# Analysis of Supply Chain in Corn Commodities at Dompu District West Nusa Tenggara Province

Dodo Kurniawan[#1], Candra Fajri Ananda[*2], Putu Mahardika Adi[#3], Moh. Khusaini[#4]

[#]*Faculty of Economics and Business, Brawijaya University, Jalan MT Haryono 165, Malang 65145, Indonesia*

[*]*STKIP Yapis Dompu, Jalan STKIP Yapis Dompu No. 1 Sorisakolo, Dompu Nusa Tenggara Barat Indonesia*

[1]dodokurniawan1987@gmail.com

[2]cfajri@ub.ac.id

[3]putumahardika@gmail.com

[4]mohkhusaini@yahoo.com

***Abstract*— The drastic drop in prices often does not merely reflect a surge in supply which is not accompanied by an increase in demand in an equal proportion, but also reflects a supply chain that is not well developed. The purpose of this study was to analyse the supply chain and supply chain margins for maize commodity in Dompu Regency, West Nusa Tenggara. The research method used a descriptive quantitative approach involving 120 corn farmers as respondents. This study uses supply chain margin analysis and Farmer's Share. The results showed that there were three types of supply chains, namely (1) Farmer-VCT-DCT-Wholesaler-PMT, (2) Farmer-DCT-Wholesaler-PMT, (3) Farmer-Wholesaler-PMT. Of the three supply chains 46% of farmers use the second supply chain, namely Farmers-DCT-Wholesaler-PMT. The supply chain that has a small margin and a high farmer's share is the third supply chain, with a supply chain margin of IDR 613 and a farmer's share of 85.22%..**

***Keywords*—** *Supply chain corn, commodities, analysis*

## 1. Introduction

Limited availability and access to markets and transportation services can extend the supply chain, resulting in high transaction costs. The high transaction costs in accessing the input supply chain as well as the output supply chain are a fundamental problem for farmers in Dompu district. So that it has an impact on the lack of profits obtained by farmers.

The creation of marketing contracts in the agro-food supply chain has proven to play an important role in connecting farmers to developed markets and increasing farmers' income [1]; [2]; [8]; [12]. Smallholders in developing countries can benefit from increased market participation and commercialization. Smallholder access to urban markets and exports will offer them higher output prices.

The results of the study by [9]; [5], showed that farmer participation in the right supply chain has a positive effect on increasing farmers' income and food security. Likewise, research conducted by [10], shows that farmer participation with traders in nearby markets and wholesalers in nearby cities has a positive effect on per capita consumption expenditure compared to intermediaries on agricultural land. Apart from increasing farmer participation in the nearest appropriate supply chain, developing a new supply chain can minimize transaction costs and can contribute to higher income for farmers [16].

Thus, increasing market access can promote sustainable production increases and increase food security. However, smallholders cannot access these markets individually and require collective action to improve their bargaining position and reduce transaction costs, [15]; [13]. This is evident from the results of research by [3], showing that by joining groups, farmers can reduce some transaction costs. In addition, [7], argue that strengthening farmer institutions increase farmers' bargaining power.

## 2. Literature Review

The supply chain or trading system can be defined as a type of economic activity that functions to carry or deliver goods from producers to consumers. It is called a trade system because commerce means trade, so it means everything related to the "rules of the game" in terms of trading in goods. Because trade is usually carried out through the market, commerce is also called marketing [11].

The supply chain includes all activities related to the effort to distribute goods produced by a company from producers to buyers or to potential final consumers. The supply chain used in the distribution of goods from producers to consumers varies according to the type of goods. A supply chain that is too long causes more supply chains to participate in distribution activities. This gives the possibility of distributing manufactured goods widely, but incurs higher costs which can lead to high prices when the goods reach consumers. Conversely, if the market channel is shorter, production costs can be reduced so that prices to consumers can be lower (cheaper) [4].

Activities to distribute goods or services will pass through various supply chains. Some supply chains are long and some are short. There are four levels of the supply chain according to [6], as follows: First, Zero-Level Supply Chain. This zero level supply chain is also known as a direct supply chain. It is said to be a direct supply chain because producers sell their goods directly to consumers, so they do not use intermediaries at all. Second, the supply chain level one (One-Level Supply Chain). This supply chain is called a level one supply chain because it only uses one intermediary agency. The intermediary institutions for consumer goods are generally retailers, while for industries it is generally a selling agent or broker.

Third, the supply chain level two (Two-Level Supply Chain). This supply chain is called a second tier channel because there are two intermediary institutions. For consumer goods, in general, intermediary institutions are wholesalers and retailers. As for industrial goods, intermediary institutions are distributors and dealers. And fourth, multi-level supply chain. This supply chain is called a multilevel channel because it uses a lot of intermediaries, usually between wholesalers and retailers there are structured collectors, where each intermediary supervises several other intermediaries. Therefore this supply chain is called a multi-level Supply Chain.

The length of the supply chain that is passed through an agricultural commodity depends on several factors. According to [17], as follows: First, the distance between producers and consumers, meaning that the farther the distance between producers and consumers, the longer the supply chain that must be passed. Conversely, the closer the producers and consumers are, the shorter the supply chain they pass. Second, the nature of the commodity, meaning that the nature of the commodity determines the supply chain chosen. The more quickly the commodity / product is damaged, the product must reach the consumer's hands quickly. And third, the scale of production, meaning that if production takes place on a small scale, then the products are produced on a small scale too. This will not be profitable if the producers sell directly to the market. In such a situation it is necessary to have an intermediary and thus the channel through which the product will tend to be long. And fourth, financial position, meaning that producers with a strong financial position tend to shorten the supply chain. Traders with a strong financial position will be able to make more purchases when compared to traders with small / weak financial positions.

## 3. Method

The research method in this study used a descriptive quantitative approach involving 120 corn farmers as respondents spread over 8 villages and 4 sub-districts of corn production centres in Dompu Regency. The village and sub-district were determined purposively, while the respondents were determined incidentally. Data collection was carried out by distributing questionnaires and interviews.

### 3.1. Data Analysis Tools

Supply chain margin is the difference between the price at the consumer level and the price at the producer level. To find out the margin of each supply chain institution, the formula is used [17].

$$Mp = Pk - Pp \quad \text{.....(1)}$$

Information:
Mp = Supply chain margins (IDR/kg)
Pk = Prices at the consumer level (IDR/kg)
Pp = Prices at farmer level (IDR/kg)

Farmer's share analysis is useful for knowing the share of the price received by the farmer from the price at the consumer level (large warehouse) expressed as a percentage. Farmer share is formulated as follows, (Widiastuti & Harisudin, 2013):

$$Fs = \frac{Pp}{Pk} x100\% \quad \text{.....(2)}$$

Information:

Fs = Farmer share
Pp = Prices at farm level (IDR/kg)
Pk = Prices at the consumer level (IDR/kg).

# 4. Result

The activity of distributing maize from farmers to consumers requires the role of intermediary traders. Traders involved in distributing maize in Dompu district include village collector traders (VCT), sub-district collector traders (DCT) and large traders (WHOLESALER). In the process of distributing maize, farmers generally sell to traders in the village or traders from outside the village who come to farmers' fields. but for farmers whose maize production is on a large scale and there are no village traders in the area, they tend to sell directly to sub-district traders or to large traders. The activity of distributing maize from farmers to consumers requires the role of intermediary traders. Traders involved in distributing maize in Dompu district include village collector traders (VCT), sub-district collector traders (DCT) and large traders (WHOLESALER). In the process of distributing maize, farmers generally sell to traders in the village or traders from outside the village who come to farmers' fields. but for farmers whose maize production is on a large scale and there are no village traders in the area, they tend to sell directly to sub-district traders or to large traders.

Based on the results of research on the maize supply chain in Dompu District, the supply chains involved in the process of distributing maize from farmers to final consumers are:

## 4.1. Village Collector Trades (VCT)

Traders who are domiciled in the respondent farmer's village are called village collector traders (VCT). In this study, 37 respondents (31%) used village collectors. Village collectors usually buy corn from farmers who have been shelled and sun-dried. Purchases can be made on the ground, in the drying field or at the farmer's house. However, most village collector traders make purchase transactions by visiting farmers in the corn field. In this case the farmers do not pay transportation costs because they are borne by the VCT. However, farmers get prices below the warehouse or wholesaler prices. The volume of corn purchases by VCT ranges from 5-8 tons in one transaction.

Before the VCT purchase transaction, the farmers have packed the corn in sacks with a capacity of 100-120 kg of dry or dry corn in the sun. Therefore, when VCT is going to buy, they take samples of the corn that they will buy by taking samples directly during shelling and also when they are finished in the sun. By looking at and checking the moisture content of the corn, the price is determined. Almost all of the payment methods made by VCT to farmers were made by paying cash, only a few VCT made payments after the corn they bought from farmers was sold.

**Table 1.** The supply chain used by maize farmers

| SUPPLY CHAIN | Number of people) | Persentase (%) |
|---|---|---|
| Farmers - VCT | 37 | 31 |
| Farmers - DCT | 55 | 46 |
| Farmers - Wholesalers | 28 | 23 |
| Number of respondent (farmers) | 120 | 100 |

## 4.2. District Collector Traders (DCT)

Traders who purchase maize from VCT and sometimes directly from farmers are called sub-district collectors (DCT). Most of the existence of DCT is based around corn production centres and is scattered around national roads. DCT sells maize to wholesalers, the volume of purchases by DCT ranges from 30-40 tons in one transaction, during the high season DCT can make 2-3 transactions in one day depending on the strength of DCT's capital.

The corn purchased by DCT from farmers and / or VCT is corn that has been packaged in sacks with a capacity of 100-120 kg, either in the form of dry or dry corn. Pricing is based on water content. Corn purchased from farmers and / or VCT is dried if the content is still high, while corn that has a moisture content below 17 per cent is directly sold to wholesalers. Sales to wholesaler based on the contract that has been made. The payment method is made non-cash through an account belonging to the DCT.

There are 55 farmers (46%) respondent farmers who sell at DCT. Of the 120 respondents, farmers are more likely to sell to DCT. This is because the price difference between VCT and DCT is quite promising for farmers, so many are asking to sell their maize at DCT. Meanwhile, to bring directly to the warehouse (wholesalers), apart from a small price difference, farmers also have limited access to the warehouse, access in this case is the network to each warehouse. This network is important to know the development of corn prices at any time. In

addition to the farmer network, there are obstacles to access to transportation services.

## 4.3. Wholesaler

The presence of large traders indicates the large production capacity of maize produced in Dompu district. Wholesaler is a trader who supplies raw materials for animal feed to Animal Food Companies (PMT) because the orders are through a contract system and the payment is non-cash but certain. In Dompu district, there are three large traders, all of which are located in maize production centre, namely in Manggelewa sub-district.

Wholesaler buys corn by being visited by farmers, VCT and DCT to their warehouse by means of non-cash payments or through a bank account with a time span of one working day for the money to enter the account. This method was chosen to prevent farmers, VCT, and DCT from criminal acts, both robbery and others.

The volume of corn purchases by wholesaler ranges from 60-100 tons in one transaction. Testing the moisture content of the maize was carried out by means of an electric device or tester so that the moisture content was known. After the water content is known, the price is determined according to the predetermined price. If the corn purchased contains high water content, wholesaler will dry it using a dryer and if the corn has met the water content standard below 17 per cent, the corn will be stored in the warehouse immediately.

There were 20 respondent farmers (23%) who made direct sales to wholesaler. This amount is the smallest of the two previous supply chains. This is because farmers still find it difficult to access wholesaler due to a lack of information and no partnership between farmers and wholesaler.

The description and pattern of the maize supply chain that occurred in Dompu Regency and its marketing institutions are presented in Figure 1, involving traders. There are variations in accessing the supply chain, this variation is caused by the presence of asymmetric information, access to marketing institutions, capital and access to transportation locations between farmers and corn traders. There are maize supply chains in Dompu District that range from farmers to village collectors (VCT), from farmers to sub-district collectors (DCT), and from farmers to large traders (wholesaler). In the end, the maize consumers in Dompu District are animal feed companies (PMT) in Surabaya, East Java.

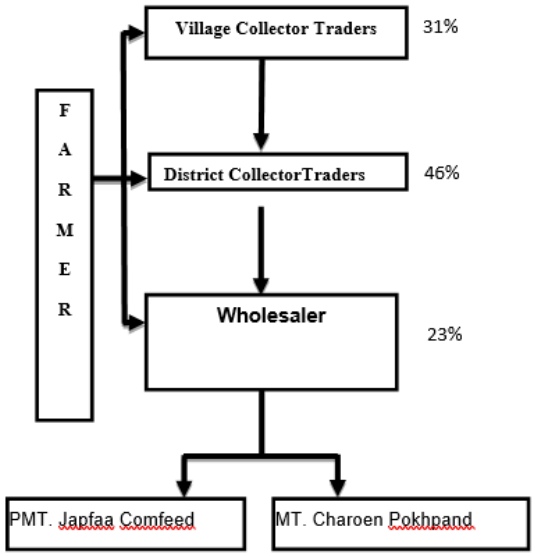


**Figure 1**. Corn supply chain in Dompu District

Limited capital, network, education, transportation and telecommunication facilities/ infrastructure means that farmers cannot sell their crops directly to end consumers to get a high price. This situation is used by intermediary traders consisting of VCT, DCT, and Wholesaler. This is what drives the formation of the maize supply chain in Dompu District.

The supply chain can be complex or simple, it is greatly influenced by the marketing agency and market system. A monopolistic market system has a relatively simpler supply chain compared to other market systems [14]. This is in line with Burharman's opinion in [17], which states that, the length of the supply chain that is passed through by an agricultural production depends on several factors; First, the distance between farmers and consumers, the farther the distance the supply chain is taken, Second, whether the product is damaged quickly or not, the more quickly damaged products must reach consumers quickly, thus requiring short channels. Third, the scale of production, if the production is small scale , it is not profitable if farmers sell directly to the market, so that the supply chain that is traversed tends to be long. Fourth, financial position, farmers who have a strong financial position tend to shorten the supply chain of their products.

**Table 2.** Types of maize supply chains in Dompu District

| No | Description of the type of supply chain | Margin (IDR/ Kg) | Marjin (%) | Farmer's Share (%) |
|---|---|---|---|---|
| 1 | Farmer-VCT-Wholesaler-PMT | 812 | 19,75 | 80,43 |
| 2 | Farmer-DCT-Wholesaler-PMT | 865 | 20,85 | 79,15 |
| 3 | Farmer-Wholesaler-PMT | 613 | 14,78 | 85,22 |

A recapitulation of total margin and farmer share of the three supply chains formed can be seen in table 2 above. In this study, the supply chain that has the largest margin is in the second supply chain, namely from Farmers-DCT-Wholesaler-PMT with a margin of IDR. 865 (20.85%) and followed by the first supply chain from Farmer-VCT-Wholesaler-PMT with a margin of IDR. 812 (19.57%) and the third supply chain that had the smallest margin was Farmers-Wholesaler-PMT of IDR. 613 (14.78%). According to (Widiastuti & Harisudin, 2013; Yuprin, 2009) the value of supply chain margins above 50% can be said to be an efficient supply chain, because the share received by farmers is greater than that received by traders.

Among the 3 supply chains in this study, the one with the highest or best farmer's share value in maize trading in Dompu Regency is the third market channel, namely from Farmers- Wholesaler -PMT, where this supply chain has the smallest margin of IDR. 613 with the largest farmer's share of 85.22%. This figure is far above the figure obtained by maize farmers in Grobogan Regency which only reached 37% (Widiastuti & Harisudin, 2013). Thus, compared to farmers in Gobogan District, East Java, the corn trading system in Dompu District has provided justice to farmers, because the price of maize is more profitable for the farmers.

## 5. Conclusion

There are three supply chains for product sales in maize farming in Dompu District, namely (1) Farmers-VCT-Wholesaler-PMT, (2) Farmers-DCT-Wholesaler -PMT, and (3) Farmers- Wholesaler-PMT. The supply chain for product output that has the least margin and the farmer's share is the third supply chain, namely Farmer- Wholesaler -PMT with a margin of IDR. 613.00 and farmer's share of around 85.22%.

## 6. Recommendation

Increasing profits by choosing the right supply chain requires a platform or institution that can facilitate between farmers and large traders. This can be done by establishing a village agribusiness service centre (PLAD) that involves actors (collaborative) and is carried out in an integrated manner (integrative) in order to provide input and absorb crop yields so as to reduce transaction costs and cut market chains.

A collaborative and integrative agribusiness institutional model is needed in the development of corn farming in Dompu district. The collaborative and integrative agribusiness institutional model (KAKI Model) is a model that involves actors in integrated services through village agribusiness service centers (PLAD) in the form of Village Cooperatives, Village Credit Bodies (Village Banks), Village Trade Enter (UD) and also through Village-owned Enterprises.

## Acknowledgments

The authors would like to thank to University of Brawijaya, STKIP Yapis Dompu, and Dompu District.

## References

[1] Abebe, G.K., & Bijman, J. "*Contract farming configuration : Smallholders' preferences for contract design attributes",* Food Policy, Vol 40, pp. 14-24, 2013.

[2] Cai, R., & Ma, W. *"Trust, transaction costs, and contract enforcement: evidence from apple farmers in China",* British Food Journal, Vol. 117, no. 10, pp. 1598-2608, 2015.

[3] Foundjem, D., Haese, M. D., Degrande, A., Tchoundjeu, Z., & Damme, P. Van. "*Forest Policy and Economics Farmers' satisfaction with group market arrangements as a measure of group market performance : A transaction cost analysis of Non Timber Forest Products' producer groups in*

*Cameroon"*. Forest Policy and Economics, Vol. 13, no. 7, pp. 545–553, 2011.

[4] Haris, H. *"Analysis of the influence of the marketing mix on decisions, satisfaction and consumer loyalty in purchasing cheerful bread in Jember ", Journal of Management and Business Indonesia*, Vol. 1, no. 2, pp. 143–161, 2015.

[5] Israfilov, N., Ablaev, I., Seisinbinova, A., & Sakulyeva, T. (2020). Impact of Supply Chain Management Strategies on the Performance Indicators of Small and Medium-Sized Businesses. *International Journal of Supply Chain Management*, *9*(4), 544–552.

[6] Istiyanti, E. "*Marketing efficiency of curly red chilies in Ngempal sub-district, Sleman district, "Agricultural Journal* MAPETA, vol. 12, no. 2, pp. 116–124, 2010.

[7] Lainawa, J., Kindangen, P., Rotinsulu, T. O., & Tumbuan, J. F. A. (2019). Strategy for Beef Cattle Agribusiness Development in North Sulawesi. *International Journal of Applied Business & International Management, 4*(1), 1-11.

[8] Maertens, M., & Velde, K. Vande. *"Contract-farming in Staple Food Chains : The Case of Rice in Benin"*, World Development, Vol. 95, pp. 73–87, 2017.

[9] Mmbando, F.E., Wale, E.Z., Baiyegunhi, L.J. S., Mmbando, F.E., Wale, E.Z., The, L.J.S. B., Baiyegunhi, L.J.S. *"Development in Practice The welfare impacts of market channel choice by smallholder farmers in Tanzania The welfare impacts of market channel choice by smallholder".* Development in Practice, vol. 27, no. 7, pp. 981–993, 2017.

[10] Montalbano, P., Pietrelli, R., & Salvatici, L. "*Participation in the market chain and food security : The case of the Ugandan maize farmers"*, Food Policy, Vol. 76, no. 3, pp. 81–98, 2018.

[11] Mubyarto, "*Introduction to Agricultural Economics"*, LP3ES, 1986.

[12] Laafar, M., Adri, A., & Rifai, S. (2020). Economic Warfare and Supply Chain Management : Impacts and Solutions . *International Journal of Supply Chain Management*, *9*(4), 1–10.

[13] Setyoviyon, I., & Sin, L. G. (2020). The Effect of Experiential Marketing on Customer Satisfaction in Malang Customer Products. *Journal of The Community Development in Asia*, *3*(3), 88–96.

[14] Soekartawi, et al, *"Farming science and research for smallholder development",* University of Indonesia, 1986.

[15] Tefera, D. A. J. B. and M. A. S, *"Agricultural Co-Operatives In Ethiopia: Evolution, Functions and Impact"*, Journal of International Development, Vol. 96, no. 1, pp. 10–14, 2016.

[16] Voors, M. J., & Haese, M. D, *"Smallholder dairy sheep production and market channel development : An institutional perspective of rural Former Yugoslav Republic of Macedonia",* Journal of Dairy Science, Vol. 93, no. 8, pp. 3869–3879, 2010.

[17] Widiastuti, N. U. R., & Harisudin, M, "*Corn marketing channels and margins in Grobogan district",* SEPA, Vol. 9, no. 2, pp. 231–240, 2013.

[18] Yuprin, *"Analysis of rubber marketing in Kapuas district"*, Discourse, Vol. 12, no. 3, Juli (2009).