



YAM SUPPLY CHAIN DEVELOPMENT: A CASE STUDY OF YAM FARMERS IN KUPANG DISTRICT, INDONESIA



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The Degree of Master in Agricultural Production Chain Management,
Specialization Post Harvest Technology and Logistics

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DEDICATION

This work is dedicated to my *parents* : Anton Bele and Yudith Y. Salassa for your infinite love; my *dear sister and brother* : Grace, Jhon, Isto and Ita for being my spirit; my *lovely nephew and niece* : Heince, Jesica ,and Clarito for making my days cheerful with your funny story and voice; and for my *beloved one* : Mario for your support and always being there for me.

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ABSTRACT

A research into yam supply chain was carried out to identify the key factors of yam production and supply chain systems that affect the supply of yam to the provincial market in Kupang District, East Nusa Tenggara Province. Up to 53 interviewed were used to generate data for analysis. The results of the analysis identified a simple yam supply chain, so that the researcher were using cassava supply chain as a recommendation and input for the development of yam supply chain in the future. In this research, It is found that the function of the government in supporting the development of indigenous food become the strength of the Yam cultivation prospective, and the collectors and processor become the missing actors in Yam supply chain in reaching the market. The research showed that the variation of the production is influenced by the size of land and farming experience. The farmer's culture in dividing the production usage which is 80% of the production used as home consumption and only 20% for local consumers becomes one of the technical tasks to be solved in selling management beside the diversification of the end product of the Yam. The missing link in the yam supply chain (collector, processor) small production of yam, small number of consumer and low price of yam become the main obstacles in the yam supply. In addition, the roles of government in empowering their regulation, and the technical obstacles like transportation limitation also hamper the yam in reaching the provincial market.

Key words: Yam, indigenous food, supply chain, selling management, production, cultivation

CHAPTER 1. INTRODUCTION

1.1. Background

A yam is a tuber that commonly grows in East Nusa Tenggara Province. It was very popular in the era of 1970s for almost all the people living in rural areas in this particular province. At that time, yams were mostly collected from forests. This resulted into mindset of community that equates a yam to “tuber of forests” and food for rural communities which are identical with the poor people.

Normally, yam grows naturally in forestry areas but starting from the end of 1970s to the beginning of 1980s, people have planted yam in field even though just for a side crop. This was done because the harvesting time of yams was during the dry season around July till October, where most of the farmers were experiencing shortage of food supply so yams became their food security. Another reason was due to the farming system of yams which required less tending than other crops (rice, corn, cassava, sweet potatoes). Yams do not need a lot of agronomic practices from farmers after cultivating. They just leave them and wait for the harvesting time in the next year. So they can do other activities such as cultivating rice, corn, vegetables, among others. Meanwhile, cassava requires special care such as weeding and applying chemicals when it is attacked by pests, among other.

Yam growers in general cultivate cassava as well. They cultivate both but in the era of 1980s up to now it seems that those growers were more likely to cultivate cassava than yam. One of the reasons was due to the economic value of yam that was lower than that of cassava. Nevertheless, growers in some areas such as Kupang District still cultivated yams for home consumption during dry season and/or scarcity of food came.

Along with the reduction of growers cultivating yams, the yam consumers have also reduced. Now consumers of yam are limited to the communities or villages where it is produced and urban areas, which are nearby those villages. People living in urban areas most of the time face a difficult of getting yams to provincial markets¹ due to the missing key actors of the chain. It indicates a missing link among supply chains from the producers (farmers) to the consumers, so that availability of yams or the supply of yams is not widespread among market. Thereby, the concern of this study is to identify components of yam production and supply chain systems that affect the supply of yams to the provincial market.

In Kupang, the supply and demand for yam could not be ascertained clearly. Therefore, it is very important if we can have another supply chain as a control to make a comparison in analyzing the supply chain of yams. Cassava supply chain is used in this research because of the development over time of plants genera (phylogeny), in which cassava and yams relate both belonging to the plant tubers.

¹ Provincial market is a market which is located in Kupang as the capital city of East Nusa Tenggara Province. There are three markets, namely: Kasih Market, Oeba Market and Oebobo Market.

And from the marketing side, they have the same market, which differentiate only on the development of supply chain according to the actors who work on these two agricultural products.

This study, therefore, seeks to identify established actors and their function in commercial yam production and supply as well as the systems that affect the supply of yams by small-scale growers in Kupang District by using the cassava supply chain as an input into yam supply chain. In doing this, the study aims to identify the factors that promote or constrain the delivery of yams in commercial-oriented production systems to provincial markets. The specific objectives are to:

- a. Identify and analyze the key actors and their socio-economic characteristics in the seed yam commodity supply chain.
- b. Investigate and analyze the factors that promote or constrain efficient delivery of yams production in commercial-oriented systems

1.2. Problem Statement

A yam is one of alternative sources of indigenous food for most people in Kupang District besides paddy, corn and cassava. Yams are still widely cultivated and consumed by many people in this district. The existence of yam consumption becomes essential especially during dry season (July - October) due to very low yield that could be harvested from other crops and normally when the supply of other staple food such as maize and cassava are very limited. During the dry season people usually harvest yams so that those who are having shortage of food could substitute with yams. In addition, farmers also sell it to get money for buying something to fulfill their other needs. But the reality indicates that the supply or the sale of yams is not widely done and reaching provincial markets. Thereby, this research focuses on supply chain management of yams in Kupang district.

1.3. Objective of the Research

To identify key factors in yam production and supply chain systems that affect the distribution of yams to the provincial market.

1.4. Main Research Question

1. What is the current status of yam supply chain in Kupang District?
 - a. What is the yam chain structure in Kupang District?
 - b. What are the roles of actors in the yam chain?
 - c. Who are the supporters and influencers and what roles do they have in yam chain?

2. What is the yam production throughout the year?
 - a. What is the farm production of yam?
 - b. Where are yams taken after harvesting?
3. What are the reasons caused yams does not reach provincial market?
 - a. What problems faced by yam farmers?
 - b. What problem faced by yam traders?

1.5. Limitation of the Study

Yams can be grown easily in almost all regions in the East Nusa Tenggara Province. Yams are food substitutes for rice after maize, cassava and sweet potato. They are also been known to contain nutrients no less than cassava. However, the amount of market demand for yams is still far lower compared to cassava. Moreover, the yam supply chain is very simple (consisting of only farmers, retailer and consumer) that makes it difficult for analyzing the problem in the whole supply chain. So in this study, cassava is used as a limiting object of the research. Farmers interviewed were farmers who planted cassava and yams in their field.

1.6. Significance of the Study

This case study focuses on the yam supply chain by exploring the cassava supply chain and the actors. It provides the information about problem faced by yam actors in the supply chain. In particular, this research is very crucial in the coming year since yams become one of the prospective local food planned by the local government regarding the development of the indigenous food.

The supply chain has played a key role in initial trading of the yams and other agricultural products. In appropriate, with analyzing of yam supply chain using the cassava supply chain as a comparison will lead appropriate flows of the supply chain from the farmers to the right market, which means provincial markets in this research.

Supply chain is a complex process, involving several actors, starting from the farmers, collectors, retailer, and wholesaler, and finally ended at the consumer. Many scientists and market practices are heavily questioning to any particular point of supply chain. In Indonesia, this study of particularly supply chain, including for yam supply chain, is very rare topic. Yam as one of the prospective indigenous foods promoted by the local government regulation becomes hot issue in empowering the local people and the local market². In this term, an appropriate and healthy supply chain of yam where the actors well functioned is highly needed.

² Local market is a market which is located nearby the living place of farmers. Usually it is a traditional market in the village.

Using cassava supply chain as input for comparison along with the actors in the chain will help to maintain the appropriate yam chain supply. The utilization of the cassava supply chain is under consideration that the chain is well developed in Kupang district and it has similar characteristic with the yam supply chain in terms of products produced.

CHAPTER 2. LITERATURE REVIEW

2.1. Supply Chain Management

Supply chain management plays an important role in the whole process of distribution of any products starting from the supplier to consumers. In this, there are some actors or number of various entities who contribute to the whole process of supply chain. Each of them have their own role in the whole link of supply chain and the roles are related or connected to each other started from the supplier until the consumers. With regard to this, Beamon (1998, 281) stated that:

“Supply chain may be defined as an integrated process wherein a number of various business entities (i.e. suppliers, manufactures, distributors, and retailers) work together in effort to (1) acquire raw materials, (2) covert these raw materials into specified final products, and (3) deliver these final products to retailers. This chain is traditionally characterized by a forward flow of materials and a backward flow of information”.

This explanation indicates that the roles or activities done by each actor or business entity during the whole process of chain support the delivery of any product to the consumers. It means that if during the supply chain there are one or two actors or entities that do not play their roles well or do not perform at all then it would affect the whole chain as well as affect the goal of the whole supply chain. There should be a continuity of activities played by each actor or entity to underpin the supply chain. That is why Marbet and Venkataramanan, (1998) defined that:

“A supply chain is the network of facilities and activities that performs the functions of product development, procurement of materials from vendors, the movement of materials between facilities, the manufacturing products, the distribution of finished goods to customers and after-market support for sustainment”.

Looking at these definitions above we can come to a conclusion that supply chain is a central and important issue because it has a great impact on the competition of firms in local and international markets. It indicates that the missing link of a supply chain will affect the performance of the whole process of products distribution to reach customers. It also implies that any product would not be reaching markets if there are no actors who play their roles in the integrated process of supply chain. In the other words, actors or any business entities are very important to for the process of delivering any products even from the raw materials, processing until reaching the consumers. Due to the importance of supply chain management then many business leaders have adopted it to underpin to design, plan and control the facilities and

tasks which consist of many stages of the supply chain (Mabert and Venkataramanan, 1998).

Supply chain strategy requires a total system view of the linkage in the chain work together efficiently to create customer satisfaction at the point of delivery to final consumers. As a consequence the cost should be reduced in the entire chain to drive out unnecessary costs and focus on adding value. Throughput efficiency must be improved, removed bottlenecks and performance measurement should focus on total system efficiency and equitable distribution of gifts to those in the supply chain adds value. Supply chain system must be responsive to customer needs (Haag et al. 2006). It means that farmers and supplier, collector and others actors should be based their products on the needs of consumer as an integral system of supply chain. This assumption is strengthening by the statement Based on the definition of the Council of Supply Chain Management Professionals (CSCMP).

“Supply chain management includes the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management. It also includes the crucial components of coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. More recently, the loosely coupled, self-organizing network of businesses that cooperate to provide product and service offerings has been called the Extended Enterprise”

2.2. Chain Actors

Supply chain consists of various and multilevel structure in which each level is influencing one to another by various existence factors in the chain. Basically, a simple supply chain at least has a customer, a retailer, a manufacturer and a supplier (Shafieezadeh , Hajfataliha. 2005, 2009). Each of them has its own role in the whole link of supply chain and the roles are related or connected to each other started from the supplier until consumers (Beamon, 1998, 281).

Additionally, in each main actor, it has more than one player. All players in every actor are conveying the similar function. Sometimes it is differing, rivaling one to another, and improving the demand for any particular products of their firms (Wibisono, 2009). Furthermore, Wibisono (2009) assumed that as the result, each player in the chain should have selected more than one counterpart from its opposite trading partners. Fundamentally, buyers or consumers in a market area depended with the supplier selection. In addition, more than one supplier within one will entitle the consumers to create a viable system for allocating the capacity of each selected producers.

Hence, it is needed to evaluate every potential producer who has to respond to a called proposal from the consumers in line with the function, rules and objective criterion (Pujawan, 2005). An evaluation to each potential supplier, who will respond to a call for proposal from a customer based on the rules and criteria that are impartial and common to all. For this reason, in general, an acquisition will take into account other criterion besides product price (Shafieezadeh, Hajfataliha. 2009). For example, quality of the product, payment system, delivery terms, diversification of product are commonly treated as negotiable criterion.

2.3. Logistic in Supply Chain

The decentralization of supply chain models is expanding the logistics capabilities in terms of flow of money, transportation information and products. It is depicted from the graph below that chain logistics also play a critical role in demand strategies. Logistics capabilities consequential from supply chain management system implementations, and real time visibility and distributed equipment fulfillment, provide the novelty and output improvements that are keys to the ability of energetically and lucratively react to market changes on market (Cambridge IC, 2009).

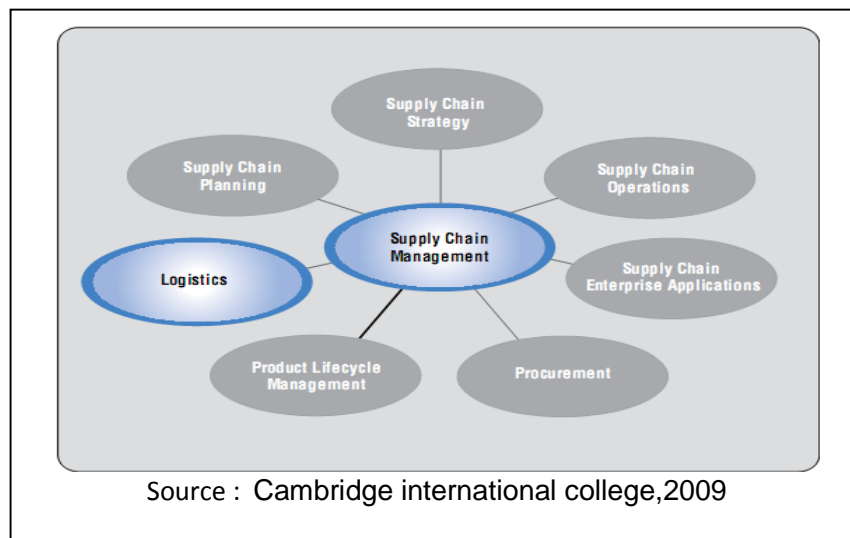


Figure 1. Supply Chain Factors

2.4. Cassava Supply Chain in Kupang District

The main actors in the cassava supply chain within and outside the local market in Kupang District are producers, processors, collectors and retailers. Some farmers act as a cassava cuttings supplier for other cassava growers, but in some area, farmers themselves grows cassava from their cuttings. Growers sell fresh cassava to the middleman, local market or collector/retailer. Fresh cassava will be used by

home industry functioned as processors. They usually buy cassava direct from growers and local markets or continuously supplied by middlemen. In some parts that have animal husbandry as a livelihood, they grow or buy cassava for feeding their animals. Collectors and retailers have important roles for bringing cassava outside the area. They sell cassava to nearby smaller local markets, and also provincial markets (Bureau Statistical of East Nusa Tenggara Province).

Kupang State Agriculture of Polytechnic has supported farmers and processors to maintain and improve quality of cassava and its product based on their research. Local government use their regulation to influence the growth of cassava, figure 2.

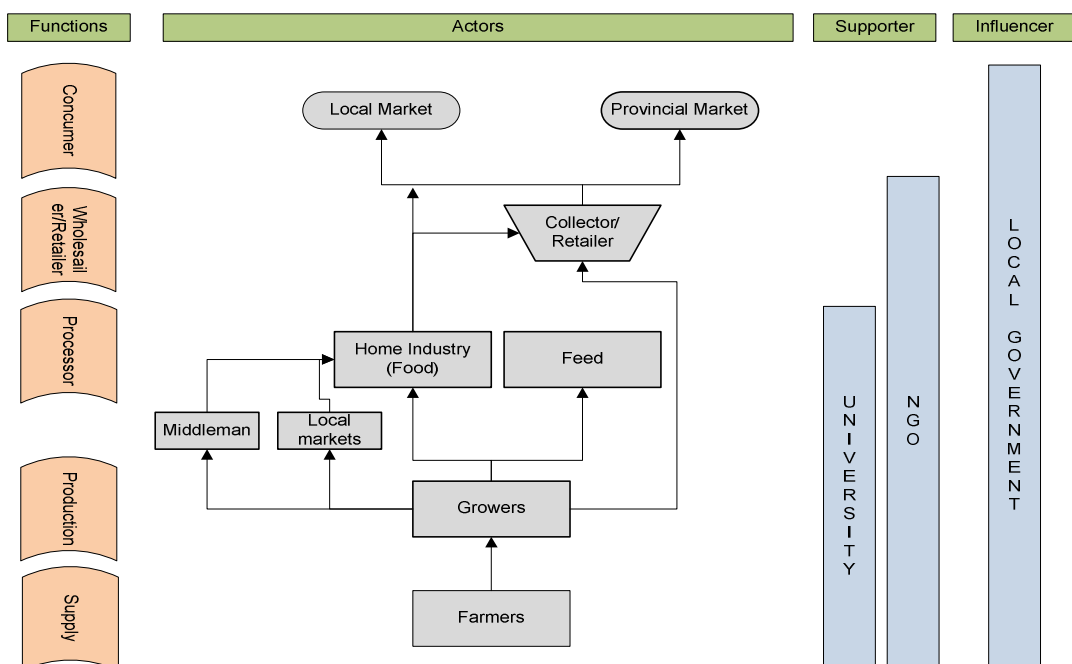


Figure 2. Cassava Supply Chain in Kupang District

2.5. Types of Yams which are Popular in Kupang District

2.5.1. Kapok Yam (*Dioscorea bulbifera* L.)



This type of yam is very popular and many communities in this district consume it. Looking at the way it is planted because this type of yam is very easy to breed due to a single tuber that is planted and produces more than ten new tubers. From this side we can conclude that it has high economical values. The average prices of this particular yam is around 2.500 to 3.000 thousand rupiahs per pile as indicated in this picture, but if it is processed in advance by burning then the prices would be 3.000 to 5.000 thousand rupiahs per pile. (Bele, 2007)

The names given to this specific yam are different from one sub district to another, but mostly people call it as “Kapok Yam”. This yam is mainly found in every sub-district of Kupang District. Farmers mostly would like to sell this particular yam than others. It indicates that somehow the communities are trying to develop the economic value of this yam.

Another function of this yam as has been indicated by Bele (2007) is that some communities process it traditionally into flour and cook it as the food for babies of ages 3 to 9 months. The processing of this tuber into flour is identified to increase food diversification and it can afford to increase economic value of it (Bele, 2007)

2.5.2. Laku Poat Yam (*Disocorea spp-1*)



This type of yam is very unique. The taste of this tuber is sweet even though it is processed traditionally by burning. It draws many communities to find interest in it. But many communities acknowledge that this type of yam is not widely cultivated and hardly sold in markets. Yam farmers mainly tend to plant and use it for their own food especially during the long drought season where people experience shortage of food (Bele, 2007).

This type of yam grows and creeps and has thorns around its base. The tubers are exactly on the bottom part but a bit far from the bottom which is approximately 30 cm and each tuber is far away from each other. Due to the position of tuber are a bit far from each other than at harvesting time, it needs specific technique in the process of digging.

Each planted tuber can produce about 5 to 10 new tubers. If people have planted a bigger size of yam seed in the beginning then they can harvest for an entire year. If the tuber is not harvested, and left in the ground until 2 to 3 years then the tuber grows bigger. In the process of harvesting, the tubers which will be used as the seeds for the next planting should not get injured otherwise they get rotten sooner (Bele, 2007).

2.5.3 Umeke Yam (*Dioscorea spp-2*)



This type of yam has a unique shape and the tuber grows upwards and then forms a spiral like shape, so growers should cover the tubers with soil. People usually call it ‘umeke’ which refers to ‘ular mengge’ or “mengge snake” because of its shape which is nearly like a snake.

The taste of this tuber is savory even though it is traditionally processed by burning. Farmers, not only yam farmers, but also others normally consume this tuber during working in their plantation fields.

This type of yam is not very popular in the society or markets due to the little information available about them. But it is very popular in some specific villages. It does not have thorn and after planting it does not requiring any specific attention like other yams (Bele, 2007).

2.5.4. Laku Leko Yam (*Dioscorea esculenta*)



This yam has thin skin and thick tuber which is yellow. It creeps so that most of time growers should take care of it. This tuber mainly grows up in forestry areas, but nowadays communities are starting to domesticate it and plant it in their gardens, which are nearby home.

Just like the other tubers, when left for long period under the ground the tuber becomes bigger and bigger. The benefit of this tuber is also for private consumption and it is not sold. One of the reasons is that the taste of this tuber easily changes within 3 days. Because of this condition normally after harvesting farmers directly process it into food to keep it savory (Bele, 2007).

2.5.5. White Yam and Purple Yam (*Dioscorea Alata*)



This tuber actually comes from Asia, and then spread to Asia Tenggara, India, Semenanjung Malaya and pacific island. The common name given by the society to this tuber is “ubi manusia” or “Human Tuber”. But based on some literatures, this tuber is known as “Ubi Kelapa” or “yam”.



These yams are clump plant which creeps until 3 to 10 m. It actually needs a high pole or tree to grow upwards. Its stem has 4 sides, not hairy and its leave is circle. Its shapes of tuber are varies which are circle, long thin, and branches. Every part of this yam can be used as seeds in the next season, included the skin of yam after peeled. (Sutedja, 1984).

During the autumn, the leaves of yam are getting dry and falling down. It is a symbol for the harvesting time because its tubers are ready to be harvested. People can keep it under soil as well or they can harvest and keep it at home in good condition. Mostly it is covered under ash in a kitchen. Communities in rural community normally leave it under soil and they will harvest when they need it (Somantri, 2006).

CHAPTER 3. METHODOLOGY

This chapter covers the study area, methods of data collections that are interviews, surveys, and other sources of information, as well as research framework.

3.1. Study Area

The research was carried out in Kupang District which is located near the capital city of East Nusa Tenggara Province.



Figure 3. Indonesia Map

Source : <http://www.infolizer.com/?title=PETA+Indonesia>

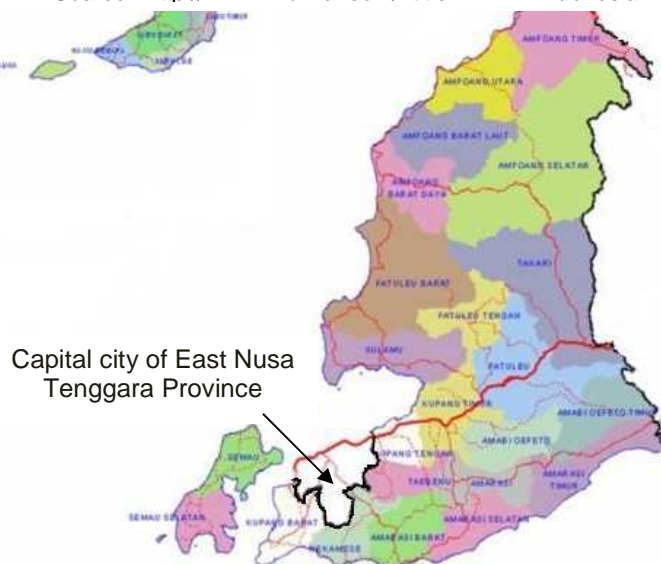


Figure 4. Kupang District Map

http://www.nttprov.go.id/htt_09/images/peta/petakab/kupang-sabu.jpg

Democratic Republic of Timor Leste (Ambenu District) in the east. The total area of the district is 53.958,18 km² with 29 sub-districts. It consists of two main type areas, which are the mainland area (7.178,28 Km²) and the coastal area (46.780 Km²) with the sea line approximately 492,4 km. Its total population is 383.896 in 2008 with 83% of the total population being farmers.

(http://ntt.bps.go.id/index.php?option=com_content&view=article&id=47&Itemid=8)

In general, Kupang has a dry tropical climate, and also tends to be influenced by the wind and it is categorized as semi-arid area since the low relativity of rainfall and the vegetation status is dominated by savanna and steppe. The topography in Kupang district tends to have highly variation with the elevation from sea level. The slope is ranging between 2 – 200 meters. Half of these slopes are situated in the mainland and the rest in the coastal area. The social-culture, farming system, agriculture patterns tend to be homogenous (www.kab-kupang.go.id/index.php?hal=kupang). The homogeneity of inhabitant in one particular area will influence the characteristic of them and the point of view of the people in seeing one particular issue (Benedict, 1934).

(www.kab-kupang.go.id/index.php?hal=kupang).

3.1.1. Gross Regional Income

The gross regional income of Kupang District is shown in the below table.

Table 1. Gross Regional Income in Kupang District from 2006 – 2008

Income sources	2006 (%)	2007 (%)	2008 (%)	Percentage of the Average
Agriculture	45.88	46.87	54.29	43.60%
<i>a. food crops</i>	32.47	32.59	32.55	32.5%*)
<i>b. farming</i>	3.82	3.87	3.84	
<i>c. animal husbandry</i>	45.20	44.88	45.14	
<i>d. Forestry</i>	0.84	0.86	0.84	
<i>e. fishery</i>	17.67	17.80	17.63	
Mining	0.61	0.66	0.75	
Processing Industry	1.82	2.00	2.26	
Electricity, oil and drinking water	0.39	0.41	0.46	
Building /construction	6.22	11.52	9.88	
Trading, hotel and restaurant	14.95	15.80	17.57	
Transportation and telecommunication	4.51	4.87	5.30	
Monetary, rental service and services company	1.40	1.48	1.63	
Services	24.22	29.52	31.95	

source : <http://ntt.bps.go.id/kab-kupang/index.php?menu=39>

*) percentage was calculated from the average income of food crops compared to agriculture income

From the table above we can see that the income from agricultural sector is increasing every year. Basically agriculture contributes 43% to the total annual income in Kupang district. It shows that this sector holds a very important role in the gross regional income since almost 45% of the annual income is provided by this

sector. It can also be noted that income coming from the agricultural sector reached 54,29% by 2008 and in average 32.5% of the total farming income earned from the food crops followed by, fishery, farming and forestry.

The second biggest income came from the services; it includes the services from government in general, private sectors, recreation and tourisms. It has 25% from the total income followed by the others sectors, which varied from 0,3-14,3 %.

3.1.2. Agriculture Condition

In Kupang district, farmers cultivate food crops in their lands, there are four particular main food crops cultivated by the farmers, namely: paddy, corn, cassava, and sweet potatoes. Statistical Bureau in Kupang (2008) reported that the total production of each crop in 2003-2007 varied, but the highest crops production came from cassava which reached 46,302.58kg/Ha. It means that agricultural condition in kupang is dominated by tubers (cassava) in terms of production amount. This condition was emphasized by the gross regional income which said that 45% of the total income contributed from this sector and it is also depicted that 32.5% of total income of agriculture sector came from food crops (Table 1).

To support the condition of the agricultural status especially the food crops with regard to indigenous food sources, in 2008, the government of Kupang started using one main program in agricultural sector. The program is aimed at increasing local food security, increase production and productivity of food crops in order to increase revenue toward a more prosperous society and reach the food security status (BPS, 2008).

3.1.3. Area and Population Density

According to the WHO, the ideal density of population is 96 inhabitants per hectare. It means that the population density of Kupang district is beyond the ideal density. In detail, the total area for each sub-district and population density can be seen in the table below.

Table 2. Area and Population Density of Inhabitants in Kupang District

No	Sub-district	Area (km ²)	Area Percentage	Density
1	Kupang Barat	136,50	2,31	100
2	Nekemese	133,18	2,26	80
3	Kupang Tengah	96,64	1,64	280
4	Taebenu	125,69	2,13	122
5	Amarasi	164,78	2,79	101
6	Amarasi Selatan	156,61	2,66	62
7	Amarasi Timur	175,00	2,97	44
8	Kupang Timur	207,69	3,52	252
9	Amabi Oefeto	150,12	2,55	42
10	Sulamu	304,63	5,16	56
11	Amarasi Barat	189,11	3,21	61
12	Raijua	46,70	0,79	250
13	Sabu Barat	181,54	3,08	165
14	Hawu Mehara	71,44	1,21	257
15	Sabu Timur	38,13	0,65	142
16	Sabu Liae	64,37	1,09	184
17	Sabu Tengah	64,81	1,10	110
18	Semau	122,98	2,09	45
19	Semau Selatan	100,85	1,71	46
20	Amabi Oefeto Timur	246,38	4,18	61
21	Fatuleu	346,26	5,87	57
22	Fatuleu Barat	457,25	7,75	89
23	Fatuleu Tengah	92,48	1,57	12
24	Takari	545,60	9,25	33
25	Amfoang Selatan	575,70	9,76	29
26	Amfoang Barat Daya	202,84	3,44	24
27	Amfoang Utara	129,64	2,20	41
28	Amfoang Barat Laut	318,59	5,40	21
29	Amfoang Timur	452,71	7,68	27
Total		19,117.09	96.13	2,793.00
Average		659.21	3.31	96.31

As shown in Table 2, Kupang has 29 sub-districts. In total, Kupang District has 19.117.09 km² with the average of 96.31/ km² in population density. Based on ideal standard of population density in terms of land availability, a district has to be populated by 96 inhabitants ha⁻¹ (<http://ftp.fao.org/nr/HLCinfo/Land-Infosheet-En.pdf>). Thus, if we compare the total number of inhabitants living in one hectare in ideal

condition according the FAO, Kupang should increase its population ten times if it is said that the ideal number of population density is 96 inhabitants/ha. This population's density status which is lower than the ideal condition makes the socio-cultural of Kupang people tends to be homogenous (Benedicte, 1934). This homogenous condition becomes the reason in choosing the respondent in conducting the research since we assumed that a homogeneous population is one where all individuals can be regarded as the same type. A heterogeneous population is one containing subpopulations of different types. It means small samples can be used in homogenous population since they have small variation (Krejecie and Morgan, 1970)

3.2. Methods of Data Collection

The study used both primary and secondary data. The primary data was generated through a set of well structured questionnaires administered on the targeted farmer respondents and the open interviews with other respondents or actors in the supply chain. The sequence was done based on technical reasoning. The structured questionnaires were intended for the farmers as the main suppliers for yams, while the open interview were intended for the governmental workers and others actors of the chain to make a check list and a confirmation data set. Beside those two things, the open interview was used to generate more detailed information.

In general, the collected data were: household education level, household expenditure on yams, inputs, types crops planted by the farmers, size of the farming area, prices of yam and close substitute, and experience in farming. Others were age and education of the farmers, gender of the farmers, yam and cassava farm sizes. The cassava farm size and its production were used in comparison with the yams' and also used as an input in the yam supply chain. The cassava supply chain is used as the input in the finding of the yam supply chain since there is an indication that the supply chain of yam is not working properly, particularly for several actors and their functions.

From the 29 sub-districts, the research studied 10 of them. The 10 sub-districts chosen (number 1 to 10 in Table 2) area are based on the distance from the provincial market and accessibility. It is also assumed that they presented of the sub-district in the area range and the population density.

Besides farmers in Kupang District, the research was conveyed in the provincial market in the capital city of East Nusa Tenggara province. There are 3 markets; Kasih Market, Oebobo Market and Oeba Market.

Secondary data was sourced from literature and relevant research works in the area.

3.2.1. Interview

In total 23 respondents who are directly or indirectly involved in the yam supply chain were interviewed, these were:

- 5 famers who are planting both yam and cassava
- 2 cassava collectors
- 3 cassava processors (home industry)
- 3 retailers of yams in 3 different markets in the capital of East Nusa Tenggara Province
- 5 consumers who were buying yams
- 2 influencers; the chief of the Ministry of Agriculture in Kupang District and the head of planning bureau in East Nusa Tenggara Province.
- 3 supporters: researchers from Nusa Cendana University and Kupang State Polytechnic of Agriculture.

3.2.2 Survey

The data about yam production was collected from 30 individual farmers through prior made questionnaire. The survey was conducted among the yam farmers in 10 sub-districts of Kupang District. The sub-districts were selected randomly with several criteria, that are location from provincial market, differences in infrastructure, and farmers who plant both cassava and yam.

From the questionnaire, asked farmers about their age, level of education, land size, their farming system, and the problem faced by them.

3.2.3. Other source of Information

Literature and documents from the province and district were used as supportive data and for verification. For example, data about the research area from Statistical Bureau of Kupang District and East Nusa Tenggara Province, Journal about Supply Chain Design and Analysis from Beamon, Cassava Marketing in Uganda by Collinson, among others.

3.3. Research Framework

The research framework revolves around the theories of effectiveness of yam supply chain using the supply chain management, which is used as baseline to address the problem of limited yam supply to provincial market. Based on this, the research developed recommendations about real problem of yam supply chain in order to solve the problem. These recommendations should be implemented by different organizations operating at the macro or micro level in yam sector.

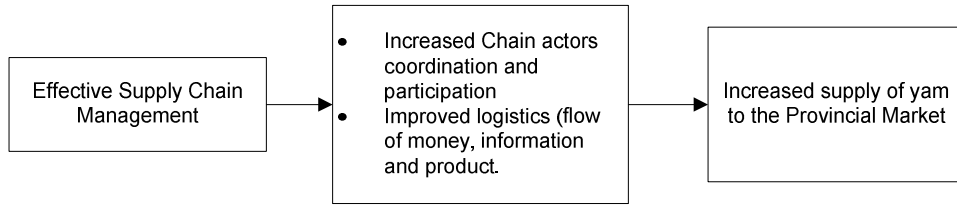


Figure 5. Conceptual Research Framework

CHAPTER 4. RESULTS

This chapter is divided into four main sections namely yam supply chain, background information of farmers, yam production, and the constraints in yam supply chain. It described the actual situation of the yam chain in Kupang and the actors. The cassava actors' roles are used for describing any other actor's function which is not owned in the supply chain. While the background information of farmers, described the farmers' age, education level, experience in farming and gender. In the chapter, the total area of agricultural land owned by farmers in general, the area used for cassava and yam cultivation, the number of yam production per used area and end product flow of yam produced were determined. This section also showed other types of crops planted by farmers besides cassava and yam. It also showed the function of each planted crop. In the last sub section, the study presented the identified constraint affecting to yam chain supply. The table below shows the overall data of the results.

Table 3. The socio-economic and background status of farmers and yam production

Factors	Mean	Stdev	min	max
Age (year)	42.87	5.86	30.00	52.00
Experience (year)	15.63	7.94	4.00	31.00
Education (year)	7.10	1.84	6.00	12.00
Farm size (ha)	1.92	0.75	0.50	2.90
Yam Area (ha)	0.06	0.03	0.01	0.10
Cassava Area (ha)	0.82	0.25	0.10	0.90
Yam production (kg/year)	701.20	488.97	54.00	1,740.00
Cassava prod (kg/harvest)	8,240.00	6,100.91	500.00	20,700.00

The summary statistic of socio economy factors of the yam farmers is shown in table above. It shows that the range of the age studied is 30-52 years old with average of 42,9 which means that the age of the farmers are relatively not to young. In average, the farmers who were taken as respondents had been in school just about 7 years.

In particular, the production of yam is significantly influenced by the land used for yam cultivation. On average, farmers only use 0.06 ha of their land for yam cultivation, and the rest are used for other crops such as paddy, corn, and cassava.

The result in detail is described as follows.

4.1. Yam Supply Chain

The yam supply chain occurred in Kupang District is described by the Figure 6 below.

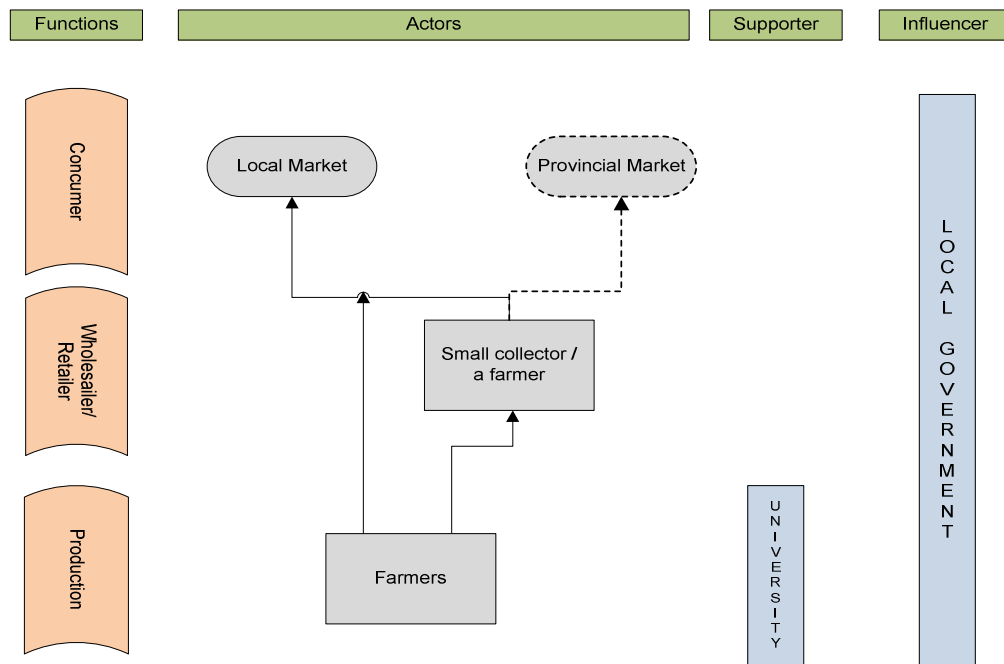


Figure 6. Yam Supply Chain in Kupang District

In Kupang, in general the yam supply chain only has three actors namely, farmers, retailers and consumers. Farmers here function as producers and suppliers. In the Figure 6, the flow of the yam supply chain starts from the farmer as the main supplier. The two selling system are used by the farmers, are direct sells to the local market and indirect selling, where the farmer sells his products to local collectors. Local collectors in this case functions as linkage agent to the provincial market. But the numbers of local collectors are very few, which results into the total production to the provincial market becoming very small. Local yam collectors in this supply chain function as retailers. The weakness of this yam supply chain is the absence of specific retailers that handle yam products. This makes it difficult for yams to be distributed to further markets.

Actually in Kupang, universities and local governments already performed its function as a supporter and influencer. In this case the University-college such as POLITANI and UNDANA have been doing a lot of research, both pure research and/or applied research, in which the results can be used by farmers in the cultivation of yam. Local government has done their function as policy makers to

prioritize the empowerment of local food sources to be developed, and one of the local food sources is yam besides cassava, corn, sweet potatoes and pumpkin. Yet, the retailer holds important role in delivering and bridging the production of yam to the consumer (buyer and/or market) does not exist, particularly the retailer that specifically dealing with yam. A summary of the interview results with every actor in the both cassava and yam supply chain about their function is explained by the following table:

Summarizing of the interview result with every actor in the both cassava and yam supply chain about their function is explained by the following table:

Table 4. Actors and Their Functions in the Cassava and Yam Supply Chain

Actors	Yam	Cassava	Function
Producers	√	√	<p>Producing cassava and yam.</p> <p>They sell cassava throughout the year depending on the production time, household's cash needs and the availability of buyers, whereas yam is more widely used as home consumption.</p> <p>They sell cassava individually in various forms including fresh cassava per kg, sack, or stack; dried cassava per kg, sack or stack; flour per kg or tin; and processed into various cakes or food.</p> <p>Selling is done at home (farm gate) or at the village-open markets to vendors or small traders and some times to large traders.</p> <p>Usually producers have no access to marketing information on prices and transportation.</p> <p>They bargain by comparing the previous prices offered by vendors or small traders or neighboring farmers. Bargain is mostly on an individual basis.</p> <p>They do not make any pre-arrangement with vendors or traders in selling their cassava</p>
Processors		√	<p>They are either individual (home industry) or companies mainly engaged in food and/or animal feeds processing.</p> <p>At present they have limited technologies on using cassava products as their raw materials in producing products.</p> <p>They are not aware of the benefits of the cassava products.</p>

Collector		√	<p>They buy cassava direct from farmers. Also, they involve in buying other crops such as sweet potatoes, corn and horticulture products. They buy in tins or bags but sell in kg in local markets. They do some cleaning of the product and packing in bags.</p> <p>Sources of capital are mainly from their own money. They have limited information on production and marketing of cassava. They can identify markets before buying the product by doing a survey.</p> <p>Usually they hire transport.</p>
Wholesaler/ Retailers	√	√	<p>There are some wholesalers for cassava who buy yam also from farmers. They both urban and rural retailers involve in selling fresh and /or dried cassava.</p> <p>Their selling points are at local market, town markets, at village centers, along road sides and bus stands.</p> <p>Retailers can buy cassava from collector or direct from farmers.</p>
Consumer	√	√	<p>Cassava and yam's consumers have their own preferences for the products. They are looking for intrinsic attributes such as varieties, appearance, taste, smell and price; extrinsic attributes such as health and environmental impacts generated during the process that occurs in the supply chain</p>
Influencer	√	√	<p>The influencer function is to influence the actors of the chain with the regulation, so the actors can do their function appropriately. The Government of Kupang as a local government has done their function as influencer in terms of policy makers in prioritizing the empowerment of local food sources to be more developed</p>
Supporter	√	√	<p>Supporters, in this case the universities and or the college, have been doing a lot of researches, both pure research or applied research which the results can be used by farmers in the yam cultivation and processing.</p>

In the table above, the actors of cassava is used as the input for the yam supply chain. Here we can see the missing actors and its functions in the yam and can be refer to the actors established in the cassava's supply chain.

4.2. Background Information of Farmers

Figure 7 shows the variation of the age distribution of farmers in Kupang District, represented by the 30 respondents that indicated a relatively high variation with a mean of 42 years. Of the 30 respondents, we can see that the highest distribution is situated in the age range between 37-39 years. The lowest age distribution existed between 30-35 and 45-47 years. We have only one respondent with 25 and 52 years.

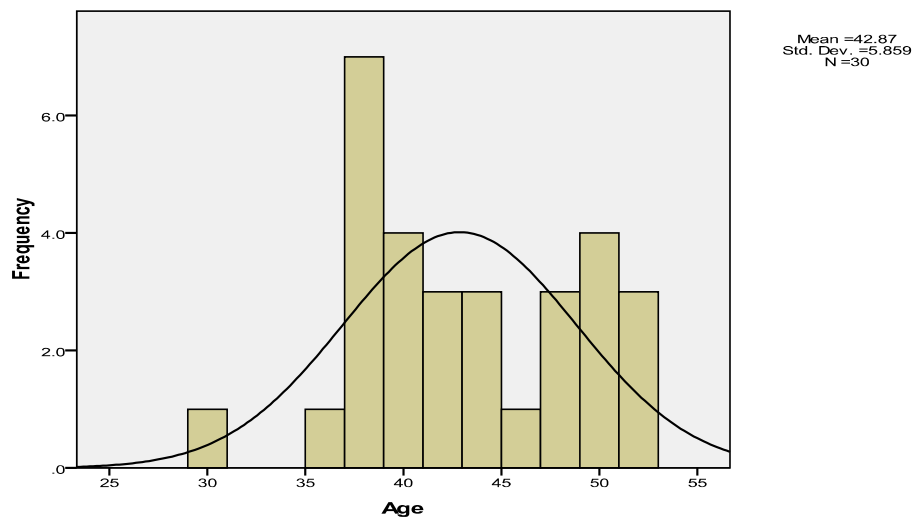


Figure 7. The Age of Farmers (year)

Furthermore, the relation among farming experience, gender and yam production are shown as followed

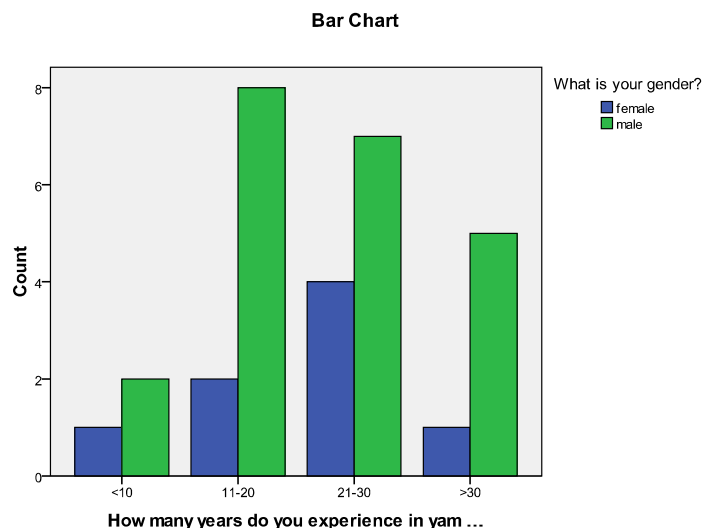


Figure 8. The Yam Farmer's Experience (year)

Table 5. The crosstabulation between yam cultivation and gender

How many years do you experience in yam cultivation? * What is your gender?

Crosstabulation

			What is your gender?		Total
			female	male	
How many years do you experience in yam cultivation?	<10	Count	1	2	3
		Expected Count	.8	2.2	3.0
	11-20	Count	2	8	10
		Expected Count	2.7	7.3	10.0
	21-30	Count	4	7	11
		Expected Count	2.9	8.1	11.0
	>30	Count	1	5	6
		Expected Count	1.6	4.4	6.0
Total	Count	8	22	30	
	Expected Count	8.0	22.0	30.0	

We can see the farming experience based on gender categories in Table 5 and Figure 8 above. From the table and graph, the study shows that the farming experience owned by men farmers is higher compared to women's. In Kupang, there is no dominant traditional pattern, but two patterns exist, namely matrilineal and patrilineal. So farming experience in general does not have the inclination to one of the existing pattern. Yet, the male experience in farming is higher than the females'.

Based on Figure 9, the educational level of farmers in Kupang is at a fairly low level. It can be seen from the high number of farmers who had only elementary school education reached 70%, very low (6.7%) for the farmers who had the senior high school education level and 23.3% for the farmers who had Junior high school level education. We found no one has higher education level.

The overall mean of farming experience and education is 15.6 and 7.10 respectively. The education level is assumed based on the time consumed in each level of education in Indonesia (Elementary school 6 years, Junior high school 9 years and Senior high school 12 years).

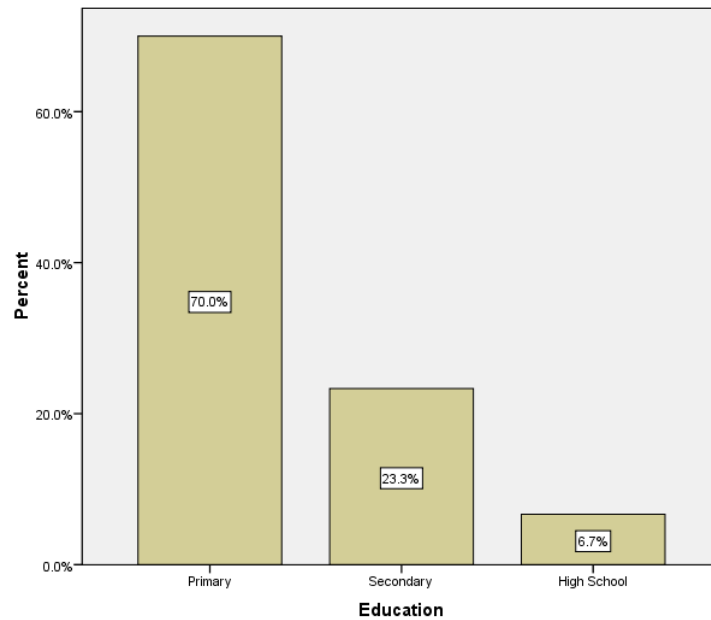


Figure 9. Educational Level of Farmers

4.3. Yam Production

In this section the total farming area, that is the area used for cassava and yams as well as the production number of the both crops are showed below, including the type of yam that are generally found in Kupang District.

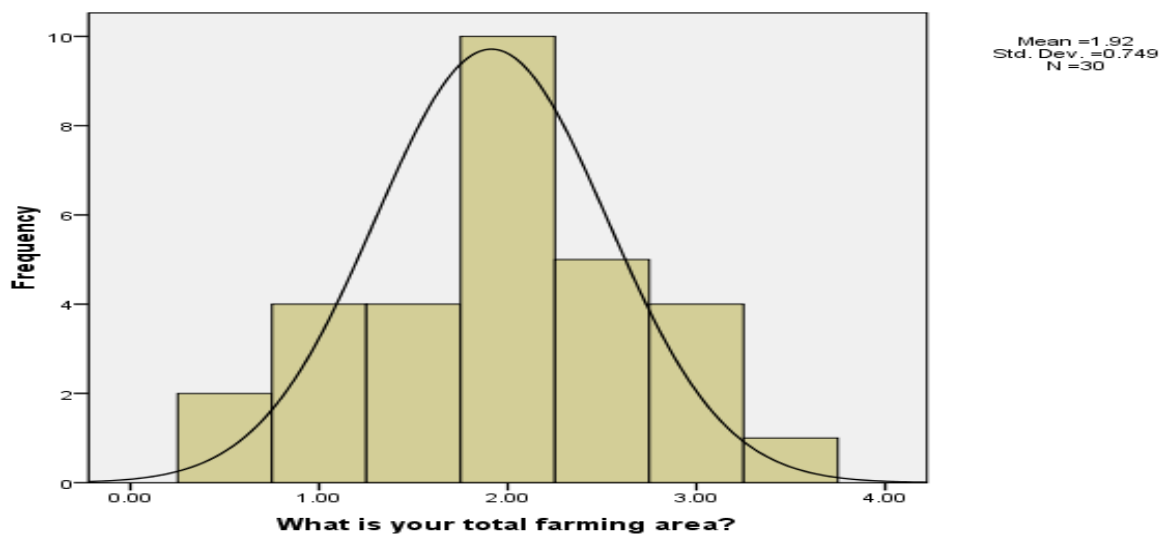


Figure 10. Total Farming Area

Based on Figure 10, total farm land area owned by each farmer is also quite varied, ranging from less than one hectare to more than two hectares. The average land size owned by farmers is 1.92 hectares with a relatively high range of variation in the distribution situated in the area range of 0-4 hectares. The 1.92 hectares farm land becomes the median of the respondents. Three respondents have less than one hectare and two respondents have more than 2.9 hectare of land far.

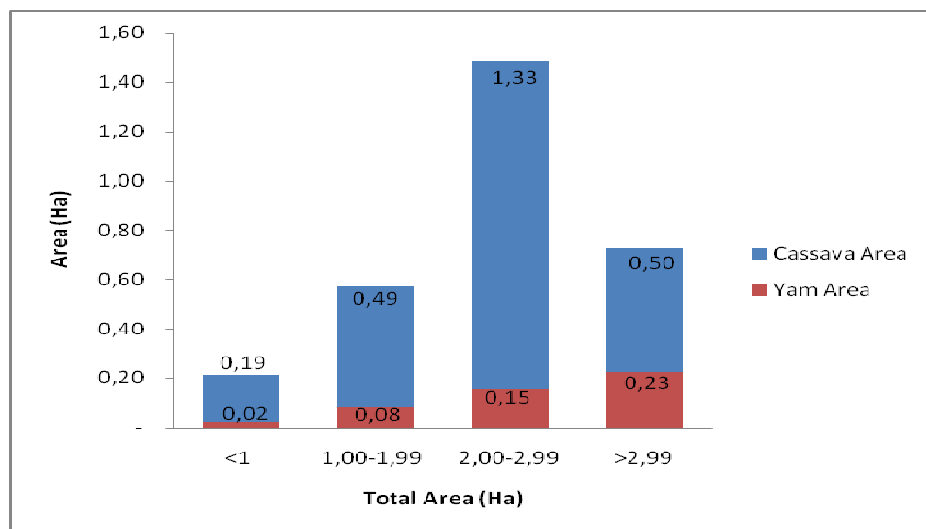


Figure 11. The size of yam and cassava area

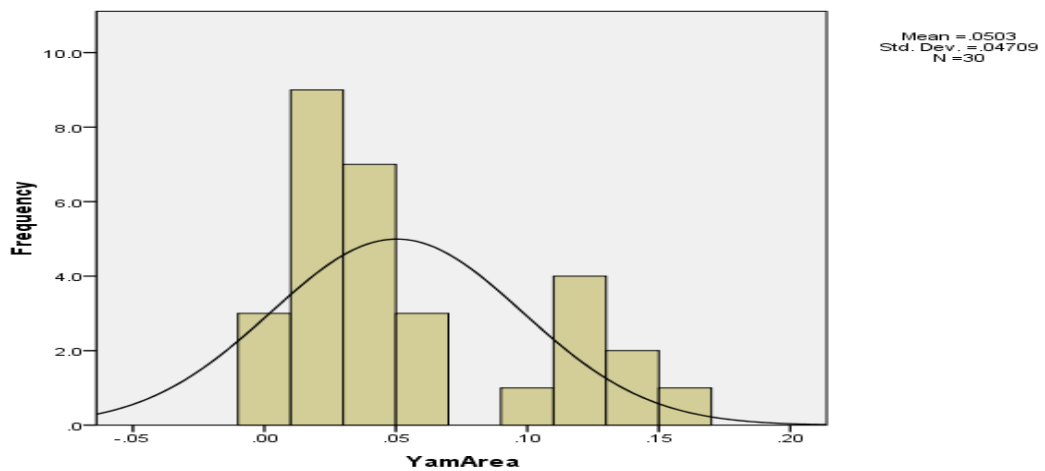


Figure 12. Total Yam Area

Figure 10 and 11 reveal that the farmers only use 0.05 ha in average of their yield for yam cultivation and the rest are used for other crops e.g. paddy, corn, and cassava

(Figure 15). This condition shows that farmers still consider the yam is not the principal crop for them.

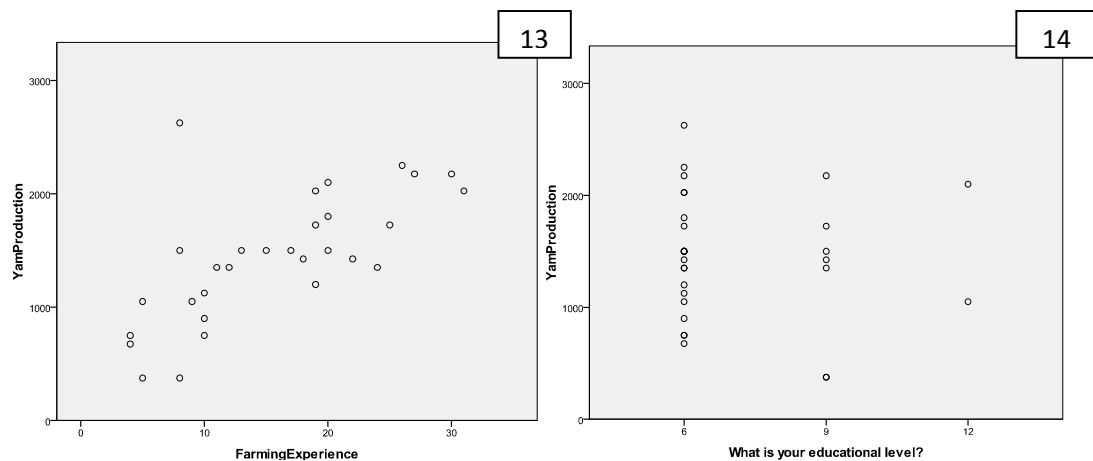


Figure 13. The Correlation between Farming Experience and Yam Production
Figure 14. The Correlation between Educational Level and Yam Production

Figure 13 shows that the longer experience of farming led to increased production of yam. We can conclude that the number of yam production is not only influenced by the size of the land used for yam cultivation area (Figure 12) but also by the farming experience. In other words, the correlation between the length of the farmers' formal education and the production is depicted in Figure 14, which showed that they have no significant correlation between the level of education and the yam production.

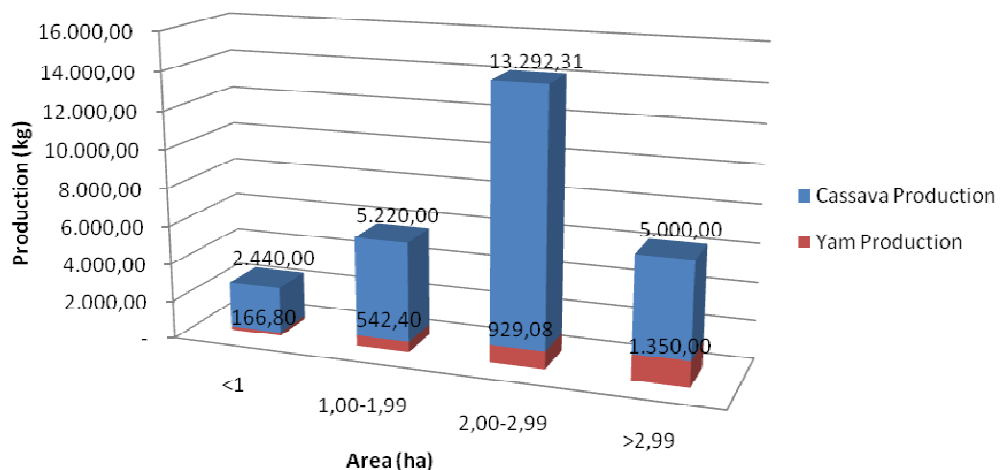


Figure 15. Cassava and Yam Production

From figure 15 we can see that the agricultural area cultivated under yam and cassava production is unbalanced. Farmers who have a yield of 2 to 2.99 hectare produce about 929.08 kg of yam in average, while cassava production reaches 13.292 kg per harvest. Yam production and yam area look directly proportional where the greater the area the greater the resulting of yam productions. Meanwhile the average of total production of cassava is various. This is caused by planting system of yam which is used as barrier around the garden, while total production of cassava variety, adapted to the planting of other crops. Figure 16 shows the type of yam, which is the most widely planted by farmers. Type of *Dioscorea bulbifera* L is the type most commonly grown by farmers and sold in local markets.

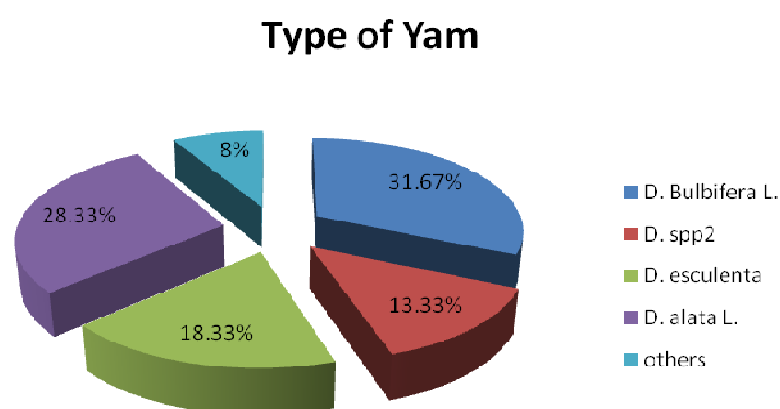


Figure 16. Type of Yams

Figure 17 shows that the farmers not only cultivate yams in particular, but also the other crops. The graph revealed at least four main crops were planted by the farmers namely paddy, corn, horticultural, cassava with the highest frequency, and other crops with the lowest frequency.

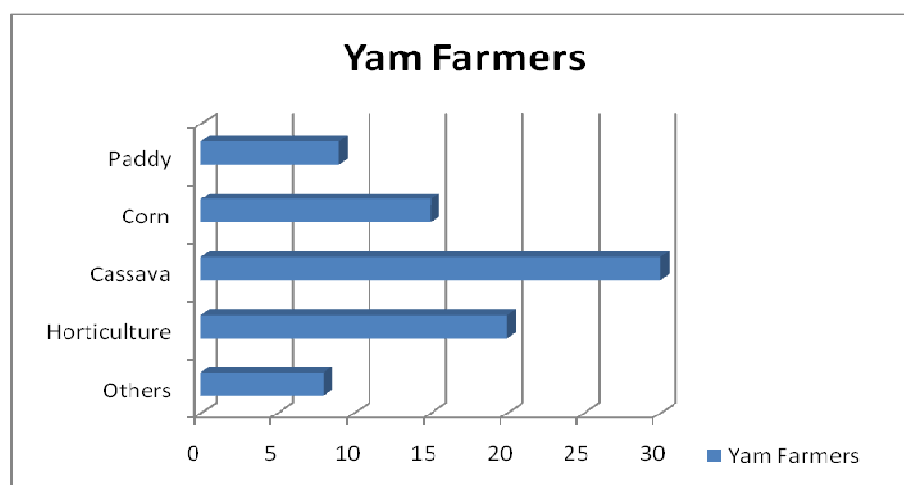


Figure 17. Other Plants which are Cultivated by Farmers

Farmers treat the other crops as substitutes and complementary crops. This figure further justifies why only a few yams can be found in Kupang. They have chosen to plant crops based on their economic profitability.

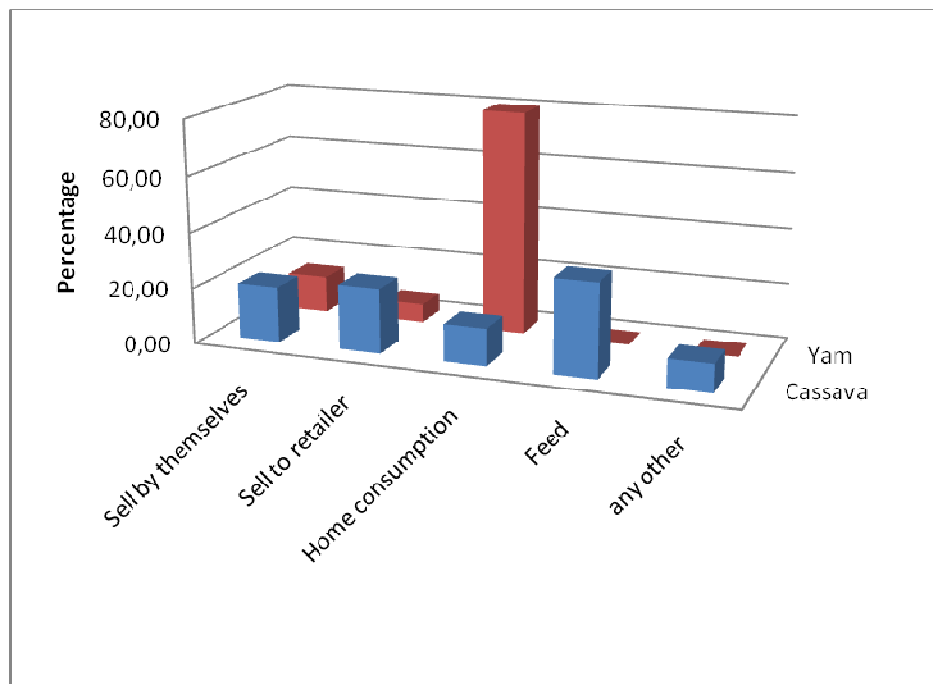


Figure 18. Final Utilization of Cassava and Yam

Figure 18 shows the final utilization of cassava and yam where the highest percentage of yam utilization is for home consumption and cassava is used for feeding their animal.

4.4. The Constrains of Yam Supply Chain in Kupang District

The below table describes the obstacles of yam supply chain in Kupang experienced by actors for both cassava and yam supply chain.

Table 6. Problem faced by Actor in Supply Chain Related with Yam Production

Actors	Problem
Farmers	<ul style="list-style-type: none"> - Changing in diet pattern, from tubers to rice - Small portion of land used for yam - General mindset of people who sees yam as a non modern food - There is no end product diversification - Long distance to the market - One time yam harvesting
Collector	<ul style="list-style-type: none"> - Few retailer who wants to buy yam - There is no processor - Space utilization
Processor	<ul style="list-style-type: none"> - Less information about yam - Discontinuity of yam product in the market - No knowledge about yam processing
Wholesaler/Retailer	<ul style="list-style-type: none"> - Small amount of yam production - Small consumer - High transportation variable cost - Low price compared to cassava
Consumer	<ul style="list-style-type: none"> - Unavailability yam in the market

CHAPTER 5. DISCUSSION

This chapter discusses the results from the fieldwork on yam supply chain development in Kupang District. These findings gained from respondents during the interviews and survey in the fieldwork is discussed grouped for answering the research questions.

5.1. The Current Status of Yam Supply Chain in Kupang District

5.1.1. The Yam Chain Structure in Kupang District

Referring to the conceptual framework on supply chain which said that basically, a simple supply chain at least has four actors, customer, retailer, manufacturer and supplier (Shafieezadeh , Hajfataliha, 2009). Supply chain is a system that used by a firm or company to distribute their products and services to its customers. This chain is a networking system that connects the various actors which have the same goal, for example procurement, product distribution in an efficient and effective way so that it will create added-value for the product. Supply chain is a logistics network that connects a link among suppliers, manufacturer, distribution, retail outlets, customers and other existed actors (Beamon, 1998, 281)

In Kupang district, the chain structure only has three main actors namely farmers as supplier, retailer which is done by the retailer or the farmer who directly sale their products to market and the last one is consumer. In figure 6, it is described that the flow of the yam supply chain is starting from the farmer as the main supplier. From the same figure, we saw two selling system used by the farmers, which are direct sell to the local market and indirect selling, where the farmer sells its products to local collectors.

The yam supply chain in Kupang district is not working appropriately, it can be clearly seen if we compare or use the cassava chain which has already well developed in advance. In table 6, it is a comparison between yam supply chain and cassava supply chain actors' functions. It is depicted that in cassava supply chain, it has already had an ideal actors and rules their function properly, in the other hand we see that the yam supply chain has no actors as follows, collector and processor.

The absence of collectors and its functions in the supply chain will hamper the flow of the products from the supplier to market. Economically, there is actual profit when a supply chain has collector actors functioned as a linkage between farmer and market that is the farmer can easily sell their product to market which means the farmer do not need to expend any cost for transportation expenditure. In addition, when there is no processor, there will be no added value since there is no diversification final product.

5.1.2. The Roles of Actors in the Yam Chain

Currently, there are three main actors in yam supply chain in Kupang District; they are producers, retailers and consumers (Figure 6). Each actor has not been functioned properly in yam supply chain for some reasons.

Retailers, as a linkage between the consumer and farmers as supplier, did not work properly in the supply chain of yam since they not dealing with the yam production mainly, they only buy the cassava and other crops product. They rarely make transaction for yam production. It is occurred because the retailers see that the consumer for yam production is low. It can be seen in figure 18, which depicted that yam is only used for home consumption not to be sold in the market intentionally. Besides that, the low price and low production level of yam (Table 6) become main obstacles in the supply chain. Retailer assumes that, if they purchase yam production in small amount since yam has low production, it will not equally balance with the variable cost should be paid.

This condition is strengthened by a statement from one retailer in Kupang which is revealed below.

"I always calculate first the profits that I will get from selling yam and if I would like to sell it outside such as to the provincial markets then the profits would be the same because I would have spent money for transportations and moreover I lost my energy for nothing. It makes me decide just to sell yam in the nearby markets. It would give much more profits if we sell yam to provincial markets in a numerous number but it of course requires much more money as capital. In order to reduce the transaction cost, I usually buy other crops such as cassava, corn or vegetables, which has more economical value, and bring them together to the provincial market". Julius , A yam retailer, 37 years old.

In addition, harvest circulation of yam which only can be done once a year is also becomes additional bottleneck in the continuity of yam flow in the market. Thus, it is not economically feasible if it is compared with cassava and other crops production which can be harvested 2-3 times in a year. It makes this status as a guaranty for the continuity for their production availability in market.

In other sides, the consumer as the final product user put yam as a compliment or variation consumption not as their staple food. It is depicted from the opinion of one yam consumer gained during the interview.

Toni, A yam consumer, 37 years old, stated "I usually buy yam just when I find it in the market, without any intentionally. We (the family) like to eat yam as a snack with cup of a tea or coffee. We never eat it as a rice substitution. It is just like a variation in our daily food. We also expect that yam could be processed into any other types of foods because it would be

nice to taste another type food. So far, we process and eat yam in our traditional ways such as burning and boiling.”

It supported the condition why we rarely found yam in the provincial market. There is an assumption that yam is not always found in the market. That is why consumer do not put intentionally yam in their list when they go to market. This condition also revealed about the missing roles of several actors in yam supply chain since the respondent said about no diversification of final product of yam.

5.1.3. Supporters and Influencers and Their Roles in Yam Chain

Yam is actually one of other many kinds of indigenous foods in East Nusa Tenggara province. The government of this province has an initiative to promote indigenous food consumptions. This initiative has been implemented by announcement to the riots to serve local food in every ceremony. It has been starting by the government by serving local food in every governmental event. It is an effort of government to underpin farmers to produce more local food materials. And if the demand for indigenous foods is steadily increasing then it of course gives profits to the farmers who produce them and become the main supplier.

There is a reason why is that the cultivation some of the indigenous foods are decreased and the communities in East Nusa Tenggara substitute it with another food e.g. paddy. The impact is that the demand towards rice is dramatically increased over time. So, it is expected that by promoting local food consumption then it will press down the demand towards rice and lift up the demand to the indigenous food. The expectation is that availability of consumers of yam in the communities will also stimulate them to continuously produce indigenous food. In this case, the function of the government as influencer in making policy and regulation is needed to advertise and to prioritize indigenous food in local market.

In the mean time, there are some supporters specifically dealing with yam which are University of Nusa Cendana Kupang and Kupang State Polytechnic of Agriculture. These two institutions try to support farmers by conducting research on yam. What has been done by these two universities is effort to classify type of yam and conducting laboratory test to identify level of nutrition of yam.

Another research conducting by this institution is the process of yam into another type of food. So far the result is that tubers of yam are processed into flour and the flour is utilized to make cake. This effort is very important not only for yam farmers but also for other chain actors like the consumers of yam because normally the processing of yam is traditionally done by boiling or burning.

Results from these studies done by those institutions will then be published to the public which is expected to become a driving force for people to consume yam. The increasing of yam consumption and yam demand is expected to expand the supply chain.

5.2. The Status of Yam Production

5.2.1. The Farm Production of Yam

Farmers produce about 701.2 kg/harvest of yam in average, while cassava production reaches 8,240 kg/harvest. The area of yam and its comparison to cassava area can be seen in figure 10 and 11. It described that in average farmers cultivate 0.5 ha for yam and 0.82 ha of their land is used to cultivate cassava. The small portion of land used for yam leads to the low level of productivity. But in figure 15, it showed that the bigger the portion of land used for cultivating yam the bigger the production which means that the level of yam production is influenced by the land size used.

Figure 13 described that experience also influence the yam production. Cultivating yam was inherited by their grandparents to their parents and to them so that they have known it since they were children and they are familiar with yam (Figure 7, Figure 8 and Table 5). All of them commented that they have been dealing with the cultivation of yam at least more than fifteen years. It means that they have lots of experiences about yam cultivation. We can conclude that the number of yam production is not only influenced by the size of the land used for yam cultivation area (Figure 12) but also by the farming experience. In other hands, the correlation between the length of the farmers' formal education and the production is depicted in figure 14, which is said that they have no significant correlation between the level of education and the yam production since in the formal education, the farmers did not learn any technical lesson on farming. In formal education mainly they studied about theoretical subjects like language, basics subject like math, biology and so fort.

From the field work, it is gained not only the data about yam production level but also the type of yam that generally found in Kupang. This type of yam has its own position in the supply chain. The type of yam is the main product in the supply chain which can be the based of consumer preference.

Basically, the type of yam that are cultivated and generally found in Kupang district market is influencing its supply chain. This is related to consumer preference. The type often found and cultivated are *Dioscorea bulbifera*, *Dioscorea esculenta*, *Dioscorea alata*, and *Dioscorea spp.* (figure 16). It shows us that consumers prefer these types of yams for their consumption.

The findings which revealed the type of yam found mostly in Kupang, it leads to the opening market opportunity for yam, since there are several options to be chosen in consuming yam based of consumer preference.

Thus if the farmers could not provide the preferable type of yam, the supply chain process will be hampered, because the yam as products that are drawn in the supply chain is not fulfilled the consumer requirement in terms of quality, quantity and preference.

5.2.2. Where are yams taken after harvesting?

After harvesting, generally yam utilize in five main way; namely home consumption, to be sold to market directly and indirectly, and animal feeding. In figure 18, there are limited utilization of yam, it is explained that the highest percentage of final utilization of harvested yam goes to home consumption which reached 80% of the total respondents. The reason for this is most of the farmers in rural areas use it as staple food particularly in the season where the yields of other crops are very limited or in the transition of season. Farmers commented that they usually experience shortage of food long drought season as well as during the transition of season. It means, mostly they harvest it when it is needed for consumption or selling otherwise they leave it because it is not easily damaged.

In addition, 20% of respondent sell the products to market. Those which are sold to the markets are fresh product. They mainly sell it in markets which are nearby their living places or to the nearby town in Kupang district. Out of 30, only 6 farmers said that they sell yam, neither sold by themselves or collectors, as the main reason in cultivating yam because usually they don't have other crops to be sold in the dry season which is the best time for yam harvesting.

The animal feeding took the lowest percentage. It occurred since the farmers has no experience in giving their livestock with yam, in other hand, they prefer to use cassava for the animal feeding, and consume yam as substitution and variation food for their family.

5.3. The reasons caused yams does not reach provincial market

As depicted in table 6 that there are several problems faced by the actors in yam supply chain. Each problems faced by the actors influence to the flow of yam in reaching provincial market.

In farmers' side, the changing diet pattern, the small portion of area used to cultivate yam related to the harvesting period of yam, no end diversification product and the distance of the market from the place they live become the problem in producing and delivering yam to provincial market. Those entire problems lead to hamper the flow of yam supply to the provincial market. To emphasize, when people change their main food source to rice, it means they will start to leave tubers as their first staple food. This pattern changing is also related to the small portion of land used for cultivating yam and the harvesting period which is said that yam is only can be harvested once in a year during the dry season. This leads to discontinuity of the yam supply.

In terms of limited product diversification, it means yam is sold mostly in fresh form. This highly correlated to the added value of the production. When people think that if there is no added value can be gained from yam, they will choose other tubers to be

planted, traded and sold in various form of final product. Consequently, yam is hardly could be found in provincial market.

Different problem is faced by the collector. The main problems are small number of further middle man who wants to buy yam, problem in space utilization and no processor actors. The small number of middleman purchasing yam will leads to the absence of retailer, wholesaler, broker etc, when these middleman were absence, there will not be linkage agents between farmers as supplier to the market, and at the end it will become constraints in finding yam in the provincial market. This problem has something to do with the space utilization in the side if collector. The big size of yam tubers compared to cassava or sweet potatoes place the collector in difficulties in providing the storage space for yam before it can be sold/delivered to the retailer or else.

The next problem faced by the collector is there is no processor which functioned to divers the final product of yam. As mentioned above that product diversification will leads to economics profit, so when there is no processors means no added value, it will become one consideration for the collector to collect yam for farmers to be distributed or delivered to the provincial market.

The next actors faced problem in yam supply chain is processor. Processor problems are: less information about yam, discontinuity of yam product in the market, No knowledge about yam processing. Many processor know nothing about yam, since mainly they area dealing only with well known tubers like cassava and sweet potatoes which has high availability to be found in the market. This related to the discontinuity of yam which only harvested once a year. Less information about yam, particularly in the characteristics of yam, lead to the lack knowledge in processing yam to be formed into others final product in terms of product diversification.

In the retailer side, they face the small amount of yam production, small number of consumer, High transportation variable cost (transportation, storage), and the Low price of yam. And again, these problems caused by the discontinuity of yam availability, small area used for planting yam, the distance between the farmers and the provincial market.

The small number of product in the provincial market leads to the small number of consumer

Since supply chain consists of various and multilevel structure in which each level is influencing one to another by various existence factors in the chain, so when one problem occurred in one actor, it will influence the other actors. Consequently, it will avoid the product to reach the market where the consumers are, in this case, the provincial market.

CHAPTER 6. CONCLUSION AND RECOMMENDATION

This chapter presents two parts. The first part is conclusion which contains the summary of the major findings from the fieldwork regarding yam supply chain management in Kupang district. The second part is the recommendations which cover some key item that should be taken into account to by some institutions and the government in supporting the supply chain of yam this particular district.

6.1 Conclusions

From the results and discussions it was indicated that there are several factors affecting yam production and yam supply chain system in Kupang district which hamper the supply chain of yam to provincial markets.

First, the current supply system of yam in Kupang district is very weak due to there are missing links in that system. There are actually some actors e.g. customers, retailers or collectors, manufactures and suppliers that should play important roles to keep the flow of yam supply chain but not all of them are involved in the current yam supply chain in this district. Findings from the fieldwork indicated that there have been lacks of retailers or collectors and manufactures in the currents supply chain of yam in Kupang district hampering the distribution of yam to provincial markets.

Second, the roles of supporters and influencers are still very limited. The government of Kupang district and East Nusa Tenggara province are promoting the local food consumption including yam but there is no any tangible actions to support the supply chain of yam to make it available in the markets including in provincial markets as well as there is no manufacture to support the process of yam into other forms of foods such as cake, crackers, flour, etc to enchant the interests of consumers. The processor of yam is not available in this district so that traditional ways like boiling and burning are still applied in processing yam. Meanwhile, the two universities which are doing the research on yam are not providing any further support to enhance the supply chain of yam to the wider market including to the provincial markets.

Third, the production of yam is still limited. It is due to the size of land cultivated for yam is small compared to the sizes allocated to other crops as well as the circulation of cultivation of yam is only time in a year while other crops can be cultivated two or three times in a year. Another reason is that the economical value of yam is still low compared to other crops which might also influence the decision of farmers to cultivate more other crops. This limited or low production of yam somehow contribute to limited supply of yam or discontinuity if yam marketing.

Fourth, some technical problems such as lack of transportation facilities and the distance between the farmers to the near markets as well as to the province markets

could also be obstacles that hinder the distribution or supply of yam to provincial markets because it requires more expenses.

6.2 Recommendations

Based on the results from the fieldwork, discussion and conclusions then some key recommendations are provided for the government, various institutions which are supporting yam production and yam farmers.

- 1) There is a need for the government of Kupang district and East Nusa Tenggara province to create a link or system on yam supply chain which could help in the distribution of yam to provincial markets as well as to provide manufacture which could process yam into different types of foods such as cake, flour, cracker, etc, which can be sold in supermarkets. This also will help to add the demand of yam in markets and of course add the economical value of yam.
- 2) There is a need for those universities which are dealing with the projects and researches on the topic of yam to provide training or workshops on the yam processing for yam farmers and the communities. It would help communities to know more the ways to process yam besides traditional way like boiling and burning.
- 3) Based on the both recommendations 1 and 2 above then there is a need for farmers to keep cultivating yam and enhancing the production of yam by giving more size of land cultivated for yam in their fields.

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Appendix 1. Pictures

Situation during Survey and Interview



A yam retailer which hold a plastic bag of yam with price Rp 5.000 which is equal with 0,43 euro



Yam's plant in field



A yam farmer in his field which hold yam's plant



Appendix 2. Questionnaire for Cassava and Yam Farmers

Name of the farmer.....

Age

Sex.....

Location: Village.....

Sub District.....

Contact #

Strategy for selection of farm

Distance (km) from the capital city of East Nusa Tenggara Province: Near ... Far....

Crops which is planted: cassava yam

1. Education level

- a. Primary.....
- b. Secondary.....
- c. High school.....
- d. University.....
- e. Never been in School.....

2. What is the total land size?

- a. < 1 hectare.....
- b. 1,00 – 1,99 hectare.....
- c. 2,00 – 2,99 hectare.....
- d. >2,99 hectare.....

3. From the above question, how much land specific for cassava and yam?

4. What are other main crops that you've planted?

- a. Paddy.....
- b. Corn.....
- c. Cassava.....
- d. Horticulture.....
- e. Other.....

5. How many years have you worked as a farmer?

- a. < 10 years.....
- b. 11 – 20 years.....
- c. 21 – 30 years.....
- d. > 30 years.....

6. Is collector available? Yes..... No.....

7. Do you have any technical assistant from other organization in cultivating yam?

8. Where does cassava go after harvesting?
 - a. Local consumer around
 - b. Local market
 - c. Collector
 - d. Home consumption
 - e. Feed
 - f. Any other.....
9. Give the reason for above question.....
10. If you have chosen a, b or c in Q.8, are you satisfied with the market pricing?
Yes..... No..... Why
11. Where does yam go after harvesting?
 - a. Local consumer around
 - b. Local market
 - c. Collector
 - d. Home consumption
 - e. Feed
 - f. Any other.....
12. Give the reason for above question.....
13. If you have chosen a, b or c in Q.10, are you satisfied with the market pricing? Yes..... No..... Why
14. What problems do you face in cultivating yam (pre-harvest and post-harvest)?
15. What are your suggestions to solve these problems?

Appendix 3. Checklist for Interview with Farmers

Name :

Location :

Explain about yam production related with topic below :

- a. Cultivation
- b. Outcome
- c. Quality
- d. Post Harvest
- e. Marketing
- f. Constraint
- g. Impact of supporter and influencer

Appendix 4. Checklist for Interview with Collectors

Name :
Location :
Contact number :

1. When the time for collecting cassava?
2. Where do you usually collect cassava?
3. How many kg of cassava are you collecting per each time?
4. How many times are you collecting cassava each year?
5. How many farmers do you have for cassava supply?
6. In which season of the year you are collecting more or less cassava?
7. Besides cassava, what other crops do you collect? Why?
8. Do you have any support from any kind of organization?
If yes, which kind of support and who is providing the support?
9. What are the problems you faced in cassava or yam collecting?
10. How these problems can be minimized?

Appendix 5. Checklist for Interview with Processing Unit

Name of the home industry :
Product :
Year of establishment :
Location :
Contact number :

1. Where and how do you get cassava?
2. How did you learn this processing?
3. Where do you sell the products?
4. What are the main problems you face for getting the cassava and in the processing unit (technical staff and equipments)?
5. What you suggest to overcome or minimize these problems?
6. What do you know about yam products?
7. How the processing can be helped to improve its processing unit capacity?
By supporters and influencers?
8. Do you have any kind of support from any organization? Yes..... No.....
If yes, which kind of support and from whom do you get?
9. What is the role of government in your processing unity?

Appendix 6. Checklist for Interview with the Retailing Point

Name :
Address :
Contact number :

1. What are the main problems you face in getting cassava and yam?
2. What you suggest to overcome these problems?
3. What problems do you have in selling cassava and yam?
4. What you suggest to overcome these problems?
5. Are you getting any kind of support from any organization? Yes..... No.....
If yes, which kind of support do you get and from whom?

Appendix 7. Checklist for Interview with the Consumer

Name :
Address :

1. Why do you buy cassava? When?
2. Why do you buy yam? When?
3. Which one do you prefer to buy, cassava or yam? Why?
4. Is it easy to get cassava and yam?
5. What are the main problems you face in getting cassava and yam?
6. What you suggest to overcome these problems?

Appendix 8. Interview Checklist with Influencer

Name :
Department :
Contact number :

1. Is there any policy for cassava and or yam supply chain?
2. What kind of support do you provide to different actors in the cassava and or yam supply chain?

Appendix 9. Checklist for Interview with the Supporters

Name of the Organization :
Location :
Contact Number :

1. What are main areas (actor) of your support in cassava and or yam supply chain?
2. What kind of support do you provide to the actors?
3. What are the main problems do you think, present in the cassava and or yam supply chain?
4. How these problems can be overcome?
5. What will be your role in minimizing of this problem?
6. In the current situation which actors of the cassava and or yam supply chain needs priority to be supported?