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The Effectiveness of the Cassava Supply Chain to Support Increasing Farmers' Income in Realizing Strong Food Security in Malacca Regency

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Abstract: Poverty remains a major issue in Indonesia, including Malacca Regency, East Nusa Tenggara (NTT), despite the region's strong natural resource potential. Cassava is one of Malacca Regency's key commodities with significant potential to support local economic growth, yet cassava farmers generally remain poor and require targeted intervention. This study aims to examine the cassava supply chain management (SCM) system in Malacca Regency in order to identify an ideal management model that can support economic development and community welfare. The research uses a mixed-method sequential explanatory approach (Creswell, 2014), conducted in three phases, beginning with a preliminary survey to understand the characteristics of the cassava supply chain. The findings show that the cassava supply chain involves seven main actors: farmers, collector traders, small agents, large agents, retailers, modern markets, and consumers. The SCM system has generally operated effectively, with integrated relationships and good collaboration among actors from upstream to downstream, ensuring efficient distribution to consumers. However, farmers' profits remain limited due to the long supply chain. The cassava supply chain includes three main flows—goods, money, and information—and overall has functioned well, enabling sustainable, long-term relationships among stakeholders.

Keywords: Supply Chain, Cassava, Effectiveness, Farmer

INTRODUCTION

The problem of poverty is still a fundamental problem in Indonesia, so efforts need to be made to reduce the number of poverty. The success of reducing the poor requires a specific and reliable and targeted model of community empowerment. The preparation of a reliable community empowerment model can be a formidable instrument for policy makers in focusing attention on improving the living conditions of the poor (Miftah, et.al, 2012).

The strategic issue that is currently developing in the national development discourse is how to increase the scale of economic, agricultural, industrial and trade activities in order to encourage the improvement of people's welfare. One of the concepts used is to increase the

potential of local resources through agroindustry so that the linkage between these sectors can be sustainable or there is a high linkage between the upstream sector, the intermediate sector and the downstream sector. Community empowerment, especially in rural areas based on local potential, is a surefire strategy to drive the regional economy based on the resources it has (Vini, et.al, 2011).

Indonesia as an agrarian country is rich in quality and healthy local food sources because it is supported by sufficient tropical and sub-tropical air that has the potential to maximize plant photosynthesis. Local food products are processed food ingredients that have been produced for a long time and have developed and consumed in a certain area or a certain local community group. Generally, local food products are processed from local raw materials, using local technology, local knowledge, and are closely related to the local culture that comes from within the country. Various local food sources available in Indonesia include: cassava, sweet potato, banana, corn, yellow squash, breadfruit, ganyong, sago, gembili, empon-empon, arrowroot tubers, taro, buildings, and others. The Potential of Local Food. One of the potential benefits of local food that needs to be considered and developed is Cassava or cassava (Husnarti, et.al, 2019). Cassava (Manihot utilissima or Manihot esculenta crantz) also known as Tree Cassava or Cassava is a tropical and subtropical annual tree of the Euphorbiaceae family. The tubers are widely known as a carbohydrate-producing staple and the leaves as a vegetable.

The prospects for cassava agribusiness are quite good considering the high demand for cassava with a growing population. Cassava itself is quite easy to cultivate in the sense that it is easy to maintain, can withstand the availability of little water in dry or less fertile land, has resistance to disease and does not take too long to harvest. So that the existence of cassava is a need that is not only to meet food and industry, but also a source of income for farmers who cultivate it.

Table 1. Cassava Exporting Countries for the 2018-2022 Period

(000 USD)

No.	Negara	Tahun					Share 2022 (%)	Kumulatif (%)
		2018	2019	2020	2021	2022		
1	Thailand	881.165	527.896	683.354	1.267.735	1.487.020	65,96	65,96
2	Laos	75.932	90.333	194.529	269.615	365.039	16,19	82,16
3	Vietnam	150.763	81.501	141.679	222.215	220.871	9,80	91,95
4	Costa Rika	88.064	98.595	93.378	98.022	110.331	4,89	96,85
5	Belanda	11.419	11.467	9.648	12.488	17.631	0,78	97,63
	⋮							
19	Indonesia	2.212	4.149	9.731	2.167	1.032	0,05	97,68
	Negara lainnya	43.235	38.291	42.103	67.882	52.408	2,32	100,00
	Dunia	1.252.790	852.232	1.174.422	1.940.124	2.254.332	100	

Sumber: *Trademap* diolah Pusdatin

Table 2. Development of Cassava Production in Indonesia for the 2018-2022 Period

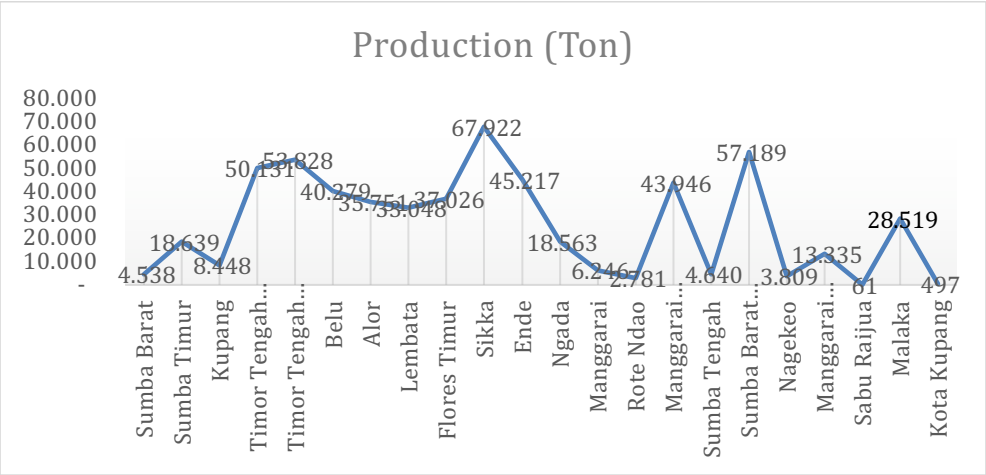
(Ton)

No	Provinsi	Tahun					Share 2022 (%)	Share kumulatif (%)
		2018	2019	2020	2021	2022		
1	Lampung	5.016.790	5.438.850	5.820.831	5.643.185	5.952.537	39,74	39,74
2	Jawa Tengah	2.544.132	2.884.726	3.257.955	2.863.289	2.482.939	16,58	56,32
3	Jawa Timur	2.239.004	1.888.803	1.552.634	1.618.905	1.434.699	9,58	65,90
4	Jawa Barat	1.599.223	1.579.185	1.309.557	1.299.196	1.034.950	6,91	72,81
5	Sumatera Utara	848.389	1.226.979	1.092.745	1.065.047	878.767	5,87	78,67
6	DI Yogyakarta	890.897	761.032	758.748	758.185	813.758	5,43	84,11
7	Nusa Tenggara Timur	624.080	534.468	508.729	516.662	476.781	3,18	87,29
8	Lainnya	2.356.506	2.036.328	1.969.822	1.966.500	1.903.880	12,71	100,00
	Indonesia	16.119.020	16.350.370	16.271.022	15.730.971	14.978.310	100,00	

Sumber: BPS dan Dit. Akabi

Keterangan : Tahun 2018-2019 berdasarkan Angka Harmonisasi Data Kementan-BPS diestimasi per provinsi
Tahun 2020-2022 berdasarkan angka estimasi dari Direktorat Akabi

Cassava as a cultivated crop will be one of the leading commodities in East Nusa Tenggara Province because cassava is a plant that does not require complicated growing conditions and very low production facilities so this will be a solution for farmers who have unproductive land to get added value in improving the welfare of farmers, especially in East Nusa Tenggara Province.



Source: BPS NTT data (processed)

Figure 1. Cassava Production Graph in East Nusa Tenggara Province

However, what often becomes a problem is that cassava farmers are generally poor and require special handling efforts. The specific characteristics of cassava farming business require special efforts to increase the income of the farming business so that it is no longer poor. The success rate of these efforts in order to be measurable and on target requires a cassava farmer empowerment model.

Likewise, in the marketing process, there are marketing institutions from producers to consumers who are involved in marketing channels, so that there is a difference between the price received by the producer and the price paid by the consumer. The price difference is due to marketing costs and benefits and in general, the more marketing agencies involved in marketing costs or the longer the marketing chain, the greater the price difference, so that they will get a lower share (price share) (Agustian, et.al, 2023).

Table 3. Cassava Price Development in Indonesia for the 2020-2022 Period

Tahun	Bulan												Rata-Rata
	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Ags	Sep	Okt	Nov	Des	
Harga Produsen Ubi Kayu (Rp/kg)													
2020	3.077	3.090	3.115	3.121	3.145	3.160	3.149	3.134	3.131	3.115	3.111	3.104	3.121
2021	3.172	3.143	3.137	3.160	3.152	3.147	3.155	3.155	3.165	3.145	3.175	3.196	3.158
2022	3.130	3.146	3.154	3.214	3.218	3.241	3.266	3.288	3.323	3.332	3.333	3.355	3.250
Harga Konsumen Ubi Kayu (Rp/kg)													
2020	5.095	5.178	5.212	5.259	5.251	5.239	5.220	5.212	5.226	5.270	5.240	5.223	5.219
2021	5.180	5.128	5.054	5.095	5.079	5.036	5.220	5.212	5.226	5.270	5.240	5.223	5.164
2022	5.299	5.328	5.355	5.418	5.450	5.536	5.573	5.585	5.654	5.671	5.676	5.689	5.520
Marjin Perdagangan (Rp/kg)													
2020	2.018	2.088	2.097	2.138	2.106	2.079	2.071	2.078	2.095	2.155	2.129	2.119	2.098
2021	2.008	1.985	1.917	1.935	1.927	1.889	2.065	2.057	2.061	2.125	2.065	2.027	2.005
2022	2.169	2.182	2.201	2.204	2.232	2.295	2.307	2.297	2.331	2.339	2.343	2.334	2.269

Sumber: BPS

If we look at the table above, it is clear that the price margin of Cassava is almost the same as the price of Cassava received by farmers. This is due to the length of the cassava road to consumers. This is also one of the reasons why cassava farmers still cannot prosper because of the consequences of the supply chain that is still not optimal and effective.

Supply Chain is a series of business processes that connect several actors to increase the added value of raw materials or products and distribute them to consumers. The purpose of the supply chain is in terms of increasing added value. Thus, each actor in the supply chain network contributes in the form of specific inputs or processes that can increase the value of a product. Supply chains are broadly not only in terms of increasing added value, but also to meet consumer demand, increase competitiveness, increase profits, and build good relationships between actors in the supply chain (Chauhan, et.al, 2005). So, it is not true that the supply chain is only concerned with the production process, but there are other components that must be considered, one of which is building coordination and collaboration with other actors along the supply chain.

In the supply chain, there are three types of flows that must be managed (Maddepung, et.al, 2015): 1) The flow of goods or materials that flow from upstream to downstream. The flow of goods is the smooth delivery of materials, scheduling of material purchases, sufficiency of materials at the time of material procurement, material handling, warehousing procedures, material hadling and packaging, recording of materials entering and exiting, configuration, lay out, and determination of space, material distribution system. 2) Money flow or financial, which flows from downstream to upstream. The flow of money is sufficient capital to start the implementation of the project, smooth payment of labor by the owner, price changes in the market that are not in accordance with the contract, too many payment frequencies, smooth flow of project funds, capital in company management, government policies in the financial or banking sector, small amount of capital in the company, pricing and payment agreements. 3) Flow of information flowing from upstream to downstream Or vice versa, it is the length of the coordination flow to make a decision, the completeness of the detailed design of the project drawing, the coordination of the owner in the implementation of the project, the problem of information flow, communication for procurement and changes in material prices, inward communication during implementation, optimal supplier performance , internal process flow and information regarding inventory, supply chain companyin the processing of material procurement.

METHOD

This study uses a mixed method approach, especially using the mixed method of sequential explanatory as described by Creswell (2014). The mixed method used in this study includes three separate phases (Heizer and Render, 2015). In the initial stage, a preliminary survey was conducted to gain insight into the characteristics of the supply chain within the specified case study area, with a special focus on the Cassava commodity. Furthermore, interviews are conducted with the aim of identifying the effectiveness and efficiency of the Supply Chain process. After that, data analysis was carried out to further explore the results obtained from the interview and determine conclusions. In general, the data collection steps are shown in Figure 2.

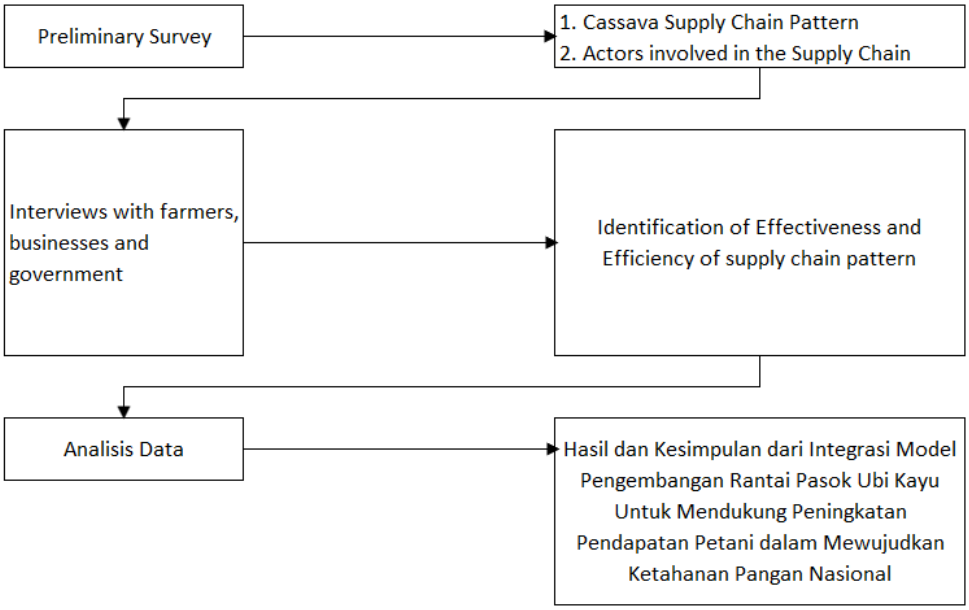


Figure 2. Research Flow

Phase 1. Preliminary Survey

Before the data collection activities were carried out, a preliminary survey was conducted to understand the cassava supply chain system in the case study area and to identify actors along the supply chain.

Phase 2. Interview

The respondent criteria in this study were determined using *the purposive sampling method*, with the selection of respondents who were considered to have high relevance to the research objectives. This criterion ensures that respondents have the relevant understanding and experience to support the analysis of effectiveness in the food supply chain.

Sample	Criterion	Number of Samples
Farmer	1. Actively manage land for at least two years 2. Have knowledge related to cassava farming processes	30
Collector Trader	1. Individuals or groups who actively collect and distribute cassava from farmers to local businesses or markets 2. Minimum of two years of work experience.	30
Processors or MSMEs	1. Small business actors who use cassava as the main raw material in food or beverage production 2. Have been in operation for at least one year 3. Being in the supply chain of the research area	30

According to Saptana et al. (2014), there are 8 (eight) indicators in measuring *supply chain effectiveness*, namely:
1. Product Availability
2. Order *Fulfillment Cycle Time*
3. Product *Quality*
4. Post-Harvest *Loss Rate*
5. Logistics Cost *Efficiency*
6. Stakeholder Satisfaction Level
7. Information *Sharing & Coordination*
8. Supply *Sustainability*

The *supply chain* process is influenced by various factors including internal and external factors. Internal factors include knowledge, attitudes, skills, and motivation. External factors include distribution, *packaging*, and *finance*.

Phase 3. Data Analysis

The data analysis technique used is the Miles and Hubermen (2014), which states that the activities in the study are carried out interactively and take place continuously until complete, so that the data is saturated. Activities in data analysis, namely data collection, data reduction, data presentation and drawing conclusions and verification.

RESULTS AND DISCUSSION

Cassava Supply Chain Flow in Malacca Regency

Based on the results of data collection carried out by the researcher, it can be identified that there are 8 (eight) cassava supply chain patterns that occur in Malacca district, which can be seen in Figure 3. The eight patterns of cassava supply chain that occur in Malacca Regency consist of:

Figure 3. Supply Chain Patterns

Pattern 1	Cassava Farmers ➔ Consumer Collector Traders ➔ (MSMEs)
Pattern 2	Cassava Farmers ➔ Collector Traders ➔ Large Agents ➔ Modern Market ➔ Consumers
Pattern 3	Cassava Farmers ➔ Collector Merchants ➔ Small Agents ➔ Large Agents ➔ Modern Markets ➔ Consumers
Pattern 4	Cassava Farmers ➔ Collectors Collectors Small ➔ Agents Large ➔ Agents ➔ Consumer Retailers ➔
Pattern 5	Cassava Farmers ➔ Small Agents ➔ Large Agents ➔ Modern Market ➔ Consumers
Pattern 6	Cassava Farmers ➔ Traders Modern ➔ Market ➔ Collectors Consumers
Pattern 7	Cassava Farmers ➔ Collectors Retailers ➔ ➔ Consumers
Pattern 8	Cassava Farmers ➔ Consumer Retailers ➔

Based on the results of interviews and FGDs, the main differences between these 8 cassava supply chains are due to the number of *stocks*, sales access, production planning, sales systems, and pricing mechanisms.

Collector Trader

Collecting traders play an important role as a liaison between cassava farmers and subsequent industry or market players (agents, markets, retailers). Apart from being a liaison, collector traders also play a role in sorting and checking the quality of cassava before it is forwarded to the market, especially modern markets or minimarkets. Then the collecting trader also plays a role in determining the direction of the market (*price signal*).

Small Agent

In the cassava supply chain, small agents also play an important role at the local or village level as an initial link between farmers and large collectors or mills. They carry out various functions that support smooth distribution from upstream to downstream.

Big Agent

In the cassava supply chain system, large agents act as the main link between small collectors/small agents and the processing industry. They handle large volumes and have a

wider logistics network than small agents. In addition, large agents determine and stabilize prices.

Retailers

The retailer plays the role of the last party before the cassava product reaches the end consumer. The role of the retailer depends on the type of cassava product being sold. Retailers also have to play a role in adjusting prices to the market.

Implementation *of Cassava Supply Chain Management* in Malacca Regency

Management or management of Cassava distribution or marketing activities in Malacca Regency uses two distribution channel strategies, namely direct distribution channels and indirect distribution channels. First, direct distribution channels are a strategy in which manufacturers directly ship or sell products to consumers. In addition, in the management of supply chain management, Cassava also uses strategic information sharing, which is part of supply chain integration. By sharing information between all supply chains involved, it can avoid misunderstandings and conflicts that occur so as to increase the efficiency and effectiveness of the Cassava supply chain performance in Malacca Regency.

Based on this, it is known that the implementation of Cassava supply chain management in Malacca Regency has been optimal because it has built an integrated relationship and good collaboration between supply chain actors, In accordance with Heizer's theory and Render8 states that supply chain management (supply chain management) describes the integration of the entire supply chain, starting with raw materials and ending with customer satisfaction. These activities consist of raw material procurement activities, services, conversion into semi-finished goods, and final products, as well as delivery to customers.

Based on the results of interviews and FGDs, there are main differences between the 8 Cassava supply chains, including the number of demands, pricing mechanisms and sales systems. In the Cassava Supply Chain Pattern 2, Pattern 3, Pattern 4 and Pattern 5, in general, the amount of demand and quantity are regulated by the Agent, because the Agent will distribute to the Modern Market and Retailers. However, in this pol, the price received by farmers is very cheap compared to Pattern 1 and Pattern 8. Because in this pattern, farmers only go through one intermediary before reaching consumers. The sales system and pricing mechanism are interconnected. In the Cassava Supply Chain Pattern 2, Pattern 3, Pattern 4, Pattern 6 and Pattern 7, most farmers sell cassava at one price. The price follows the traditional market price, but local traders have more power in determining prices. This system results in farmers paying less attention to the quality of the product because they do not get incentives in providing good quality cassava.

In Pattern 6, Cassava Farmers must pay attention to the quality of their products, because the target is the Modern Market that pays attention to good quality. In addition, in this Pattern 6, farmers must be open with harvest information so that Collector Traders can coordinate with the Modern Market. Therefore, in this Pattern 6, farmers must have good planting and harvest management, so that the cycle can run well.

Farmers and traders mostly know about the supply chain, the benefits of the supply chain and the structure of the *supply chain*. However, in the process this *supply chain* cycle cannot be avoided, especially by farmers, so in terms of income, farmers are very dependent on collecting traders or existing agents.

Data Analysis

Malacca Regency is one of the areas with the largest cassava production in East Nusa Tenggara Province. Agriculture and Plantations are also the leading sectors for this region in generating regional income, namely almost 40% of the GDP of Malacca Regency is obtained

from Agriculture and Plantations. The only thing that tends to be a problem for farmers is poor access to sales, so inevitably they sell to collectors at low prices.

Table 4. Results of Multiple Regression Analysis of Supply Chain Effectiveness.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10,207	8	1,276	9,922	<,001[b]
	Residual	10,415	81	,129		
	Total	20,622	89			

a. Dependent Variable: Y1

b. Predictors: (Constant), X8, X5, X7, X3, X4, X6, X1, X2

Table 5. Results of the Probability analysis of each variable

Independent Variables	Probability Value
Product Availability	0,764
Order *Fulfillment Cycle Time*	0,008
Product *Quality*	0,007
Post-Harvest *Loss Rate*	0,334
Logistics Cost *Efficiency*	0,040
Stakeholder Satisfaction Level	0,020
Information *Sharing & Coordination*	0,012
Supply *Sustainability*	0,019

Based on the results of multiple regression, it shows that the results of *supply chain* effectiveness are dependent variables that affect internal and external factors that influence, as can be seen from sig f is 0.001 < 0.05. The results of the analysis of each internal and external factor can be seen in Table 5. Of the 8 variables measured, only the variable of product availability and the level of post-harvest loss did not contribute to the effectiveness of the Cassava *supply chain* performance in Malacca Regency.

CONCLUSION

Based on the results and analysis of Cassava supply chain management in Malacca Regency, the following conclusions can be drawn: Cassava supply chain actors involve 7 main actors, namely, Farmers, Collectors, Small Agents, Large Agents, Retailers, Modern Markets and Consumers. The implementation of Cassava supply chain management in Malacca Regency has been running optimally because it has built an integrated relationship and good collaboration between supply chain actors from upstream to downstream, so that Cassava is distributed to consumers effectively and efficiently. Even though in terms of profits, farmers still cannot get maximum profits due to the length of the supply chain that occurs.

There are three flows in the Cassava supply chain in Malacca Regency, namely the flow of goods, the flow of money, and the flow of information. The entire cassava supply chain in Malacca Regency has been running well, so that all parties can establish long-term relationships and have been well integrated to distribute to consumers.

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