

## Prospect The Model Development in Salt Supply Chain

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**Abstract.** This article reviews the literature on the model of a supply chain system published between 2010-2018 where the period experienced a notable increase in the discussion of the supply chain system model. The model that will be used in this study is the development of models and methods based on the shortcomings in the previous literature. Specifically, it reviews the methods and models that are relevant for development in the model of the salt supply chain system. The approach method used in decision making is a qualitative, quantitative, and mixed approach. This paper uses a framework that allows models to be used for similar purposes and can be compared over time. It is also used to identify gaps in the literature. The findings in this literature study highlight the new institutions that are needed and the factors that influence decision making on the choice of supply chain system. The cooperatives as an institution that mediates the farmers' interests and as an alternative channel. The determining factors in the choice channel are price, transaction costs, and risks that can provide a profit.

**Keywords:** Cooperatives, Decision Making, Article Review, Salt Supply Chain.

### 1. Introduction

The supply chain system is a business activity that includes a flow of goods and services from the point of production to the point of consumers. A supply chain system needs to take benefits of every opportunity to improve its performance. The model of supply chain system considerably determines the amount of profit obtained by each element. Likewise, in the salt supply chain system, the factor that determines the amount of profit for the farmers is the choice of supply chain system used. The salt supply chain system in Indonesia shows a complex model [1] involving farmers, PT. Garam, importers, collectors, wholesalers, iodized salt producers, distributors, sub-distributors, retailers, and consumers. The role of wholesalers in the supply chain system is extremely dominant, especially in determining the quality and price of salt. Unlike the salt supply chain system in several African and Indian countries, these countries have used cooperatives as one of the elements of intermediary between farmers and salt processing factory [2].

The model of the trading system does not only determine the amount of profit gained by each element but also able to motivate producers to improve their production performance. The salt supply chain model is almost the same as the other agricultural commodity supply chain model, including tobacco, rice, seeds, milk, livestock products, and horticulture. Salt and agricultural products are perishable and seasonal products. The supply chain system of agricultural commodities involves farmers, middleman, wholesalers, retailers and consumers [3][4][5][6][7][8][9]. Cooperatives are also used as one of the transaction choices [10][11]. The existence of the cooperatives will extremely benefit the farmers

because they are institutions that collaborate among their members. The farmers will choose the channel of the cooperative trading system when the margin earned is higher than the channel of the trading system through wholesalers or traders.

The factors that determine the choice of the trading system include the characteristics of farmers, the quality and quantity of crops, the payment system, capital, access to markets, and access to market information. Furthermore, price is the key factor considered in the supply chain system. However, there are farmers who consider risks more than prices [3][12][13]. In addition to the model of the supply chain system, the factors owned by the sellers and the buyers also determine the level of profits and risks that must be accepted by each element of the supply chain system.

This paper aimed to review the literature on the model of the supply chain system issued between 2009 - 2018. Attention is focused on methods that may be extremely relevant for the development of the model of the salt supply chain system. In reviewing the literature published since 2009, this paper identifies new trends in the literature and highlights any gaps in the literature that will benefit future research.

## 2. Methods

This study uses a descriptive statistical analysis. The search processes of relevant reference are identified by using the keywords “model of the trading system”, “supply chain model“, “distribution model”, and “marketing model”. Reference is specified about the supply chain system of agricultural products. There were some journal publications related to the supply chain system. All samples of published journals are published from 2010 to 2018. After conducting a review and analysis, the research related to the supply chain system is divided into 2 (two) main categories were choice of supply chain channels, and the methodology used in the supply chain system. This classification is based on the review of content, abstract, and overall research in general, although it is not limited to the possibility of slices of category and classifications.

The category of choices of the supply chain channels used by producers include collectors, wholesalers/retailers, consumers, markets, processing factories, supermarkets, and exporters. Moreover, the factors influence the farmer choices are product attributes, prices, payment systems, organization membership of the farmers, facilities, and infrastructure, access to credit, market information, risk and transaction costs. There are 3 types of research approaches applied are qualitative, quantitative, and mixed methodology approaches.

## 3. Result

### 3.1. Choices of the Supply Chain System

Decision making on the choices of the supply chain system faces a situation of uncertainty and risk. Generally, salt and agricultural products are more at risk than a manufactured product. Therefore, they need to be handled appropriately. Risks that arise in agricultural commodities are production, market, farmer, and financial risks [14]. Farmers can respond to the risks faced by determining the right choice for the supply chain system channels and the factors that influence farmers' decisions.

Referring to the study of the supply chain system of agricultural products, farmers as producers of basic commodities can directly sell the products to consumers. Wholesalers and middlemen are elements of a supply chain system that are mostly performed by farmers [3][4][5]. It is strengthened by the opinion of [6][9] [7], which stated that farmers make sales on land by wholesalers and middlemen. Direct sales on land are influenced by transportation access, market information, credit usage, and membership of an organization. The choice of supply chain system makes direct sales to the market by considering the distance from the land to the nearest market, and the profits obtained are greater than making sales at the location of the land.

The farmers can also make transactions with processing factories. Direct sales to the factories will be more profitable for farmers, but with the requirements that the quality of the product produced to meet the criteria. The existence of a middleman will add marketing costs. The position of traders and

middleman cannot be ignored because of the transactions made with farmers. The farmers' need for cash can only be fulfilled by traders and intermediaries. Marketing costs can be reduced to a cooperation contract between farmers and factories is needed so that the farmers have better bargaining options.

Some researchers stated that there needs to be an institution that mediates the interests of farmers in conducting trading procedures [6][11][13][15]. The institution can be in the form of a cooperative. Farmer cooperatives are expected to develop marketing infrastructure, accessibility of the latest marketing information to support the bargaining power of farmers to develop profits and investments in commercial agriculture. Farmers will choose the channel of a cooperative supply chain system when the margin earned is higher than the channel of the supply chain system through wholesalers and middlemen. However, some farmers are more concerned with trust, firmness, social relations in the community of traders compared to the price offered [16]. Sales through cooperatives carry enormous risks [3]. Furthermore, the payment system and the level of trust in the leadership of the cooperative [13] also influence the decision on the supply chain system. The payment system through cooperatives uses a delay system, while farmers need cash to fulfill their daily needs. The existence of cooperatives is only used as market information media, but the farmers are reluctant to improve the quality and make sales through cooperatives [17].

The pattern of trading in milk and honey uses cooperatives as an alternative to sales other than through traders, middlemen, consumers, and [18] [19]. The existence of dairy cooperatives can facilitate the transfer of technology and the commercialization of products but cannot offer better prices than the choice of trading procedures through middlemen or traders.

The choice of a supply chain system for horticultural commodities can be through traders, middlemen, or traditional markets [18]. Likewise, the rice and horticulture trading system show a complex pattern [20][22]. In the horticulture commodity, the trading system is very much influenced by price, risk, quality, and quantity of crop yields, distance to market, price information, and farmer characteristics [3][4][17][23][24][25][26]. The choice of supply chain channel based on quantity and quality product, the distance to the market, and the transportation access [25]. The farmers determine the choice of marketing channels based on the income they earn [27].

In the rice supply chain system, some farmers make choices by selling their crops through cooperatives, self-consumption, or sell to the market [10][28] [29][30]. When farmers have access to buyers and large quantities of production, the choice of farmers will sell through the market. Sales through cooperatives are not always carried out by cooperative members [30]. The cooperative reinforces networks; all actors must be more involved in exchanging information to increase sales and profits for all actors. The supply chain system of livestock products shows that the traders, wholesalers, or direct system [31]. The factors that influence the choice of livestock trading through traders are the price and transaction costs.

The choice of the supply chain system can be adopted from several agricultural commodities for the development of the model of a salt supply chain system. But the choice of direct sales to the market or consumers cannot be made considering salt cannot be consumed directly. Farmers sell the salt as raw material for food and industrial salt. The development of the model of the salt supply chain system is expected to be able to fulfill the farmers' desire to get more affordable prices and certainly can facilitate farmers to improve the quality of salt. The main factors that influence the choice of salt farmers are the existence of a cash payment system to fulfill living needs, minimize the risk of damage and minimize transaction costs that must be incurred in the supply chain system. To bridge the need for an institution that sits with farmers to improve its performance. Institutions that can be utilized are cooperatives. So far, salt cooperatives only function as a savings and loan facility. Therefore, salt cooperatives need to improve performance in order to be able to compete with other elements.

### *3.2. Decision-Making Approach to the Choice of Supply Chain*

Several researchers use the multinomial logit models in modeling the farmer's choices for selection of marketing [8][10][16] [27]. This method is carried out based on the results of the questionnaires that have been done on the farmers. The multinomial logit models approach formulates the selection of

various marketing channels. According to rational choice theory, each individual prioritizes alternative marketing channels based on utility sequences and will choose channels that provide maximum utility.

The selection of supply chain system channels also uses the logistic regression analysis [32][19]. The decision-making process develops in two stages. The first stage, farmers decide whether they will sell the commodities or not. The second stage, it will be done when the farmers decide to sell, the farmers choose the element of trading that will be used. The farmers choose to sell on land, or the local village roadside market, or local city or a combination of the two markets.

Pearson's chi-square method and the multivariate probit approach can explain the farmers' choices based on the factors that affect them, among others are age of farmers, land size, type of variety, ability of bargaining and distance of the land to the market [3][4][6][9][13][24][26][30].

The approach using Tobit models was used to determine the farmers' behavior on the participation of farmer channel selection [15][31]. The determinants used to model the farmers' choices are the demographic characteristics of farmers' household, market information, trust, risk, and uncertainty. Farmers will make two decisions, namely, the choice of the type of marketing channel and the number of commodities to be sold [15]. The Tobit modeling approach assumes that participation and the decision on the number of sales are made simultaneously. The weakness of this model approach is its inability to separate participation and intensity of participation decisions.

Best-Worst scaling method and Latent Class Cluster Analysis are used to evaluate marketing choices [27]. The evaluation is performed by ranking the interests based on the characteristics and heterogeneous nature of the farmers' utilities. This method can also classify the farmers based on the differences in the utility of farmers' characteristics and social demographic differences that have different priorities in decision-making. It is different from [18] using data envelopment analysis (DEA) in grouping based on District Milk Union (DMU) by taking into consideration the price variations between markets.

On the contrary with the research conducted [33] about the analysis of marketing performance through the identification of marketing channels that are most favorable by farmers using Stochastic Dominance Analysis (SDA). SDA can determine whether a strategy dominates the other fully or partially related to the expected utility of uncertain results.

The marketing channel selection approach is carried out by calculating the number of profits obtained from each alternative [27][28]. Factors which is considered in profit calculation are distribution processes, production processes, and marketing so they can find price transmission between supply chains.

Simulation modeling to find out the farmers' profile in making optimal decisions about marketing through cooperatives or private traders. The parameters used are the accuracy of payments and risks faced by farmers.

The choice model of farmers uses the game theory approach to model the interaction between bargaining power and market information on prices that will be received by farmers [3][11]. Market information greatly benefits farmers and can improve farmers' efficiency related to asymmetric information that will determine the profits of farmers and traders [11]. Meanwhile, the risk is to set the optimal amount that must be sold through several trade system alternatives [3].

Another approach that can be used for the selection of trade system channels is by using questionnaires, tabulating data, and describing the results of data tabulation [7][29]. The process and behavior of farmers' decision-making are difficult to evaluate using mathematical models based on utility theory. A number of socio-economic, demographic, and psychological factors affect the decision-making and behavior of farmers in reality.

#### **4. Conclusion**

Based on the review that has been explained before, this study presents several observations and trends about the development of decision-making models and approaches to the selection of the supply chain channels. In the literature published starting from 2009, it explained that the trade system channel used by farmers is almost similar, namely through middlemen or wholesaler, traders or markets. However, there is some literature which state that cooperatives can be used as an alternative trade system that is

expected to be able to support and taking side with the farmers. The development model of the salt supply chain will use the gap [5][6][11][32] by using cooperatives as an institution that mediates the farmers' interests and as an alternative channel. In the choice of supply chain system, the factors that need to be considered are price, transaction costs, and risks. Its can provide a description of the benefits or profits that will be received by each element of the supply chain system.

The approach that can be used to develop the salt supply chain system is to combine qualitative and quantitative approaches. The qualitative approach is used to solve problems when the elements of the trading system have different qualitative requirements. The quantitative approach is used to provide a description of the utility in each element of the supply chain system.

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