalo Province occurred at the consumer level with a coefficient of the standard deviation of 17,291.52, while that at the producer level came with a standard deviation of 12,202.82. Price stability at the producer level was relatively small or came with low price fluctuation, and that at the consumer level was relatively high or had high price fluctuation.
- IMC (Index Market of Connection) was 0.76. It showed growing market integration. That is, price changes at the consumer level could be significantly perceived by producers. It suggested that price at the retailer level was the main factor affecting the price at the farmer and consumer levels.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

References

[1] Center for Information for Strategic Food Price. 2022. Harga Rata-rata Cabai Rawit di Indonesia. https://hargapangan.id

[2] Daud Sofyani, Yuriko Bokoesoe, & Yanti Saleh. 2018. Analisis Pemasaran Cabai Rawit di Desa Sosial Kecamatan Paguyaman Kabupaten Boalemo. Jurnal AGRINESIA. Faculty of Agriculture, Universitas Negeri Gorontalo, Gorontalo.

[3] Eliyatiningsih & Financia Mayasari. 2019. Integrasi Pasar Cabai Merah di Kabupaten Jember (Pendekatan Kointegrasi Engle-Granger). Jurnal Pertanian Agros Vol. 21 No. 1. Politeknik Negeri Jember.

[4] Faot M. Linda, I Nyoman Sirma, & S. P. N. Nainiti. 2019. Efisiensi Pemasaran Cabai Rawit di Kecamatan Amarasi Kabupaten Kupang Provinsi Nusa Tenggara Timur. Jurnal Buletin Excellentia (P-Issn:2301-6019). Agribusiness Department, Faculty of Agriculture Undana.

[5] Gorontalo Provincial Government. 2020. Kembangkan Varietas Cabai Local, Cara Pemprov Kendalikan Inflasi Dinas Komunikasi Informatika dan Statistik Provinsi Gorontalo. Https:// Gorontaloprov. Go. Id/ Kembangkan-Varietas- Cabai- Lokal- Cara- Pemprov- Kendalikan- Inflasi/. Di Akses 15 Maret 2022.

[6] Indriani R., R. Dama, Y. Musa, & A. N. Tenriawaru. 2019. Mekanisme Rantai Pasok Cabe Rawit di Provinsi Gorontalo. Jurnal Sosial Ekonomi Pertanian. Universitas Negeri Gorontalo. Gorontalo.

[7] Indriani R, R. Rahim, & D. Mahyuddin. 2019. Rantai Pasok Aplikasi pada Komoditas Cabe Rawit di Provinsi Gorontalo. Ideas Publishing. Gorontalo.

[8] Kustiari Reni, Wahyuning K. Sejati, & Riva Yulmahera. 2018. Integrasi Pasar Dan Pembentukan Harga Cabai Merah Di Indonesia. Jurnal Agro Ekonomi, Vol. 36 No. 1. Pusat Sosial Ekonomi dan Kebijakan Pertanian. West Java.

[9] Price Information System. 2022. Laporan Harga Produsen dan Konsumen Bulanan Tahun 2018-2021. Https://aplikasi2.pertanian.go.id

[10] Statistics Indonesia in Gorontalo. 2022. Produksi Cabai Rawit di Provinsi Gorontalo. Statistics Indonesia.

[11] Statistics Indonesia. 2022. Bulletin Konsumsi Pangan dan Pusat Data dan Sistem Informasi Pertanian. Statistics Indonesia.

[12] Sustiyana & Iswahyudi. 2020. Evaluasi Risiko dalam Rantai Pasok Cabai di Kabupaten Sumenep. Jurnal Hexagro Vol. 4 No. 2. Faculty of Agriculture Universitas Islam Madura. Indonesia.