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Corn Supply Chain in Central Java Province: Marketing Channel Efficiency and Chain Institutional Performance Approach

Nur Muttaqien Zuhri[1], Endang Siti Rahayu[2], Kusnandar[3], Mohamad Harisudin[4]
Sebelas Maret University, Surakarta, Indonesia[1,2,3,4]
Jl. Ir Sutami No.36A, Jebres, Surakarta City, Central Java 57126
Correspondence Email: nurmuttaqienzuhri@gmail.com
ORCID ID: 0000-0001-9837-1579

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ABSTRACT

Increasing corn production requires a supply chain to channel production from farmers to consumers. The supply chain of corn as a raw material for animal feed in Central Java Province is not yet well managed because each farmer or business is still carried out individually. The aim of the study was to analyze the supply chain picture based on the Food Supply Chain Network and the efficiency of the corn agribusiness supply chain in Central Java. Sampling techniques from farmers using proportional random sampling and snowball sampling methods will lead researchers to the next informant or to related institutions to the final consumer. Data analysis uses the FSCN, Marketing Margin, Farmer's Share and DEA methods. There are five corn agribusiness marketing channels in Central Java Province. Marketing margin and farmer's share with the Farmer-Cooperative-Consumer chain being the most efficient. Farmer-Village Trader-SubDistrict Trader-District Trader-Consumer marketing channel being the least efficient. Technical efficiency at the farmer level was 2%, at the village trader level 40%, at the subdistrict and district trader levels 37.5%, at the cooperative level 66.67%, at the animal feed company level 40% and at the poultry farmer level 25%.

Keywords: Corn, DEA, Farmer's Share, Marketing Margin, Supply Chain

INTRODUCTION

Corn is a source of carbohydrates after rice as a food source that can be widely utilized by the community. In addition to its function as food, corn can also be processed as poultry feed which has an important contribution to egg and chicken meat production (Rahayu, Dewi, & Abid , 2021; Ehsan et al., 2022). The availability of corn has a multiple effect on agribusiness, especially livestock farming. The current increase in animal feed prices is influenced by the price considering that corn used for animal feed must be imported and accounts for almost 70% of the cost of making animal feed. This condition is burdensome for smallholder farmers and will eventually affect buyers, especially the price of chicken meat and eggs (Kamble, Gunasekaran, & Gawankar, 2020; Ilyas et al., 2020; Sharma, Kamble, Gunasekaran, Kumar, & Kumar, 2020).

As one of the production centers, corn is currently one of the main commodities for farmers in Central Java Province, especially in Grobogan, Blora and Wonogiri Districts. In addition to low production costs compared to other commodities, corn also has greater added value. Corn production in Central Java Province has increased from 2016 - 2021. The largest corn production was in 2020 at 3,820,000 tons with a harvest area of 611,082 ha. The smallest corn production was in 2018 at 3,414,906 tons with a harvest area of 568,692 ha (Badan Pusat Statistik, 2021). Although corn production fluctuates, corn farmers in Grobogan, Blora and Wonogiri districts do not switch to other commodities because these areas are centers of corn production and the natural conditions are very supportive for corn cultivation. Farmers continue to strive to increase corn production in order to increase farmers' income (Busch & Spiller, 2016; Niles & Wagner, 2018).

Increasing corn production requires a supply chain to distribute corn yields from farmers to consumers, where the supply chain can be seen by farmers managing supply and demand (Wiseman, Sanderson, Zhang, & Jakku, 2019; Kumar et al., 2021). This includes procurement of raw materials, production inputs, production and assembly processes, production storage and management activities, delivery and distribution processes to customers. Supply chain management aims to reduce costs, reduce capital, and improve services for consumers. Supply chain management should be concerned with the reduction or uncertainty to improve supply chain performance (Yadav et al., 2020a; Walter & Etany, 2018). The main objective of supply chain management is to maximize the achievement of performance in product value creation by allocating limited or small costs as possible (Nanyunja et al., 2016; Zhang et al., 2021; Yadav et al., 2020b). The development of optimizing the supply chain performance of a company can be known after evaluating or measuring supply chain performance (Yuna, Sarah, & Arielle, 2016; Plakias, Demko, & Katchova, 2020; García-Barrios, Demko, & Katchova, 2017).

The form of supply chain management requires special consideration (Sharma, Shishodia, Kamble, Gunasekaran, & Belhadi, 2020; Belhadi, Kamble, Mani, Benkhati, & Touriki, 2021). The need for an approach in the corn supply chain in Central Java Province, which is expected to provide an overview of the availability of corn supply as a consideration for the management of the corn supply chain in delivering products from producers to consumers. So that consumers will find it easier to get products from producers. By knowing the corn supply chain in Central Java Province, it will be able to provide answers to product accuracy, time, and market needs.

Supply chains can work if there are strong and effective interactions between suppliers, farmers, traders and other actors (Butt, Ullah, Ali, Saddozai, & Khan, 2022; Yadav et al., 2020c). The corn supply chain as a raw material for animal feed in Central Java Province has not been fully managed properly, because each farmer or business is still carried out

individually. has not implemented a good supply chain management system and there is no institutional organization such as an integrated farmer group institution to facilitate farmers in producing and marketing their corn products. The aim of this research is to analyze the supply chain picture based on the Food Supply Chain Network and the efficiency of the corn agribusiness supply chain in Central Java.

LITERATURE REVIEW

Corn is a perishable product that requires special handling along the supply chain. Each institution in the supply chain system has problems and challenges related to operations and logistics (Zuhri, 2022).The assessment of relative efficiency is done by comparing marketing channels with each other from the marketing of equivalent products by looking at qualitative indicators of marketing functions, market behavior, and institutional relationships (Susilo, 2023).

Define marketing margin as the difference between the price at the producer farm level and the price at the final consumer level. Farmer's share is the percentage ratio of the price received by maize producer farmers to the price paid by final consumers (Ernawatiningsih, Budhi, Marhaeni, & Yuliarmi, 2023). Data Envelopment Analysis is a multifactor analysis method to measure the efficiency and effectiveness of a group of homogenous Decision Making Units (DMU).

Supply chain performance measurement is carried out by comparing the DMU of each supply chain actor's performance with other DMUs at each level of the supply chain. By measuring performance, it can be seen which DMUs must improve their performance (Pakpahan, Karsidi, Sugihardjo, & Anantayu, 2022). Each input and output has a different purpose for measuring supply chain performance. Each performance attribute has a performance indicator that is useful for knowing the performance efficiency of a DMU (Kurniawan, Ananda, & Khusaini, 2021).

Increasing corn production requires a supply chain to distribute corn crops from farmers to consumers, where the supply chain can be seen by farmers managing supply and demand activities, including procurement of raw materials, production inputs, production and assembly processes, production storage and management activities, shipping and distribution processes to customers. distribution to customers (Mustaniroh, Murod, & Silalahi, 2020). Supply chain management aims to reduce costs, reduce capital, and improve services for consumers. Supply chain management should be concerned with the reduction or uncertainty to improve supply chain performance. The main objective of supply chain management is to maximize the achievement of performance in product value creation by allocating limited or minimum costs (Harwati & Pettalolo, 2019). The development of optimizing the supply chain performance of a company can be known after evaluating or measuring supply chain performance.

RESEARCH METHOD

Research Locations, Types, and Sources of Data

This research was conducted in November-December 2022 in Grobogan, Blora and Wonogiri districts. The location selection is done purposively. These locations were chosen with the consideration that the three districts are among the corn production centers in Central Java Province. This type of research is quantitative research with proportional random sampling technique from farmers. Data collection techniques used were questionnaires and interviews with corn farmers. The determination of the next informant in this study uses the snowball sampling method which will lead researchers to the next informant or to the relevant institutions until the final consumer. There were

98 corn farmer respondents who were considered capable of providing the complete information needed by the researcher. The snowball sampling resulted in 15 village-level collectors, 8 sub-district-level collectors, 8 district-level collectors, 3 cooperative institutions, 8 poultry farmers, 5 animal feed companies and 1 food company.

Marketing Margin Analysis

Marketing margin analysis is used to see the level of efficiency of corn marketing in Central Java Province. The calculation of marketing margin is done to determine the difference in price per unit at the producer or consumer level. Marketing margin is the price difference paid between marketing institutions (Indah, Setiawan, Hendrarini, Yektingsih, & Sunarsono, 2021). The components of the marketing margin consist of the costs required by marketing institutions to perform marketing functions called marketing costs or functional costs and marketing institution profits. The total margin (MT) is the sum of the marketing margins in each of the marketing institutions involved.

Farmer's Share Analysis

Farmer's share is negatively related to the marketing margin, the higher the marketing margin, the lower the share that will be obtained by farmers or producers (Benedek, Fertő, & Molnár, 2018). Analysis of marketing margins and farmer's share as an indicator of measuring marketing efficiency must be accompanied by taking into account the functions that occur, the costs incurred by each supply chain institution involved.

Corn Supply Chain Institutional Performance

This study aims to analyze the performance of each member of the farm-level corn supply chain in order to improve the efficiency of corn supply chain performance in Grobogan District using non-parametric methods, especially DEA. DEA is a non-parametric approach based on linear programming with the help of DEAP 2.1 software. In this study, the assumption used is constant return to scale.

RESULTS

Food Supply Chain Networking (FSCN)

The supply chain structure explains who are the parties involved and their roles in carrying out supply chain flow activities. The supply chain structure in Central Java Province is analyzed through the chain members involved. Supply chain members are institutions or actors involved in the flow of products, finance, and information. Members of the corn supply chain in Central Java Province are farmers, village collectors, sub-district collectors, district, or large collectors. The relationship structure of the corn supply chain can be seen in Figure 1 below.

Figure 1: Corn Supply Chain Structure in Central Java Province

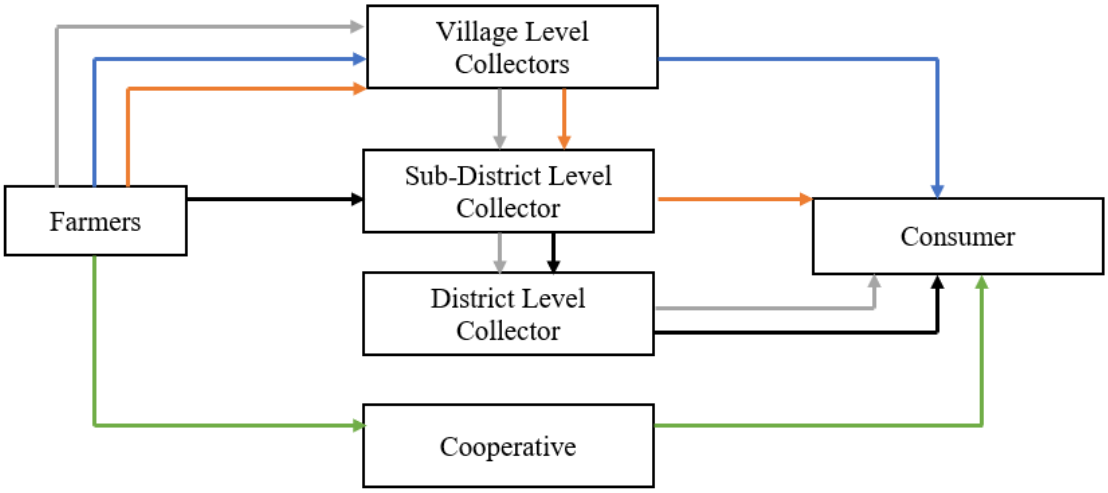

Figure Description:
: Chain Channel 1: Farmer-Village Collector-Consumer
: Chain Channel 2: Farmer-District Collector-District Stacker-Consumer
: Chain Channel 3: Farmer-Village Collector-District Collector-Consumer
: Chain Channel 4: Farmer-Gatherer Village-District Collector-District Collector-Consumer
: Chain Channel 5: Farmer-Cooperative-Consumer

Margin of Marketing

The marketing margin is the difference in price paid by consumers and received by producers. The marketing margin of the corn supply chain in Grobogan, Blora and Wonogiri districts is calculated by subtracting the purchase price from the sales price of each chain member. The marketing margins of each supply chain channel can be seen in Table 1 below.

Table 1. Marketing Margins of Corn Supply Chain in Central Java Province

Channel Pattern Marketing	Price Farmer Level (Rp/kg)	Consumer Level Price (Rp/kg)	Marketing Margin (Rp/kg)	Marketing Margin Percentage (%)
1	4000	6250	2250	36.00
2	3800	8525	4725	55.43
3	3500	8000	4500	56.25
4	3500	8925	5425	60.78
5	4000	5866	1866	31.81

Source: Processed Primary Data

Farmer's Share

A high farmer's share value does not necessarily indicate that the marketing system is efficient. This is related to the amount of value added to a product by the marketing institutions involved. The farmer's share value is inversely proportional to the marketing margin. This means that the higher the farmer's share value, the lower the marketing margin value, and vice versa. The farmer's share values for each corn supply chain channel pattern studied can be seen in Table 2.

Table 2. Farmer's Share of corn Supply Chain in Central Java

Channel Marketing	Farmer Level Price (Kg/Pipil corn)	Price at Consumer Level (IDR/Pipil corn)	Farmer's Share (%)
1	4000	6250	64.00
2	3800	8525	44.57
3	3500	8000	43.73
4	3500	8925	39.22
5	4000	5866	68.19

Source: Processed Primary Data

Table 2 shows that channel 4 has the lowest farmer's share value among the other channels, at 39.22 percent. This shows that farmers in marketing channel 4 only get 39.22 percent of the price paid by consumers. The low farmer's share in marketing channel 4 is due to the fact that the farmer's selling price is much lower than the selling price at the last link in the chain, the district-level trader. The average price of corn at the farm gate is IDR 3,500 per kg of corn, then after going through the distribution chain process from village-level traders to subdistrict-level traders to district-level traders, the price of corn at the end consumer's purchase price becomes IDR 8,925 per kg of corn. The channel pattern with the highest farmer share value is channel pattern 5, which amounts to 68.19 percent. The price received by final consumers is IDR 5,866/kg of corn. The high value is due to the fact that the only supply chain members involved are farmers with cooperatives who then sell to poultry farmers.

Corn farmers should have the opportunity to earn the highest farmer's share, but the fact is that not all farmers can sell directly to final consumers. This is due to several factors, such as capital entanglement between farmers and middlemen, limited access between farmers and marketing areas so that some farmers sell their harvest in bulk and also different market price information received by each corn farmer (Lezoche, Panetto, Kacprzyk, Hernandez, & Alemany Díaz, 2020; Ochoa, Ruiz, Olmo, Figueroa, & Rodríguez, 2020).

Supply Chain Institutional Performance

The performance analysis of supply chain actors is calculated using the DEA method with the assumption of output-oriented CRS (Sadati, Nayedar, Zartash, & Falakodin, 2021; Hung & Khai, 2020). That is, how much output must be produced using the same amount of input, so that the DMU becomes efficient. The performance analysis of supply chain actors was conducted on actors in the corn supply chain, namely: farmers, village-level intermediary traders, subdistrict-level intermediary traders, district-level intermediary traders, cooperatives, animal feed companies and poultry farmers. It was not possible to measure the performance of animal feed companies using the DEA method because there is only one food company involved in the corn supply chain in Central Java Province, so there is no comparison for benchmarking.

Performance Analysis of Corn Supply Chain at Farm Level

The calculation of farmer performance involved 98 respondents in Grobogan, Blora and Wonogiri districts. The processed results below illustrate the results of the efficiency calculation of corn farmers based on DEAP 2.1 software as follows.

Table 3. Distribution of DMUs by Efficiency Achievement Level of Corn Farmers in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	2	2
0.70≤ E ≤ 0.80	Efficient	5	5
0.80≤ E ≤ 0.90	Efficient	45	46
0.90≤ E ≤ 1.00	Efficient	44	45
1	Highly Efficient	2	2
Total		98	100
Minimum		0.634	
Maximum		1.000	
Average		0.893	

Source: Processed Primary Data

Analysis of Corn Supply Chain Performance of Village-Level Gatherers
Measuring the performance of village-level intermediary traders involves a sample of 15 actors who are in direct contact with farmers and intermediary traders above them.

Table 4. Distribution of DMUs by Efficiency Achievement Level of Corn Village Level Traders in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	0	0
0.70≤ E ≤ 0.80	Efficient	0	0
0.80≤ E ≤ 0.90	Efficient	0	0
0.90≤ E ≤ 1.00	Efficient	9	60
1	Highly Efficient	6	40
Total		15	100
Minimum		0.902	
Maximum		1.000	
Average		0.991	

Source: Processed Primary Data

Performance Analysis of the Corn Supply Chain of Sub-district Level Collectors
Measurement of the performance of village-level intermediary traders involves 8 DMUs that are directly related to farmers, village collectors and intermediary traders above.

Table 5. Distribution of DMUs Based on the Achievement Level of Efficiency of Sub-district Level Traders in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	0	0
0.70≤ E ≤ 0.80	Efficient	0	0
0.80≤ E ≤ 0.90	Efficient	0	0
0.90≤ E ≤ 1.00	Efficient	5	62.5
1	Highly Efficient	3	37.5
Total		8	100
Minimum		0.979	
Maximum		1.000	
Average		0.993	

Source: Processed Primary Data

Performance Analysis of District-Level Corn Supply Chain Aggregators

The performance measurement of village-level intermediary traders involves 8 DMUs that are directly related to sub-district intermediary traders and the final consumers above.

Table 6. Distribution of DMUs Based on the Level of Achievement of District-Level Merchant Efficiency in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	0	0
0.70≤ E ≤ 0.80	Efficient	0	0
0.80≤ E ≤ 0.90	Efficient	0	0
0.90≤ E ≤ 1.00	Efficient	5	62.5
1	Highly Efficient	3	37.5
Total		8	100
Minimum		0.981	
Maximum		1.000	
Average		0.995	

Source: Processed Primary Data

Performance Analysis of Corn Supply Chain at the Cooperative Level

The performance measurement of farmer group cooperatives involves 3 DMUs that are directly related to farmers and the end consumers above them.

Table 7. Distribution of DMUs Based on Efficiency Achievement Level of Cooperatives in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	0	0
0.70≤ E ≤ 0.80	Efficient	0	0
0.80≤ E ≤ 0.90	Efficient	0	0
0.90≤ E ≤ 1.00	Efficient	1	33.33
1	Highly Efficient	2	66.67
Total		3	100
Minimum		0.999	
Maximum		1.000	
Average		0.99	

Source: Processed Primary Data

Performance Analysis of Corn Supply Chain at Animal Feed Company Level
The performance measurement of animal feed companies involves 5 DMUs that are directly related to traders at the sub-district and district levels.

Table 8. Distribution of DMUs by Efficiency Achievement Level of Animal Feed Companies in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	0	0
0.70≤ E ≤ 0.80	Efficient	0	0
0.80≤ E ≤ 0.90	Efficient	0	0
0.90≤ E ≤ 1.00	Efficient	3	60
1	Highly Efficient	2	40
Total		5	100
Minimum		0.990	
Maximum		1.000	
Average		0.996	

Source: Processed Primary Data

Performance Analysis of Corn Supply Chain at the Poultry Farmer Level
Performance measurement of poultry farmers involves 5 DMUs directly related to traders at the village and district levels.

Table 9. Distribution of DMUs by Efficiency Achievement Level of Poultry Farmers in Central Java Province

Efficiency	Category	Total Respondent	Percentage (%)
0.30≤ E ≤ 0.40	Very inefficient	0	0
0.40≤ E ≤ 0.50	Not efficient	0	0
0.50≤ E ≤ 0.60	Not efficient	0	0
0.60≤ E ≤ 0.70	Not yet efficient	0	0
0.70≤ E ≤ 0.80	Efficient	0	0
0.80≤ E ≤ 0.90	Efficient	0	0
0.90≤ E ≤ 1.00	Efficient	6	75
1	Highly Efficient	2	25
Total		8	100
Minimum		0.932	
Maximum		1.000	
Average		0.985	

Source: Processed Primary Data

DISCUSSION

The corn supply chain is analyzed in a complex supply chain network, also known as Food Supply Chain Networking (FSCN). There are 5 elements used to analyze the supply chain including chain objectives, chain structure, chain management, chain business processes and chain resources.

Supply chain goals are one of the special concerns in supply chain management activities. Supply chain targets include which areas are targeted and the development of targets aimed at maintaining the sustainability of supply chain performance. The target market for corn in Central Java Province is mostly within the province and only a small portion outside the province as raw material for animal feed and animal feed. Most farmers in Grobogan, Blora and Wonogiri districts sell their produce to intermediary traders. The reason why most farmers prefer to sell to local traders is due to the buying ability of local traders who are able to buy farmers' crops in any quantity and the close location will save transportation costs. If the farmer's harvest is abundant, the collector trader will provide assistance in the form of a truck that will come to the farmer's land and without any rental fee, which benefits the farmer.

Development goals also need special attention in addition to corn market goals because development affects the sustainability of supply chain performance activities. Development goals are the objectives to be achieved together in supply chain activities. The development goal to be achieved in this supply chain is an improved coordination and cooperation system that is expected to benefit all members. With increased coordination and cooperation, farmers are expected to have certainty at any time in selling their products and at a price that is not too bad and intermediate traders have a steady supply and can form other cooperation systems with larger companies or traders without worrying about the amount of uncertain supply.

Corn Farmers

Corn farmers are the first members of the corn producer group. There were 100 farmer samples in Grobogan, Blora and Wonogiri districts in Central Java Province. The total number of respondents is divided into 5 chain channels: 17% of the respondent farmers are in chain I, 18% are in chain II, 14% are in chain III, 43% are in channel IV and 8% are in channel V. The higher percentage of respondents in channel IV is due to the fact that large intermediaries have a higher percentage of farmers in channel IV. Channel IV

has a higher percentage because large intermediary traders have a wide purchasing coverage and the ability to buy large yields, while also having a good relationship with farmers and smaller intermediary traders. On average, farmers cultivate 8070 m2 of corn land. Farmers and large collectors play a very important role as they determine the quantity, quality and continuity of corn in Central Java Province. Interviews with farmers revealed that farmers can plant corn twice a year on average.

On average, farmers sell their corn crops in 83% dried kernels and 17% half-dried kernels. The drying process carried out by the average farmer still uses the traditional process of sun drying. At the time of the research, corn prices at the farm level were in the range of IDR 3,500-IDR 4,800 for dry-piped corn and IDR 2,800-IDR 3,500 for half-dried pipil corn. Collecting traders and cooperatives usually come to the farmer's house and buy it on the spot.

Village Collecting Traders

Village collectors are intermediary traders located in the village and around where the farmers live. Village collectors act as intermediaries and direct sellers of corn by collecting the harvest from farmers and then continuing the chain. Village intermediaries also sell the corn directly to ungag farmers in Grobogan, Blora and Wonogiri districts. There were 15 village-level intermediaries in this study, one of whom has a wide enough scope to purchase corn from outside Grobogan, Blora, and Wonogiri districts, such as Boyolali and Kendal districts, to fulfill demand. Village collectors usually look for corn from other corn -producing areas that have the same characteristics or type of corn as those produced in Grobogan, Blora, and Wonogiri.

The farmer and the village intermediary will bargain over the price. If there is an agreement on the price, the farmer will receive payment at that time in cash and in full. The purchase price of corn depends on several things such as the market price and the quality of the corn produced by the farmer. Most farmers prefer to sell their harvest to village collectors rather than large traders outside the village due to practicality. Farmers tend to choose village intermediaries because they do not want the hassle of looking for other traders and also to avoid additional transportation costs.

Sub-district Gathering Traders

Subdistrict-level intermediary traders are traders from the surrounding area who buy products in bulk through village intermediary traders or direct farmers. The research in Grobogan, Blora and Wonogiri districts involved 8 subdistrict-level traders who live near the research locations. These traders purchase corn directly from the farmers in large quantities of around 2,000 - 5,000 kg per purchase and pay the farmers in cash. There are two types of sales made by subdistrict collectors: first, the subdistrict collectors sell directly to poultry farmers and animal feed companies. Sub-district collectors also sell the pipil corn back to District collectors if the moisture content of the pipil corn is still high. Subdistrict-level traders make the same purchasing decisions based on the prevailing market price and the quality of the corn. Subdistrict-level traders purchase corn products by visiting farmers at home or in fields that are ready for harvest.

District-level Collecting Traders

District-level intermediate traders are traders who purchase corn from all subdistricts in Grobogan, Blora, and Wonogiri. In addition, district-level traders also purchase corn from other districts such as Boyolali, Kendal, Semarang, Sragen. Respondents were obtained from district-level traders spread across Grobogan, Blora and Wonogiri districts. District-level traders purchase large quantities of corn: more than 5 tons in one purchase or once a week. The type of corn received varies, with dry and wet corn at different prices. District-level traders have dryers and large-scale corn storage facilities (silos). This

allows district-level traders to receive large quantities of pipil corn of various qualities. When purchasing corn, large traders will first contact collectors at the subdistrict level and bargain for the price. Once a price agreement has been reached, the corn will be delivered by truck by the district-level trader. Pipil corn from district-level traders is then sold to animal feed and food companies in Central Java.

Farmer Cooperatives

Agricultural cooperatives are cooperatives whose members consist of farmers who own land, or farm laborers and people with interests and livelihoods related to agricultural businesses. This cooperative carries out agricultural economic business activities. In addition to agricultural economic businesses, agricultural cooperatives can also help improve the welfare of farmers. The welfare in question can facilitate farmers' business activities, through the procurement of fertilizers, provide capital loans, seeds, plant pest control drugs, agricultural tools, provide agricultural counseling and help sell agricultural products of cooperative members. Agricultural cooperatives in Grobogan, Blora and Wonogiri districts buy corn from farmers to sell directly to poultry farmers in Grobogan, Blora, Wonogiri and surrounding areas. Cooperatives already have farmer partners who receive farmers' corn commodities, so there is no need for large marketing costs for distribution. The cooperative buys corn from farmers at an average of Rp. 4,000 kg/corn pipil with a cash payment system.

Marketing Margin

Marketing margin analysis is conducted on equivalent marketing channels (Huang & Song, 2018; Baur & Schläpfer, 2018). This means that the unit volume at each level of the marketing institution must be the same. In this study, the unit of volume used is kg of pipil corn. This decision was based on the culture of farmers in Grobogan, Blora, and Wonogiri districts who sell corn in units of weight, i.e. per-kg of dried corn kernels. Similar marketing margins can be found at the farmer and collector level in the same region. This is due to sales competition in order to establish trust. The marketing margin values of the corn supply chain channel patterns studied can be seen in Table 1.

The channel with the largest marketing margin value is channel pattern 4 with a marketing margin of IDR 5,425 per kg of pipil corn or 60.78 percent. The magnitude of the margin obtained is due to marketing channel pattern 1 having the most marketing institutions. The supply chain members are Farmers - Village-level traders - Sub-district-level traders - District-level traders - Consumers (Animal Feed Companies and Food Companies). The more marketing institutions involved in the distribution of a commodity from the producer point to the consumer point, the greater the difference in the price of the commodity (Fu, Zhan, & Tan, 2017; Nuntapanich, Nuntapanich, & Maicharoen, 2022). The supply chain member in channel 1 that contributes the largest margin value is the district-level collector, which amounts to IDR 2,925 per kg of pipil corn or 32.77 percent. This is because the district collectors perform drying and packaging activities on the value-added dried pipil corn.

Marketing channel pattern 5 has the lowest marketing margin value of IDR 1,866 or 31.81 percent. The small number of institutions involved is one of the factors for the low margin (Wägeli & Hamm, 2016; Carmona, Griffith, & Aguirre, 2021). The difference is that channel pattern 5 goes through farmer cooperative actors while the other channels go through traders. The members of the supply chain are Farmers - Cooperatives - Final consumers (Poultry Farmers). The small margin is due to the low selling price of pipil corn for feed. The difference in margin is influenced by the different number of marketing institutions involved, the different selling prices received by farmers for each channel, and the different selling prices at the final level.

Farmer's share

Table 2 shows that channel 4 has the lowest farmer's share value among the other channels, at 39.22 percent. This shows that farmers in marketing channel 4 only get 39.22 percent of the price paid by consumers. The low farmer's share in marketing channel 4 is due to the fact that the farmer's selling price is much lower than the selling price at the last link in the chain, the district-level trader. The average price of corn at the farm gate is IDR 3,500 per kg of corn, then after going through the distribution chain process from village-level traders to subdistrict-level traders to district-level traders, the price of corn at the end consumer's purchase price becomes IDR 8,925 per kg of corn. The channel pattern with the highest farmer share value is channel pattern 5, which amounts to 68.19 percent. The price received by final consumers is IDR 5,866/kg of corn. The high value is due to the fact that the only supply chain members involved are farmers with cooperatives who then sell to poultry farmers.

Corn farmers should have the opportunity to earn the highest farmer's share, but the fact is that not all farmers can sell directly to final consumers. This is due to several factors, such as capital entanglement between farmers and middlemen, limited access between farmers and marketing areas so that some farmers sell their harvest in bulk and also different market price information received by each corn farmer (Lezoche et al., 2020; Ochoa et al., 2020).

Supply Chain Institutional Performance

Based on Table 3. the distribution of values obtained from 98 decision-making units, there are only 2 DMU farmers (2%) who have an efficiency achievement (100%) or a value of 1, with an average efficiency achievement of 0.893. From the results of the efficiency calculation using the DEAP 2.1 approach, out of 15 DMUs, 6 DMUs (40%) obtained efficiency. With an average technical efficiency achievement of 0.991. From the results of the efficiency calculation using the DEAP 2.1 approach, out of 8 DMUs, 3 DMUs (37.5%) with 100% efficiency achievement were obtained. With an average technical efficiency achievement of 0.993. From the results of the efficiency calculation using the DEAP 2.1 approach, out of 8 DMUs of district-level traders, 3 DMUs (37.5%) with 100% efficiency achievement were obtained. The average technical efficiency achievement is 0.995. From the results of efficiency calculations using the DEAP 2.1 approach, from 3 DMUs at the farmer group cooperative level, efficiency was obtained for 2 DMUs (66.67%) with 100% efficiency achievement. The average technical efficiency achievement achieved by the cooperative is 0.99. From the results of the efficiency calculation using the DEAP 2.1 approach, of the 5 DMUs at the animal feed company level, 3 DMUs (40%) achieved 100% efficiency. The average technical efficiency achieved by animal feed companies is 0.996. From the results of the efficiency calculation using the DEAP 2.1 approach, out of 8 DMUs at the level of poultry farmers as final consumers, 2 DMUs (25%) achieved 100% efficiency level. The average technical efficiency achieved by poultry farmers was 0.996.

CONCLUSION

Based on data analysis, there are five corn agribusiness marketing channels in Central Java Province. The Farmer-Cooperative-Consumer marketing channel is the most efficient, with the lowest marketing margin of IDR 1,866 and the highest farmer's share value of 68.19 percent. The Farmer-Village Trader-District Trader-District Trader-Consumer marketing channel is not the most efficient, with the highest marketing margin of IDR 5,425 per kg of corn and the lowest farmer's share value of 39.22 percent. Supply chain institutional performance at the farm level technical efficiency was 2%, village traders 40%, sub-district and district traders 37.5%, cooperatives 66.67%, animal feed companies 40% and poultry farmers 25%.

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DECLARATION OF CONFLICTING INTERESTS

The article I published declares that it is free from conflict of interest and is responsible for everything that happens in the future.

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