

Dynamic Model of Supply for Manau Rattan West Sumatra

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Abstract: Conditions of rattan raw materials manau have over supply but the price rose about 30%, this is because state system of trade and transport links between the islands is not good, and the number of players in the distribution channel of rattan raw materials affects the selling price of rattan in the raw materials market. The approach taken to solve the problem of the distribution of rattan in West Sumatra is by using system dynamics approach. Policies can be done for the distribution of raw materials this cane, then drafted several alternative policies or scenarios, namely: increased purchasing power of the industrial processing of raw materials of rattan which is supported by the local government to reach local markets and increase transport ship pilot began to be repaired and added to its fleet so time delivery of raw materials to be faster and more stable selling prices.

Keyword: Distribution, Dynamic Systems, Trading Systems

1. Introduction

Prices of raw materials of rattan manau from West Sumatra today is not stable, so the rattan entrepreneurs still complain of the price given by the supplier is still expensive and has gone up. From the survey results to the area upstream of rattan (area Siberut, Sikabaluan, and the Mentawai Islands), Previous research (Dewi st, al 2015) obtained information that conditions rattan prices that exist today is influenced by the distribution channels of rattan raw materials from upstream to downstream, while difficult, the length of the distribution chain, conditions of service which must be taken because of the natural conditions and unpredictable weather make rattan raw materials difficult to obtain.

Complex supply chain network that consists of several actors or players strive toward different purposes and have performance indicators at different levels, in many cases are often at odds with each other must be taken into account in their operations. In terms of performance measurement in the supply chain if researched deeper into a complex problem that does not allow solving a single objective optimization problem. Supply chain is complex because it has some of the entity consisting of raw material suppliers, manufacturers of finished goods, finished goods suppliers, distributors, retailers and end customers. Each entity in the supply chain has its own performance measures to optimize its purpose. For example,

the supplier has the goal to provide raw materials and finished products required by the manufacturer or by the consumer. Manufacturer focused on the production, minimizing work in process, minimizing the size of the batch production, maintaining product quality, satisfy consumer wants and as much as possible to do service to consumers, distributors measuring performance is assessed on the ability to meet the needs of the public (consumers), stabilize prices, managing the warehouse, inventory, maintaining the continuity of the production and speeding up production to consumers, while retailers aim to minimize the price of the product and deliver products with a short time to the consumer.

Delivery of raw rattan manau from upstream (upstream) to all points of demand (downstream) are located spread is often a problem in the distribution of rattan raw materials so that the price of raw rattan to be expensive, time of delivery, the amount of raw materials that will be sent is uncertain, many a point that should be flown in one route makes the condition of raw material supply to the processing industry or national rattan industry is hampered. As our previous research revealed that solving the problem of distribution of rattan raw materials from the upstream to the downstream are expected to produce a minimum transport costs, the optimal distribution and optimal solutions to transport costs of raw rattan from upstream to the National Rattan Industry. As the previous research (Dewi, *et al* 2016) discussing about the problem of distribution of rattan raw materials in the supply chain need to approach the system is expected to provide a foundation broader sense of the factors that influence the behavior of the system and provide a basic understanding of the multiple causes of a problem within the framework of the system

Termination export of raw rattan, it has yet to make the furniture industry in Padang, and West Sumatra obtains adequate supplies of raw materials. Some employers complain about lack of raw materials and raw materials if there is not in accordance with the order. Several studies of how the distribution of raw rattan to date no one has addressed about how to distribute the shoulder of the upstream (Forest) from rattan raw materials to downstream (industrial raw material processing rattan to rattan furniture). Thus the problem becomes interesting and as we know that rattan is a commodity which is owned by Indonesia as the world's number one producer of rattan. Obviously this requires transportation planning studies for the case of rattan in Indonesia which involve multi-disciplinary to scientists for study very diverse aspects.

The purpose of this research is to see the behavior of players in the distribution of raw materials of rattan manau in West Sumatra. This research also examined from each sub system that formed so that will facilitate the decision maker when will apply policy related to the distribution of raw material of rattan manau West Sumatra

2. Literature Review

The application of the model system Dynamic for supply chain management stems from the dynamic industry (Forrester, 1958, 1961). A model of production and distribution systems in development by Forrester to explain the 6 (six) things in the flow system interacting, which is the flow of information, materials, orders, money, manpower and capital equipment. Development and use of simulation models of dynamic systems described Forrester developed around issues of supply chain management. Further research conducted by Forrester in 1961 showed that it had a lot of issues on the supply chain of which is a matter of application demand, ample supplies, and the effect of advertising policy on product variety, decentralized control or the impact of the use of information technology in the management process. Since Forrester examines the supply chain as part of the industrial system in terms of policy design, research covered issues ranging from inventory management to integrate the global supply chain. Forrester received much criticism that underlies the expansion of

advanced research. Although the model is simple but Forrester these models yield important insights into the dynamics of the supply chain.

The supply chain should be in a dynamic environment, because they are managed by the frequent disruptions of production and transport with complex networks. Associated with these characteristics requires a high degree of operational flexibility. In order to achieve flexibility, several technologies have been developed to enable acquisition, processing and exchange of information involving the players. A system associated with the physical and information aspects of the process may be referred to as cyber-Physical Systems (CPS). CPS in Supply Chains is used to provide a reference model. Once the conceptual model is proposed to describe the difference between Supply Chains used (or not) the concept of CPS. Finally, a simulation-based test case was developed to support the implications of the implementation of the CPS for synchronization and improve the Supply Chains (Frazzon, *et al* 2015)

Methods for supply chain management continually draw attention to research significantly. The main reason is a small improvement brings huge potential for cost savings and performance improvements in the supply chain system of truth. However, the mathematical formulation of the multi-echelon supplies chain that is a problem, a challenge for the modern theory regarding optimization and control. This formulation is a dynamic large-scale optimization problem that is affected by the uncertainty and incomplete information. This trouble blocking the stochastic optimal control policies. Various approaches have been proposed, and shown to be effective for certain kinds of problems. Various studies have shown that the potential of Model Predictive Control (MPC) to reduce operating costs of inventory systems and supply chain support. MPC assumes that supply chain models are actually capable of influencing the decision-making. This model is used to predict the state of the system (inventory, service levels, etc.) within a fixed period, and to optimize operational decisions (production, delivery, etc.) through the optimization program. Models, however, may contain inaccurate parameters (capacity, etc.) or a certain amount (demand, request, etc.) (Schildbach *et al*, 2016).

3. Methodology & Model Development

Inventory policy which will involve all parts ranging from the location of farmers, wholesalers, traders between islands, and wholesalers have a very important role on the availability of raw materials for industry rattan cane. Many studies have been developed for the determination of inventory policy that sets inventory policy and transport policy from one section to the next should be set out in an integrated manner (Chan *et al*, 1998). Coordinating the flow of products between the parts necessary when transferring products aim to minimize the cost of the system is a problem in the supply chain flow (Anily *et al* 1999). Amount to be sent, the capacity of the vehicle and the mileage between locations will determine the setting of resettlement policies (transport policy) of raw material between parts.

Breakthrough technology to enhance the competitiveness of independent becoming increasingly important because of the increasing demands of international buyers in the global supply chain rattan industry. System assessment (traceability system), quality assurance and food safety as well as attention to sustainable development efforts become a necessity for national rattan industry associated with an international network of rattan supply.

The structure of the model to be modeled is the distribution system rattan manau depicted on the condition of the system is based on a global model (Forrester 1980). The conceptual model is shown interactions between subsystems that form the basis of models and diagrams presented in Figure 1.

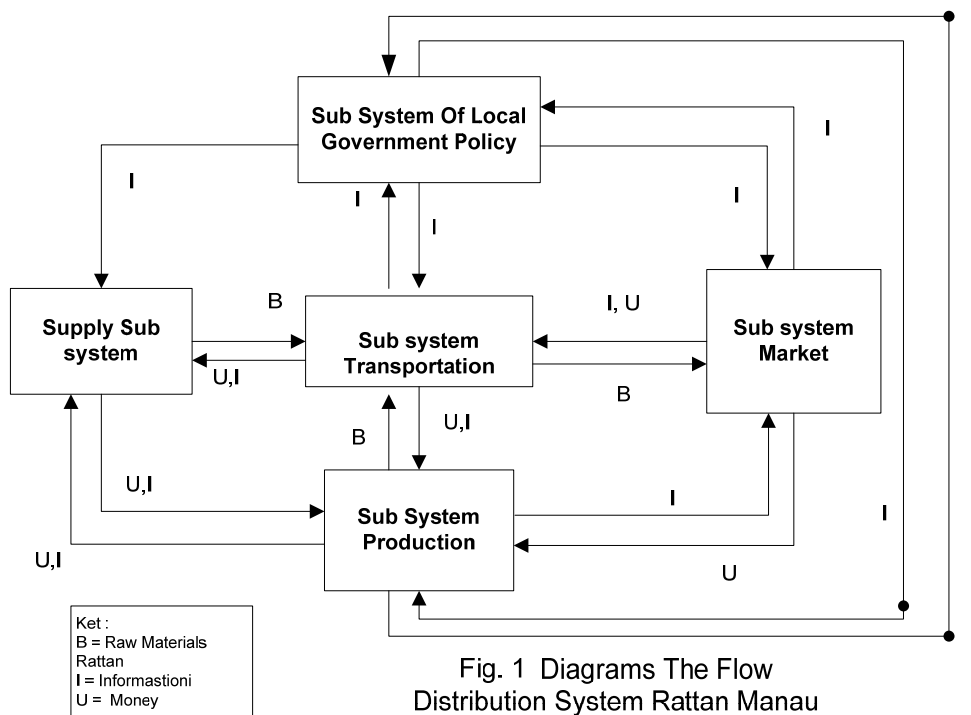


Fig. 1 Diagrams The Flow Distribution System Rattan Manau

In this study, which will be discussed are part of the supply sub-systems, sub-systems and subsystems transport which is in the upstream production of rattan producers manau in West Sumatra. Here is presented a brief description of each subsystem:

1. Transport subsystem serves as a sub-system that regulates the flow of goods, information and money in the distribution of raw rattan. These subsystems interact with supply subsystem, production subsystems, subsystems and subsystems market local government policy. Transport in rattan raw material distribution problems manau plays a fairly important. Starting from the ideal distribution of raw material transportation manau fairly stable at an affordable price, supply many times, timely delivery, and quality of raw materials is excellent. Conditions were difficult distribution lines and scattered islands in West Sumatra make manau rattan raw material price increases. Manau rattan raw materials from upstream are transported by means of transport of boats klotok engine L300 has a capacity of 2-3 tons. This type of boat is a mainstay for transporting cane growers harvest rattan cane to the collectors in the village. High prices of fuel and spare parts to be a problem for farmer's rattan impeding in distributing raw rattan. Crop farmers gathered in the collectors subsequently transported by boat pioneer.

The problem of transporting passengers and goods in Indonesia is the largest archipelago country in the world (consisting of 17,504 islands +), the means of transport pioneer connecting the islands. Due to the difficult transportation conditions, many of the island's undeveloped economy, thus becoming disadvantaged areas. Mentawai Islands is one of the areas lagging behind due to difficult transport links as well as the number of ship pilot who came on this island is very limited, so that the movement of passengers and goods to be not optimal. Transportation lines in the Mentawai Islands which is not good because the ship is waiting, broken, and is the process of maintenance have become a phenomenon in the Mentawai Islands as rattan-producing areas of quality number one, this incident will affect the supply of rattan raw materials to downstream industries in the city of Padang.

2. Sub supply system serves to produce the raw materials of rattan, interacting with the transport subsystem; Subsystem Supply serves as a provider of raw materials for

subsystem rattan production and market information for the subsystem. While the interaction with the transport subsystem serves as a provider of raw materials for collectors, traders and rattan industry. In supply subsystem is vast amount of activity stems from a portrait supply subsystem delivery process stages of rattan raw materials from upstream (upstream) to all points of demand (downstream). Early rattan raw materials from farmers and cane cutters in the upstream (Upstream) of the survey results as obtained information that some of the cutters have been many who cultivate cane so that they no longer need to explore the woods just yet entirely built from local governments. For this kind of rattan particular are still looking in the woods because it's hard to be cultivated, From Farmer / cutting cane usually rattan raw materials delivered to collectors in the village or in the district to be processed into raw materials that have added value better in this section are usually recipient which has a substantial capital that usually dominate the raw materials of rattan and technology owned by big capital affects the quality of raw rattan. Rattan processed usually bought by merchants or even now many industries national rattan which has shed a buffer so that they can directly receive rattan raw material according to the needs (demand), the condition of raw material prices and adjusted for purchasing power traders / rattan industry and the survey results by conducting interviews with local rattan industry today that they expect is consistency in order to supply raw rattan industry can continue to produce and fulfill orders. Production of raw rattan manau currently in the Mentawai Islands over supply for crop cultivation conditions rattan cane farmers conducted in collaboration with the Ministry of Forestry succeed.

3. Sub production systems function to produce raw materials in the upstream raw rattan subsystems that interact with the transport, supply and markets in the city of Padang. Factor in the production of this model is derived from the supply of subsystems such as rattan raw materials from farmers, transport subsystems such as the flow of raw materials, market subsystem of the money to be gained after traders can meet the needs of rattan. The level of demand for rattan products obtained from the consumer will make the production subsystem; the level of demand can be met. The level of demand depending on the size of the market demand and market share. Furthermore, in relation to regional policy subsystem to obtain information about the conditions in terms of marketing and organization of information obtained by the institutions participating in the process of delivering goods and services from producer to consumer point.

Effect of Rattan delivery of finished products to the consumer market is determined by variable time delay delivery, which is influenced by the level of shipments carried by the transport subsystem and the availability of raw materials originating from supply subsystem. The lower the rate of delivery of the goods, the longer the product to the consumer. Send a long delay time will be impacting on the delivery delay time competitor, it is assumed that consumers would prefer to buy from a competitor or any other product that has the same functionality with products such as synthetic rattan chair rattan.

Variable effect delivery delays and the effect of price along with the level of demand, production levels and the delivery rate will form a loop negative which reflects the mechanism of market clearing, as demand grows steadily, production levels will be increasingly difficult to meet demand due to raw material shortages causing effect of a decrease in the share of market and demand for rattan products.

4. Subsystem markets subsystems interact with the production, transportation and local government policy. In conjunction with supply and production subsystems in addition to goods which become the main object of information also plays a role where of this subsystem will be obtained by how much demand for rattan raw materials to be supplied by the supply and production subsystem. Meanwhile, in interaction with subsystems

transport is concerned the money should be provided to drain the product of subsystem supply to production for the next to the subsystems market the following information on how a transport capacity, when to be sent, when the goods arrive, the route to be used, mode of use and price must bear collectors, traders, downstream industries and end consumers to be paid.

5. Subsystem local government policies, to interact with the subsystems of production, markets, supply and transportation. The government's policy in this regard is expected to provide information about markets, policies to develop the industry of intermediate goods in the upstream and subsidies for transportation as a business activity in which there are flows of goods and services from the point of production to the point of the consumer.



Source : Google

Figure 2: Map of the Mentawai Islands of West Sumatra

3.1. Study overview of West Sumatra Province

Alluding to the availability of raw material such as natural rattan that cost farmers Rp. 6,000 / kg and after being processed into dried cane to Rp 10,000 / kg-Rp. 15,000 / kg for good quality. Meanwhile, for the types of rattan manau price is relatively stable position in rattan farmers Rp 10.000 / stem - Rp 11.000 / stem for a length of three to four meters, while for dry manau cane price of Rp. 15,000 / rod - Rp. 20,000 / rod. (Merchant rattan West Sumatra 2016) The decline of the domestic economy accompanied by rising prices of basic necessities makes furniture makers in the city of Padang, West Sumatra (Sumatra) threatened with bankruptcy. Based on the survey in the field, one of the centers of rattan in the area of Kampung Pitameh, Village Tanjung Saba, Lubuk Begalung, Kota Padang, only looked one or two people who still weave rattan craftsmen in the region. In fact, this location is known rattan craft center. The results of this craft egg baby swing, chairs, tables, and a range of homewards made from rattan may be available in this area. Markets are penetrated up out of West Sumatra province, and even abroad.

Some time ago, the rattan industry products could raise the name of West Sumatra at the national level as a first-class producer of rattan products, in addition to other production

centers in the island of Java, Sulawesi and Kalimantan. But lately the potential for sluggish, due to lack of demand from consumers and compete with similar products from other regions. In West Sumatra hundreds of residents dependent with rattan, such as in the Mentawai Islands, Siberut, Sikabalan, Pasaman, Sijunjung, and Dharmasraya that had been sold to small industries in Padang.

Mentawai District, West Sumatra is known as one of the superior quality rattan-producing areas in the world, Mentawai Islands is the largest rattan producers who make up 60 percent of the total production of rattan West Sumatra, people rely on subsistence income from the rattan. Besides, the existing industrial furniture makers, such as in Padang and other areas has not shown an increase, both in terms of quality and productivity efforts, so impressed was the way place. To that end, the need for more concrete efforts of various parties to revive the industrial potential of becoming the industry in the regions, so that it can compete and parallel with products produced rattan industry in Indonesia.

Table 1 Data rattan production in West Sumatra

Year	The Number Of Rattan	Information
2012	928,02	Ton
2013	53.752,08	Ton
2014	5.525,0	Ton
	70.578	Batang
2015	8974,08	Ton
	81.292	Batang

Source: Industry Ministry West Sumatra (2016)

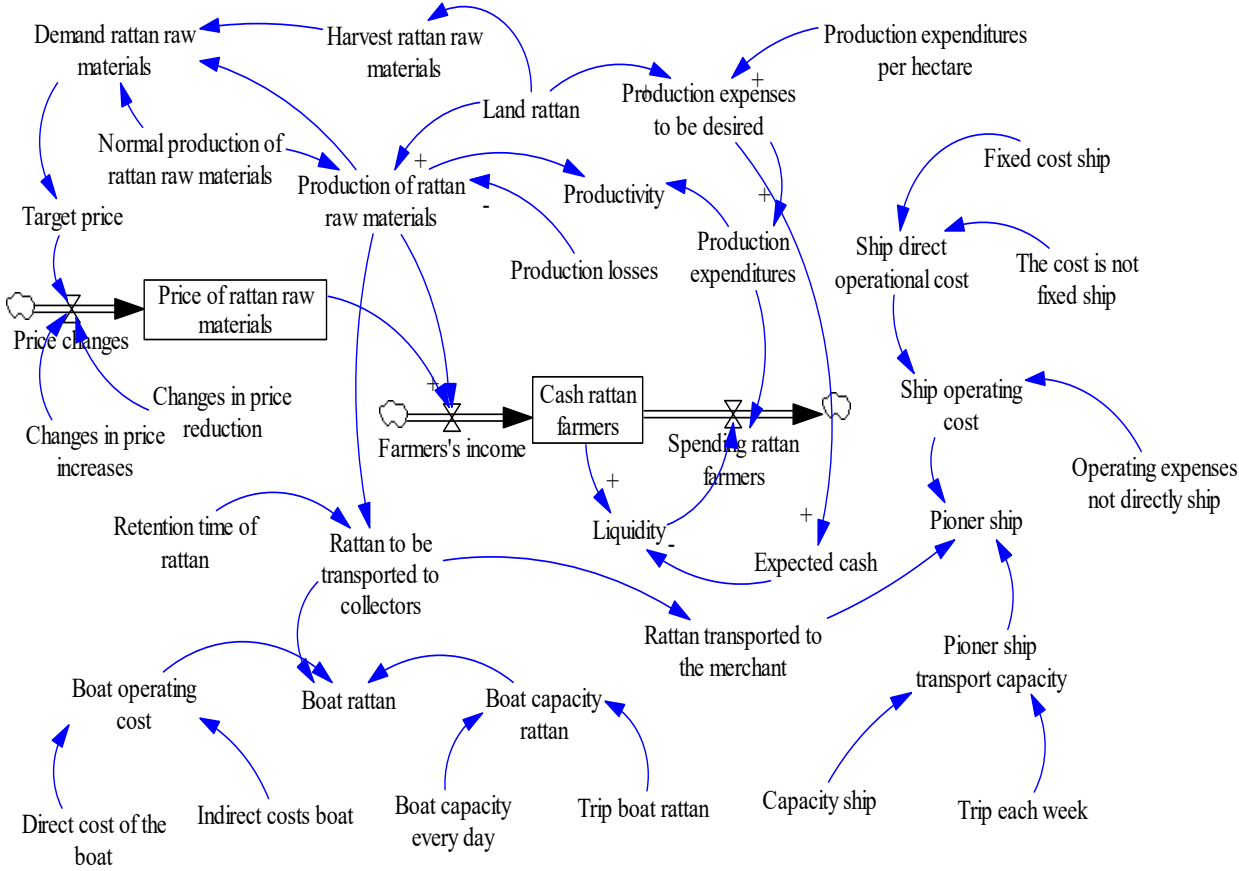


Figure 3 Causal Loop Distribution Rotan Manau West Sumatra

3.2. Formulation Model

Model formulation is writing the equations used in the definition of variables, for example the level, rate or auxiliary, the definition of constants / parameters, the definition of the function tables, including other special functions. Formulation of the model created by the flow chart, in this study. Formulations made with language models designed specifically for the dynamics of the system.

Formulation:

$DRRM = NPRRM - (HRRM - PRRM)$	1
$PRRM = (NPRRM - LR) - PL$	2
$FI = (PRRM/PrRRM)$	3
$CRF = FI - SRF$	4
$PED = LR - PEPH$	5
$PC = TP*(CPR - CPI)$	6
$RTC = PRRM*RTR$	7
$BR = (RTC/BCR)*BOC$	8
$BOC = DCB + ICB$	9
$PS = (RTM/PSTC)*SOC$	10
$SOC = SDOC+OENDS$	11

Where:

DRRM : Demand Rattan Raw Materials

PRRM : Production Of Rattan Raw Materials

FI : Farmers' Income

CRF : Cash Rattan Farmers

PED : Production Expenses to be Desired

PC : Price Change

RTC : Rattan to be Transported to Collectors

BR : Boat Rattan

BOC : Boat Operating Cost

PS : Pioneer Ship

SOC : Ship Operating Cost

HRRM : Harvest Rattan Raw Material

NPRRM : Normal Production Of Rattan Raw Materials

LR : Land Rattan

PEPH : Production Expenditure Per Hectare

SDOC : Ship Direct Operational Cost

OENDS : Operating Expenses Not Directly Ship

RTM : Rattan Transported to The Merchant

PSTC : Pioneer Ship Transport Capacity

4. Results & Discussion

4.1. Simulation results

The approach taken to solve the problems of distribution channels rattan in Indonesia is by using system dynamics approach. The dynamics of the system is an approach that thoroughly. Thinking paced system, where feedback theory and computer simulations are advantages to solve complex problems. The application of the methodology is expected to show a dynamic system behavior cane industry in the real world, in order to get the best solution from a series

of experiments conducted through scenarios policy.

From Figure 4 below shows that the condition of stable supply, but prices for raw materials more expensive rattan cane phenomenon shows Indonesia at this time so many furniture makers replace it with another material. This has an impact on the supply upstream of the reduced purchasing power of downstream industries.

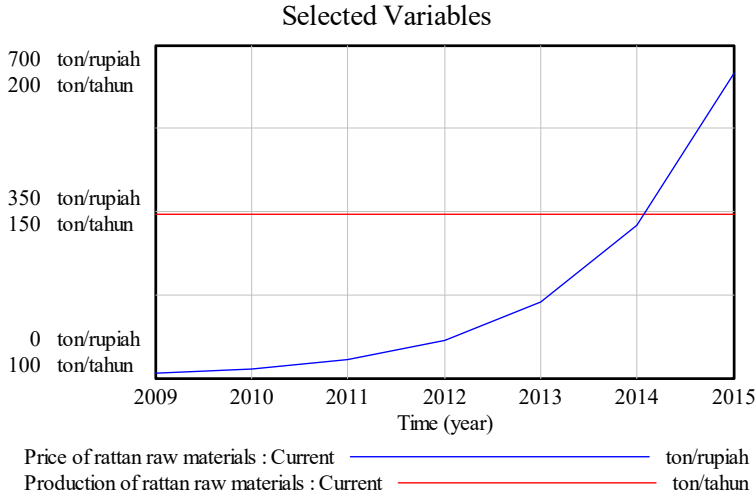


Figure 4 Subsystem production

In figure 5 below rattan raw material supply conditions are already over supply but because of absence of demand from downstream industries

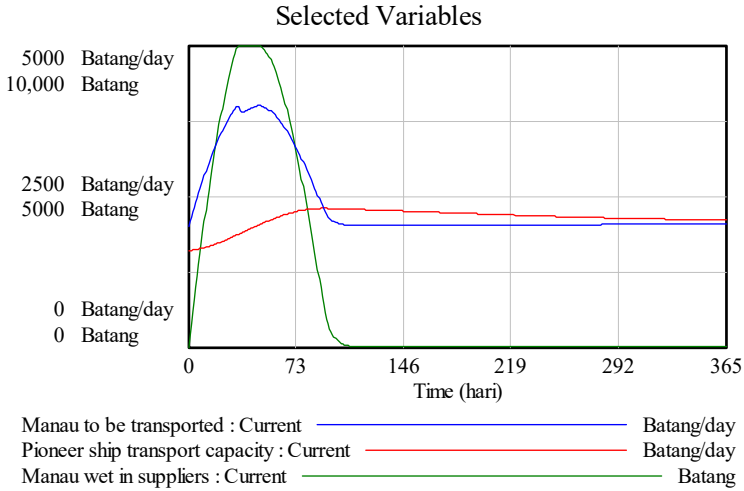


Figure 5 Results supply subsystem

In Figure 6 below shows the freight transportation in the upstream decreased productivity due to the many boats that must be repaired, damaged, these should be taken much and ships with losses of purchasing power would decrease transportation services.

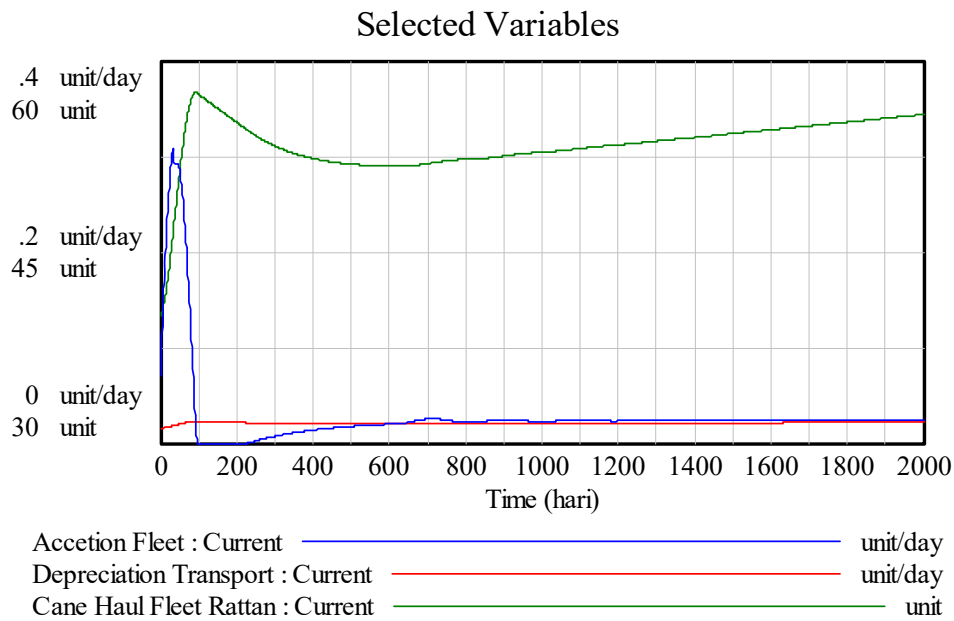


Figure 6 Results Sub transport system

4.2. Results of the Behavior Model

We analyzed the behavior described by the simulation results of the model have been developed. This analysis aims to provide an overview of rattan raw material supply performs manau in West Sumatra through increased demand for raw materials of rattan and improvement of means of transportation of raw materials produced in the upstream can be immediately distributed to downstream.

Observations of the size of participation can be done with the following scenario

1. In this scenario, demand is growing at a high rate. The reason is the increased purchasing power of the industrial processing of raw materials of rattan which is supported by the local government to reach local markets.
2. The scenario of the transport ship pilot began to be repaired and added to its fleet so that the time of delivery of raw materials to be faster and the prices to be stable.

From the research that has been done, some points need to consider doing so the next stages as follows:

1. Condition of rattan raw material supply in upstream activities in a state of oversupply for land cultivation rattan cane farmers, assisted by the ministry of forestry has been successful.
2. Transport lines for the distribution of raw rattan in West Sumatra from upstream areas rely on a boat with a capacity of 2-3 tons for up to collectors in the village. Furthermore, raw rattan transported by ship pilot capacity of 80 tons to arrive in the downstream city of Padang, West Sumatra. Inter-island transport lines that occur at this time is quite difficult because of a limited number of vessels, number of improvement activities and the path through enough so that the area of Siberut, Mentawai Islands Sikabalu and traversed only once every 2 weeks.
3. Activities rattan production upstream located area of Siberut, Sikabalu, and the Mentawai Islands is a kind of raw rattan and rattan raw materials downstream to dry will become the raw material supply so the furniture industry in the area of Kampung Pitameh, Village Tanjung Saba, Lubuk Begalung, Padang city
4. Market rattan West Sumatra is still around area Kuto Pulau Padang, Medan North Sumatra and Cirebon. Currently the demand conditions dry rattan raw materials are declining this case but because of the Decree No. 35 / M-Dag / Per / 11/2011

Ministry of Commerce has established the prohibition of export of raw rattan. Where after the Decree of the Minister of Trade is out of rattan raw materials becomes difficult to obtain if a price has gone up to 30% and the quality does not match the demand.

5. Local government policies in the region by opening the Kuto Pulai Padang is expected to increase the demand for raw materials to enter the downstream industry finished goods, as well as the role of local government in the marketing environment that helps local governments themselves to furniture using furniture made from rattan as being carried out by some other rattan kabupaten procuring school of rattan for all government schools.

5. Conclusion

From the results of the study as well as previous simulations, it appears that the main problem in the distribution of raw rattan is demand for rattan raw material decreased and conditions of conveyance from the upstream to the downstream are limited, so both of these greatly affect the conditions of supply and price of raw materials rattan in West Sumatra. Policies can be done for the distribution of raw materials this cane, was composed of a few alternative policies that are arranged in two scenarios, namely: increased purchasing power by the industrial processing of raw materials of rattan which is supported by the local government to reach the local market and transportation improvements pioneer ship began to be repaired and added to its fleet so time delivery of raw materials to be faster and more stable selling prices.

References

- Ahmad Mortazavi a, Alireza Arshadi Khamseh an, Parham Azimi b (2015) "Designing of an intelligent self-adaptive model for supply chain ordering management system" *Journal Engineering Applications of Artificial Intelligence* 36 207-220
- Badan Pusat Statistik Propinsi Sumatera Barat, 2015.
- Philip Beske, (2012) "Dynamic Capabilities and Sustainable Supply Chain Management" *International Journal of Physical Distribution & Logistics Management* vol 42 no 4, pp372-387
- Emmanuel D. Adamides, Pachristos,G and Pomonis, N (2012) "Critical Realism In Supply Chain Research Understanding The Dynamic Of a Seasonal Good Supply chain" *Journal International Of Physical Distribution & Logistik Management*
- Forrester, J.W, (1958-1973). *Book Industrial Dynamics; a Major Breakthrough for Decision Makers.* Publisher Harvard Business Review 36 (4) : 37-66
- Goncalves P, J Hines and J Sterman. (2005). "The Impact of Endogenous Demand on Push-Pull Production System". *Journal System Dynamic Review* Vol.21.No.3 John Wiley vend Sons Ltd Boston.
- Kessler, W., McGinnis, L., Bennett, N., Makins, Q., Nagao, D., & Bennett, N. (2012), "Enterprise alignment and inertia risk during transformation". *Journal Information Knowledge System Management*, 11,51-168
- Mohammad R. Rasouli*, Joss J.M. Trienekens, Rob J. Kusters, Paul W.P.J. Grefen (2015) "A Dynamic Capabilities Perspective on Service-Oriented in Demand-Supply Chains 7th Industrial Product-Service Systems Conference - PSS, industry transformation for sustainability and Business Procedia CIRP 30 (2015) 396 – 401
- Nurlaela Kumala Dewi, Miming Miharja, Gatot Yudoko (2015), "Analisis Kebijakan Distribusi Bahan Baku Rotan Dengan Pendekatan Dinamik Sistem. Studi Kasus Rotan Indonesia *Jurnal Perencanaan Wilayah dan Kota* vol. 26, no. 3, hlm. XX-XX, Desember 2015 DOI: 10.5614/jpwk.2015.26.3.3

- Nurlaela Kumala Dewi, Pradono, Miming Miharja, Gatot Yudoko (2015) "Optimization Of Rattan Raw Material Supply Chain Route Case Study: Rattan Katingan Indonesia" Proceeding Of The Eastern Asia Society for Transportation Studies, Vol. 10, 2015
- Nurlaela Kumala Dewi, Pradono, Miming Miharja, Gatot Yudoko "Logistic Travel Distance And Time Optimization Of Raw Rattan Materials In Indonesia" Transportation Research Procedia 00 (2017) 000-000
- Nurlaela K Dewi, Pradono, Miming Miharja, Gatot Yudoko " Phenomena Of Rattan Distribution In Indonesia" International Journal Of Applied Engineering Research (IJEAR) ISSN 0972-4562 (2016)
- Purnomo,H, and Mendoza,G (2011)"A.System dynamics model for evaluating collaborative forest management" International Journal of Sustainable Development & World Ecology
- Sidola, A, (2012) "System Dynamic Investigation of Information Technology in small and medium enterprise supply chain" Journal of Advance in Management Research Vol 9 no 9 pp 199-207
- Sachan,A, Sahay, B.S and Sharma,D,(2005) "Developing Indian Grain Supply Chain Cost Model" International Journal Of Productivity and Performance Management, vol 54 pp187-205
- Shenle Pan , Michele Nigrelli, Eric Ballot, Rochdi Sarraj, Yanyan Yang MINES ParisTech, PSL Research University, CGS – Centre de gestion scientifique, 60 Bd St Michel, 75006 Paris, France "Perspectives of inventory control models in the Physical Internet: A simulation study Journal Computers & Industrial Engineering 84 (2015) 122–132
- Ozatagan, G.(2011) "Dynamics of Value Chain Governance: increasing Supplier Competence and Changing Power Relations In The Periphery Of Automotive Production-Evidence from Bursa", Journal Turkey European Planning Studies, 2011, 77-95 19