SUPPLY CHAIN MANAGEMENT OF AGRO INDUSTRY OF CASSAVA

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Abstract: The purpose of this study was to determine the mechanism of supply chain and the pattern of cassava of agroindustry supply chain flow and analyze the relationship between the components of SCM and the impact on supply chain activity improvement and agroindustry performance. Sample of research were producers of agroindustry local food of cassava as much of 106 respondents were taken by simple random sampling. The data analyzed by qualitative and quantitative analysis. Qualitative analysis used to describe the mechanism and pattern of cassava of agroindustry supply chain flow and principles of SCM. While quantitative analysis used to analyze the components, SCM activity improvement and agroindustry performance by using a structural equation model. The results showed that the mechanism of cassava agroindustry supply chain is the creation of collaboration and coordination among supply chain actors ranging from farmer, processor, distributor and consumer. Structural equation modeling analysis results showed the expected value to meet the criteria and are very good although AGFI marginally acceptable or good enough as an index measuring GFI (0.900), AGFI (0.860), TLI (.974), CFI (0.980), Cmin/DF (1.147), RMSEA (0.038), the probability (0.204) and the value of c^2 (68.813).

Keywords: supply chain management, agroindustry, local food, cassava, structural equation models

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Cassava is a versatile crop that can be utilized in various industries. The stalk can be used as new seedlings and replanted. In addition, it also can be used to make particle board, crafts, briquettes and charcoal. Cassava leaves can be used as a vegetable to be eaten. In addition, it is also used in industry, specifically the pharmaceutical industry and animal feed industry. Cassava leather, can be used as animal feed, while the meat can be processed into food products, tapioca flour, cassava, mocafstarch, dextrin, adhesives, ethanol, and others.

Agro-industry is an integral part of the agricultural sector which has an important contribution in the process of industrialization in rural areas. Agro-industry benefit not only to transform primary products to processed products, but also transform the work of traditional agrarian culture that creates low added value into modern industrial work culture that creates high added value. Agro-industry development policies

included investment policy, technology and location of agro-industry must get major consideration.

In Southeast Maluku, Maluku province, cassava commodity has a great agro-industrial prospect and potential. The involvement of all parties in developing agro-industry of cassava is very important. It is essential that all parties must be responsible in developing the local food agroindustry of cassava sustainably. Farmers, craftsman, merchants and consumers have tasks and functions in which they relate each other like a chain. They have such task and function as raw material suppliers, processors derived products, sales and decision makers. The linkage between the chain actors in the process of creating and distributing the product to the customer is the most effective and efficient way for the firm to remain successful and became the center of the development of supply chain management (Agus, 2011).

Agro-industry of cassava should be able to unite the internal functions of a business effectively and connect it with suppliers and external operational supply chain members whose role efficiently and effectively. Chain supply members must focus in the chain supply practice, chain supply attention, and chain supply competencies which give effect toward the increasing of chain supply actors' activities and agro-industry performances. This study is aim to find out the mechanism and the flow ofchain pattern of cassava agroindustry and analyze the relationship between SCM components and the impact on supply chain activity improvement and agroindustry performance.

RESEARCH METHOD

The research location was determined by purposive sampling with some reason such as there are centers of agro-industrial cassava which doing processing activities and product diversification of cassava; cassava agroindustry has prospects for further development; and the desire of researchers to maintain local food as local food asset property. The data collection used in this study was simple random sampling in which the researcher took 106 producers of local food agroindustry of cassava as the respondents.

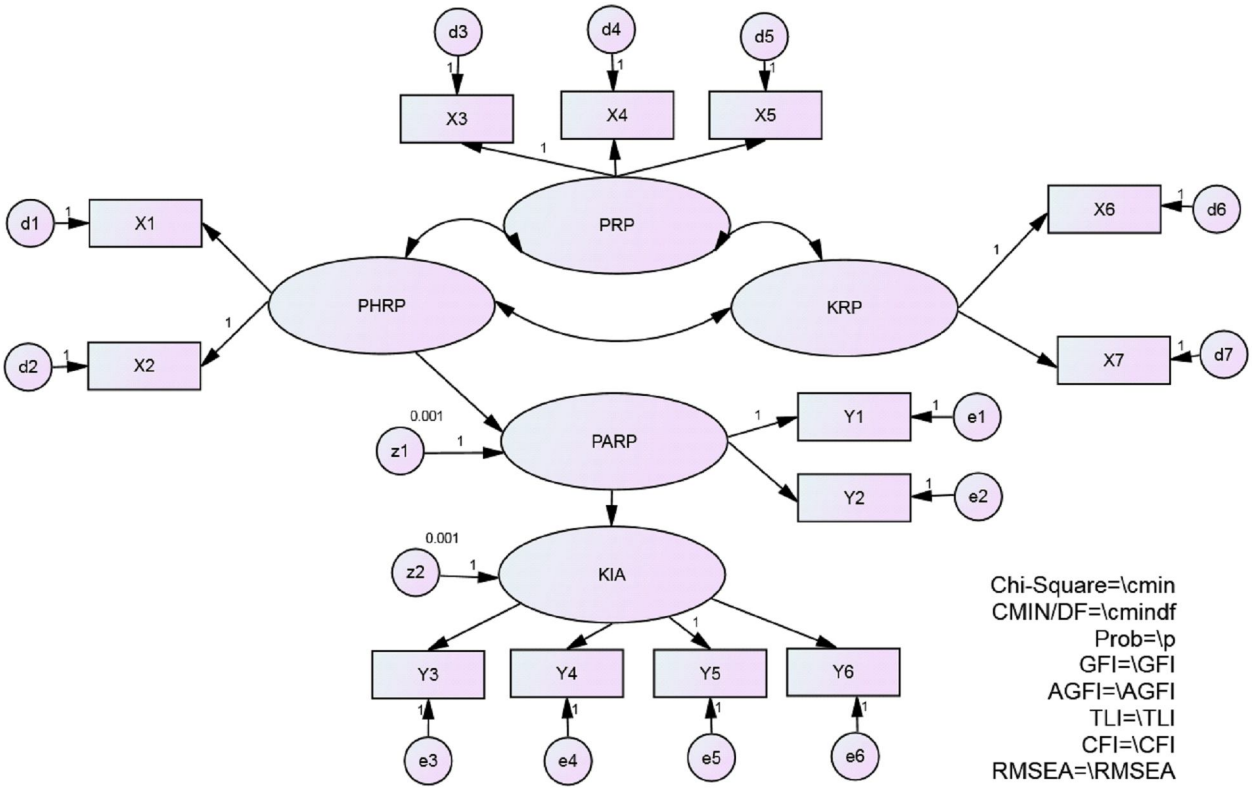
Interviews with certain respondents such as chairman of the business group agroindustry were conducted to determine the accuracy of the information, do validation of the result analysis, and develop an understanding of SCM. The instrument used in the study was a structured questionnaire. The primary data were obtained by observing and interviewing the respondents, while the secondary data were obtained from other institutions related to the study. The data analysis was done both qualitative and quantitatively. The qualitative analysis was used to describe cassava agroindustry SCM and the principles of SCM, while the quantitative analysis was used to analyze the impact of SCM components toward the increasing of supply chain actor activity and the performance of agroindustry by using Structural Equation Models (SEM).

For checking the instrument accuracy, the researcher had tested the validity and reliability of the instruments. The reliability was tested using Cranbach Alpha. The validity and reliability was tested using SPSS 16.SEM models framework which was proposed consists of variables of: the practice of supply chain (PRP), supply chain concern (PHRP), supply chain competence (KRP), improvement of supply chain activity (PARP) and the performance of agro-industry (KIA). The conceptual model that combines the research hypothesis is shown in Figure 1. The hypothesis testing of the component of supply chain management, PARP and KIA is that the H1: PRP correlated with PHRP; H2: PRP correlated with the PPP; H3: PHRP correlated with the PPP; H4: PHRP positively-effected the PARP; H5: PARP positively-effected the KIA.

FINDING AND DISCUSSION

Supply Chain Agroindustry of Cassava

The spects of the study were structurally organized covering target the supply chain, supply chain structure, resources, chain management, business process chain and supply chain performance. By studying these aspects, the researcher could find out the chain supply phenomenon and propose the best development ideas.



Description:
X1 = coherence or fusion; X2 = the proximity of the area; X3 = integrity of service customers and suppliers; X4 = dissemination of information; X5 = the speed of communication and supply chain; X6 = quality and service; X7 = operations and distribution; Y1 = integrity and synergy principles of supply chain management, Y2 = improved management of agro-industry input-output; Y3 = increase product diversification and relative efficiency of agro-industry; Y4 = increasing of profitability of agro-industry; and Y5 = increased performance of agroindustry product marketing; Y6 = increase value of SCM actors.

Figure 1. The Conceptualization of *Structural Equation Models* (SEM) of SCM Agroindustry

Supply chain management examines the efficiency and effectiveness of the flow of goods, information and money flow that occurs continuously by involving related parties. In practice, the SCM can integrate manufacturs, suppliers, retailers, and sellers efficiently. So, they can produce and distribute the goods in precise quantity and minimal cost. One of applications of supply chain management is the logistic efficiency system that is reliable. (Dunne, 2001).

Supply Chain Management is used to optimize the values of the supply chain by optimizing the flow of goods, information, and money in the supply chain so that the products which reach the consumer can provide satisfaction in terms of timeliness of delivery, goods quality, and an affordable price. In turn, it will provide the maximum benefit to all members involved in the supply chain (Chopra & Meindl, 2004 and Apaiah & Hendrix, 2004). One of the most important things in supply chain management is the sharing of information, therefore, the material flow, cash flow and information flow are elements in the overall supply chain which need to be integrated (Chen, et al., 2004).

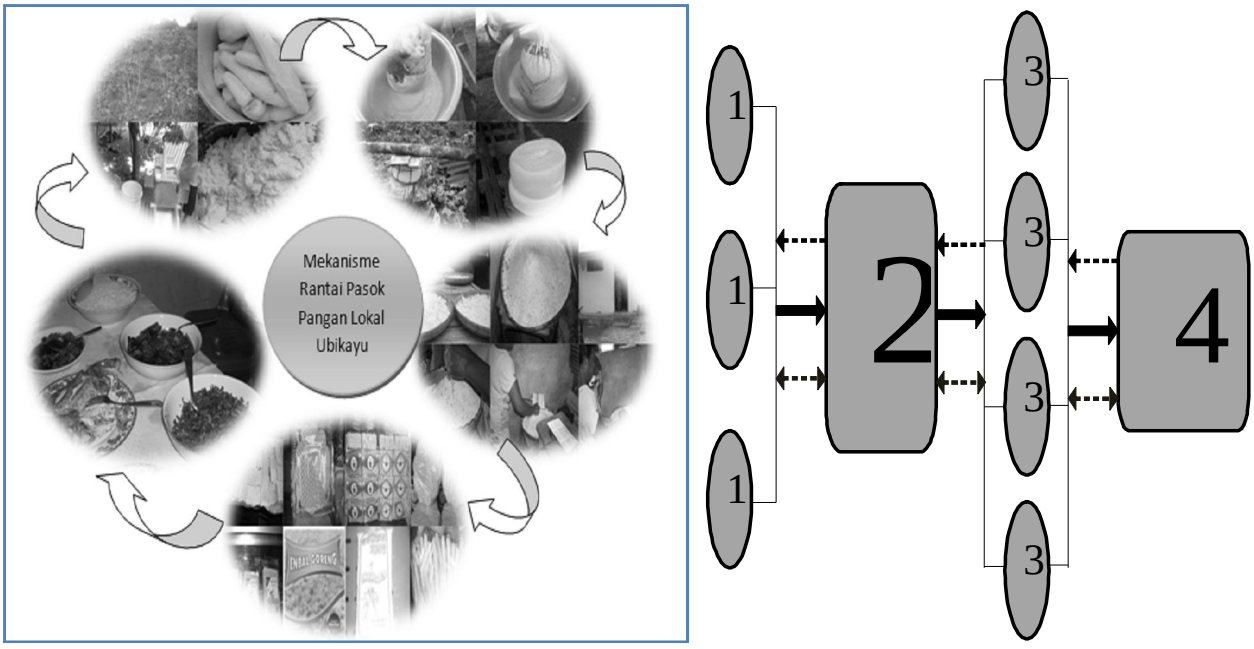
The development of supply chain has become the concern of perpetrators of the agro-industry in which agro-industry is one of new research objects in the field of supply chain management (SCM) implementation framework on agro-industry of cassava linked from upstream and downstream as a chain mechanism. The mechanism of agro-industry

of cassava supply chain starting from farmers as suppliers of raw materials who in charge of preparing cassava in processed form semi-finished materials, and then forwarded to the agro-industry craftsman to be processed into finished products which then be distributed to the merchant. The finished products of cassava are enjoyed and consumed as soup, snacks, and food for sale. The mechanism of agro-industry of cassava supply chain is shown in Figure 3.

The involvement of the supply chain actors such as farmers, craftsman, merchants, retailers and consumers is very important in order to support the success levels of the management. The farmers act as raw materials producers; the craftsmen act as a producer of processed local food products; the trader responsible for marketing the product and doing activity related to marketing functions and also consumers services; and consumers are responsible for providing feedback and suggestions for the products improvement. Each of supply chain actors are free to organize, unify and connect the various processes that occur in the mechanism of the supply chain. The effectiveness of current settings management of demand and supply of raw materials and final product is necessary because it can strengthen the better relationship among supply chain actors. The mechanisms and flow pattern of the supply chain can open opportunities to exchange knowledge and information among supply chain actors so they can increase the quality of their relationships in which it can foster their ability as supply chain actors. The information system of supply chain is necessary for the firm in order to develop cooperation by creating coordinated network in provisioning efficient goods and services to the consumers (D'Amours, et al., 1999).

Most of industries focus on improving the efficiency of their supply chains. One major key which commonly mentioned is the exchange or sharing of information about the quality in the supply chain (Lee, et al. 2000). The chain offers management is focus on the long term and thoroughly profit among the members who created network and shared information about the quality of management among the members who use the chain offers (Yu, et al., 2001).

The first step which can be created by the supply chain actors in initiating resources access, planning



Description:
1 = Farmers (SuppliersLolun)
2 = Craftmen
3 = Retailers
4 = Consumer.

Figure 2. Supply Chain Mechanism of Local Food Agroindustry of Cassava

the sale techniques, the storage and distribution, the requirements, the suppliers' selection, and the sales channels is by making a plan about agroindustry of cassava. These plans are used to develop strategies to manage all of the resources so that it can produce high quality products and satisfy the consumers. A coordination among members of the supply chain which focusing on the type, order quantity and price is very important. The coordination makes market information, ranging from retailers and back to the manufacturer, becomes more transparent. The collaboration between members of the supply chain should be well intensified since the strong supply chain depends on the strength of all the elements in it.

Descriptive Analysis of the Research Variable

The analysis results of the research variable which was conducted descriptively indicated that any of the variables studied had a variation. The detail information of the analysis of the research variable is showed in Table 1.

Coherence and geographic proximity strongly supported the activities of supply chain actors. It happened because the coherence of the supply chain could support cooperation belief and accurate information system, and regulated the availability and interest among suppliers or customers. Each craftsman wanted to get raw materials quickly. The contiguous location of agroindustry of cassava helps the flow of raw materials easily. The average index value of 72.8 proved that coherence and geographic proximity strongly support the activities of supply chain actors to create better coordination.

The customers and suppliers had to consider some factors such as: improving the integration of supply chain activities, sending the goods in a timely manner directly to the customer, contacting the end user to get feedback, listening to the signals of market demand, classifying customers based on the needs of the service, and participating in decision-making suppliers. Indicators of communication and supply chain speed were required in order to widespread the activity of the agro-industry supply chain actors. The average value of the index at the high category,73.39, proved that the supply chain was a very important practice among actors in improving the supply chain integration, services, notification of information and smooth communication so that the agro-industry management processes run optimally. The given information, communication and supply chain speed related to agro-industry of cassava were still very limited due to the difficulty in accessing the material and disseminating information. This happened because the activity of the supply chain actors was still separated.

The good quality services of agroindustry of cassava was the ability to respond the requests in a timely, timely product delivery, ability in responding to customer needs, cooperation with key suppliers, and take advantage of business assets. Operational indicators in allocating and distributing raw materials and finished products to customers which were done well could create a sense of mutual trust and customer satisfaction. Unfortunately, the average value of the index in this case only amounted to 69.96 in which it showed that it is in the middle criteria. In response, researchers believed that the competence of the supply chain still needs to be addressed and corrected in order to improve service quality, operational and distribution of agro-industries.

The enhancement activity of supply chain included the integrity and synergy of supply chain actors and the improvement of input-output management of agro-industries. Integrity described the coherent which has potential and ability to radiate authority among chain actors, while synergy described the combined activities that happened among actors of the chain. Input supply chain agro-industries included natural resources, human, financial, and information resources. Supply chain actors in charge of planning, implementing, and controlling input into various forms like raw materials, auxiliary materials and other materials, while the output of the supply chain included of semi-finished goods and finished goods. The input and output must be regulated as good as possible by the perpetrators of the supply chain so that each actor will get the profit, (Timisela, 2014).In this case, the average value of the index is at the medium criteria, 64.08, which means that repair and renewal activity in improving supply chain activities is needed.

Agro-industry performance measurement were include diversification of products and the relative efficiency of agro-industry, value-added of supply

chain actors, the profitability of agro-industry and agro-industry marketing. Cassava agro-industry had not been diversifying its processed products because its entropy index value is only 0.85 <1.Besides, the craftsman of cassava agro-industries were still rely on traditional products. Therefore, we need training and mentoring to increase the product efficiency and diversification. By showing the value of the indicators presented, it can be concluded that the added-value received by farmers compared to other chain actors is very low. In respond, the supply chain actors should be responsible for the supply chain complement without disserving others party. Indicator supply chain is said to be good if the supply chain actors perform well. The researcher hopes, the profitability of cassava agro-industry development can be improved and further developed.

The Improved performance of product marketing of cassava includes increasing the role of market participants, improving the credibility of the product, and improving the marketing mechanisms. The average value of the index principle supply chain among actors of cassava agro-industry is 67.49 which is in the middle criteria. This means that the supply chain actors need to increase the activity of the chain to achieve an increase in diversification of products and the relative efficiency of agro-industry, increase the value-added of supply chain actors, improve the profitability of agro-industry and improve the agro-industry marketing performance.

Table 1. Descriptive Analysis of the Principles of Supply Chain Management

Frequency of Response Caution of Supply Chain						
			Score			
Indicator	1	2	3	4	5	Index
Coherence	0	0	59,5	7,5	33,0	74,7
Geographic Proximity	0	21,8	20,8	38,5	18,9	70,9
Average index						72,8
Supply Chain Practice						
			Score			Index
Costumers and supplier who done the integration and service	0	52,8	6,6	20	20,6	61,68
Information Notice and Supply Chain Speed	0	0	13,2	40,6	46,2	86,6
	1,9	2,8	50,0	24,5	20,8	71,9
Average index 73,39						
Supply Chain Competencies						
			Score			
	1	2	3	4	5	Index
Service Quality	0	11,3	56,6	16	16	67,28
Operational and Distribution	0	22	18,9	33	26,1	72,64
Average Index69,96						
Increasing of Supply Chain Activity						
			Score			
	1	2	3	4	5	Index
Integrity and synergy of supply chain actors	8	12	28,1	26,4	25,5	69,88
Increasing of agroindustry input-output management	12	28	36,4	3,8	19,8	58,28
Average Index64,08						
Agroindustry Performance						
			Score			
	1	2	3	4	5	Index
Agroindustry Diversification and Efficiency	0	34,7	26,2	25,5	13,6	63,60
Added-value	0	10,9	50,6	21,5	17	68,92
Effort Profitability	0	0	64,3	22,1	13,6	69,86
Marketing Performance	0	0	75,9	10,4	13,7	67,56
Average Index67,49						

Source: Prime Data Analysis

The Analysis of Chain Supply Management and Agroindustry Performance by using *Structural Equation Models* (SEM) Approach

Validity test is done by analyzing the value of the items, in which its value then be correlated with the total value of all items by using the Pearson product moment correlation.

the measurement model includes the relationship between the indicator value loading the constructs (latent variables).Complicated relationship can be established between one or more independent variables with one or more dependent variables. Each variable can take the form factor or construct which is created from several indicators. In the SEM

Table 2. Reliability and Validity Testing of Variable of Supply Chain Management and Agroindustry of Cassava Performance

Variable	Cronbach _ α	Validity
X1	0,847	0,501
X2	0,827	0,801
X3	0,851	0,400
X4	0,849	0,438
X5	0,856	0,347
X6	0,829	0,721
X7	0,849	0,438
Y1	0,847	0,472
Y2	0,848	0,499
Y3	0,844	0,531
Y4	0,835	0,664
Y5	0,843	0,528
Y6	0,848	0,480

Source: Prime Data Analysis

Sugiyono (2007) stated that the instruments are valid if the r^3 0.3 and all the items used in the study were valid. Table 2 shows that the *r* each of coefficient is ^{3} 0.3 which means that the instruments used in this study are valid. The reliability was tested by using *Cronbach Alpha. Instruments used in a study is reliable if the value is >0.6* (Arikunto, 1993; Malhotra, 1996; Sugiyono, 2007). Table 2 shows that the value of all variables is >0.6 which means that the instruments used in this study are reliable. So, it proves that all the instruments used in this study are valid and reliable.

The Analysis of *Structural Equation Modelling (SEM)*

Bagozzi & Fornell, 1982 and Ghozali, 2011 *in* Timisela, 2014 said that structural equation model is a model that allows the multivariate analysis to examine the relationship among the more complex.

SEM test together with Bollen (1989) found out that structural model includes the relationships between independent and dependent constructs, while

analysis, assessment of goodness-of-fit is the main aim to find out how far the hypothesized model fits the data sample.

The analysis result shows that all indicators are statistically significant. The value of each indicator of loading factor is ^{3} 0.5. The significance test of the elements extracted in the form of latent variable can be obtained from the value of the standardized loading factor of each element. Table 3 shows the estimation results of SEM analysis.

The indicators of latent variable are great. It proves by the indicator of each of latent variable which have the critical ratio of 2.00 and the probability of <0.05. The probability value of the testing of goodness of fit is 0.143 with good measures of feasibility models. Thus, the model fit that predicted by values of the observations is eligible. Value of CMIN / DF (1,193), RMSEA (0.043), CFI (0.973), GFI (0.904), AGFI (0.859) and TLI (0.966) is shows that the model has a fit because it meets the recommended criteria. There is only one value which is marginal. It is AGFI. However, it is still can be tolerant and said to be good enough.

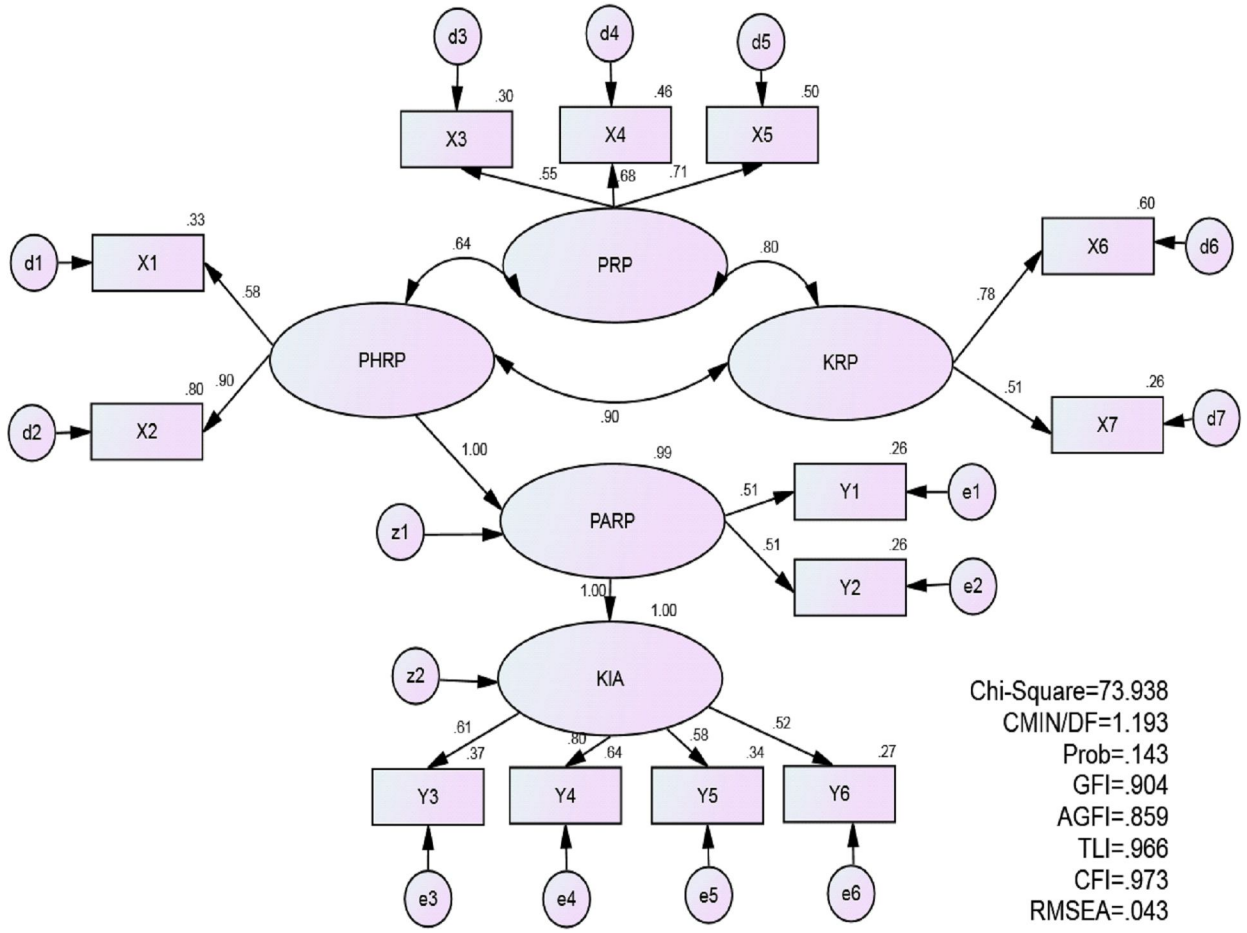


Figure 3. The Result of *Structural Equation Model* (SEM) Test of Agroindustry of Cassava

Table 3. The Result of Estimation SEM Analysis

Variable			Estimation	Regression Standard	S.E.	C.R.	P	Label
PARP	<---	PHRP	0.692	0.997	0.128	5.427	***	par_8
KIA	<---	PARP	1.080	0.998	0.243	4.448	***	par_9
X5	<---	PRP	1.687	0.709	0.394	4.276	***	par_1
X2	<---	PHRP	1.000	0.896				
X1	<---	PHRP	0.455	0.578	0.072	6.334	***	par_2
Y1	<---	PARP	1.000	0.514				
Y4	<---	KIA	1.280	0.797	0.215	5.965	***	par_3
Y3	<---	KIA	1.166	0.607	0.232	5.015	***	par_4
X3	<---	PRP	1.000	0.548				
Y2	<---	PARP	0.551	0.511	0.132	4.166	***	par_10
X7	<---	KRP	0.572	0.513	0.117	4.875	***	par_11
X4	<---	PRP	1.059	0.677	0.237	4.469	***	par_12
X6	<---	KRP	1.000	0.777				
Y5	<---	KIA	1.000	0.580				
Y6	<---	KIA	1.042	0.516	0.233	4.467	***	par_13

Resource: Prime Data Analysis.

Table 4. The Result of Feasibility Testing Model of Structural Equation Model (SEM) of Supply Chain Management and Agro-Industry Performance of Cassava

Goodness of Fit Index	*Cut – off Value*	Analysis Result	Model Evaluation
χ^2 *chi-square* (CMIN)	Below the *chi-square* tabel	73,938	Good
Significance probability	≥ 0,05	0,143	Good
RMSEA	≤ 0,08	0,043	Good
CFI	≥ 0,95	0,973	Good
GFI	≥ 0,90	0,904	Good
AGFI	≥ 0,90	0,859	Good Enough
CMIN/DF	≤ 2,00	1,193	Good
TLI	≥ 0,95	0,966	Good

Resources: Prime Data Analysis

Hypothesis Testing

According to Svensson (2002), supply chain management is a business philosophy that simultaneously should refer to the entire activity dependency, co-management of the supply chain, operational resources, tactical, and strategic levels from the producer to the consumer as well as between the supply chain network. Supply chain management shows all of the activities that can be done to get the right product to the right consumer at the right quality and at the right time in the supply chain (Goffin, et al., 1997; Wagner, 2003).

The result of hypothesis testing shows that all of the variables are interconnected and affected positively. Table 5 shows that H1- H5 can be accepted because the test results were significant. The CR is > 2.00 and p is <0.05. The testing of H1-H3 show a correlation between the variables of supply chain practices, attention to supply chain and supply chain competencies. Each indicator shows the closeness of the relationship with the constructs formed. A good correlation between the three components showed their principles of supply chain management. To support the supply chain management activities of agro-industry of cassava, those three components must be aligned into a sustainable cassava agro-industry.

In this digital era, the main challenge of networking supply chain is to encourage the companies to switch from the practice of traditional into a network of supply chain that can incorporate many components such as production, fulfillment, supplies, demand management, product development, and customer engagement to establish a supply chain that integrates to each other (Madu and Kuei, 2005; Lambert, et al., 1998).Supply chain management is a hierarchical and strategic approach toward the planning of supply and demand, the providing of source of raw materials and components, the manufacturing of products and parts, the ordering of fulfillment, and the delivering to customers and end users.

H4 testing indicates that PHRP influence the PARP. Dimensions forming of PHRP are consist of the coherence of trust between members of the supply chain; cooperation among members of the supply chain; a sophisticated information system; ability to manage the inventory supply chain; and the interest among suppliers or customers. The influence of agro-

Table 5. The Resume of the Result of Structural Model MRP of Cassava Agroindustri

Path			Estimate	S.E.	C.R.	P	Hypothesis	Explanation
PRP	<---	PHRP	0.640	0.043	3.551	***	H1	Accepted
PRP	<---	KRP	0.802	0.058	3.668	***	H2	Accepted
PHRP	<---	KRP	0.900	0.069	5.531	***	H3	Accepted
PARP	<---	PHRP	0.997	0.128	5.427	***	H4	Accepted
KIA	<---	PARP	0.998	0.243	4.448	***	H5	Accepted

Resource: Prime Data Analysis

industries in the supply chain and the proximity of the area consist of the distance of the customers with the suppliers within the region and the location of agro-industries. The proximity is a main focus sustainability of cassava as local food agroindustry. Agro-industries of cassava which is located in rural areas is easier the craftsmen to interact and transact with farmers who produce raw materials. This is in line with the results of research by Marsigit (2010) which states that the distribution of processed food products is closely related to the availability of raw materials (local food).The main raw materials are which at least 25% derived from agricultural products, Soekartawi (2000). In this case, the agricultural products meant by the researcher are the local food products.

H5 testing showed that PARP influences the performance of the agro-industry. It is absolutely necessary because if the business management is good then the performance of the agroindustry will be better. Dimensions forming of PARP agro-industry include integrity and synergy of supply chain management and improvement of agro-industry input-output. Integrity and supply chain synergy is needed in the development of agro-industries. Applying the principles of supply chain management well will give good effect toward the development of the agro-industries. Craftsmen should regulate the use of inputs well so that they can produce the maximum output. Lack of attention toward input-output management resulted in cessation of the business achievement. Dimensions forming performance of the agro-industry consist of diversification and efficiency, added value, profitability and marketing. We need more modern product diversification effort in order to improve agro-industry profit and create efficient agro-industries in using production inputs so that we can produce proportional outputs. Marsigit (2010) argues that the diversified development of locally processed food products will indirectly increase the production of raw materials. Hence, a value-added of supply chain actors, the profitability among the supply chain actors, and marketing efficiency must also be improved so that each party can obtain advantages in the market mechanism. This data is supported by research of Gunasekaran, et al. (2004) which found out that the fundamental aspects that need to be considered in the SCM is the performance management and continuous improvement. To create an effective performance, we need measurement system which is able to evaluate the performance of the supply chain holistically. Performance measurement is indispensable as an approach in order to optimize the supply chain network (Van der Vorst, 2006).

CONCLUSION AND SUGGESTION

Conclusion

The mechanism of supply chain showed the activities of supply chain actors such as the activity of farmers who produce raw materials, craftsmen who produce refined products, traders who buy and sell products and consumer as the end user of the product. Supply chain flow pattern showed the flow process of the raw materials and products, the financial and the information that is very useful for the improvement of sustainable supply chain management. The use of the principles of SCM indicates the triumph of local food agro-industry through involvement of supply chain actors in improving and enhancing the performance of the agro-industry.

SCM provides a viewpoint which asks the craftsmen of cassava and sago agroindustry to focus on the supply chain practice and supply chain competence. These components play an important role on the increasing of chain supply actors' activity and the performance of agro-industry. Evidence presented in this study reinforce the notion that effective supply chain management will enable agro-industries become competitive in the creative economy.

The results of SCM structural equation modeling analysis of Agroindustry has already meet the specified criteria very well. Although there was a slight problem at the AGFI, it is still acceptable marginally. The indices showed that the value of GFI= 0.908; AGFI = 0.860; TLI = 0,974; CFI = 0.980; CMIN / DF = 1.147; RMSEA = 0.038; probability = 0.204; and c2 = 68.813

Suggestion

The activities of local food agroindustry cannot be separated from the ability of organizing and managing which have been summarized into the unity of a process called chain management process by including chain actors: craftsmen who support the

chain mechanism. Supply chain management is supported by some components such as supply chain practices, supply chain attention, and supply chain competence. These three components relate to each other and influence the increasing of supply chain actors activities and the performance of agroindustry of cassava in rural areas.

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