Simplification of Models and Database Design of Copra Supply Chain in North Sulawesi Province of Indonesia

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ABSTRACT
North Sulawesi Province in Indonesia has a huge numbers of coconut growers that consists of 42% from the whole peasant in the region. Traditionally, growers produces copra and have their commodity sell to local cooperation, while some of them sold to the middle buyer that eventually sell the product to cooperation or to the company produces coconut oil. While the first practice seemed to be beneficial to the growers, the latter if optimised properly may be of more benefit to the peasants due to more dynamic supply and demand between growers and buyers. It could also make a direct sellers to buyers transaction which result in a best supply chain that result in a competitive price of sale which is an advantage to the coconut growers.

General Terms
Coconut supply chain.

Keywords
Cocounut, growers, supply chain

1. INTRODUCTION
Coconut growers in North Sulawesi rely on the selling of their product to local cooperation usually running by government. While this practice is consider the best practice, some peasant still looking for direct selling to obtain more income or as a result of private lease known as "ijon" in Indonesian language. To maximise the benefit to the growers and minimising peasant's lease, it needs to compare system models between traditional approach to a more popular direct selling system via marketplace.

2. SUPPLY CHAIN

2.1 Supply Chain vs Logistic Management
Supply Chain is a system in which an organization delivers their product along with its services to the customers. The organization is then will collaborate to other organization(s) that involve in the chains. Supply chain sometimes comprises of the process in which a thing might have changes its entity from raw material to be a usable product.

Supply Chain Management is a development of logistic management, but the different is Supply Chain Management is an integrated system which coordinate the whole processes in an organization/company that they could prepare and deliver the product/service to the consumers (Martono, 2015). The processes consists of : planning, source of input to the process, tranform the input to be an output (make), transportation, distribution, deliver, warehousing, information system, product/service payment, product/service consuming and compliance, returning the product/service [5].

Supply chain concept is new in terms of logistic matters. Old concept agreed that logistic mainly as an internal problem on each company, and the solution usually done on its company alone. In this new concept, logistic issue is seen as a more complex problems which spread very long since raw materials up until final product to be consumed; hence a chain of stocking goods.

2.2 Strategic goal of Supply Chain Management.
Supply Chain is like a 'blood' on every business organization that connecting suppliers, producers, and end users on the network, in which it is very important to the creation and delivering goods and services. In controlling supply chain, it needs processes like planning, execution, and controlling supply chain operation. The goal of Supply Chain Management is to make demand and supply to be as effective and efficient as possible. Main problems on supply chain is very related to (Stevenson, 2009): Determine the level of precise outsourcing, manage the buying, manage the supplier, manage the customer relationship, identificate the problem and briefly respond to it, risk management [9].

Supply Chain has a strategic goal that needs to be accomplished in order to make the supply chain to win or at least survive (Pujawan, 2014). To win the market, supply chain should able to provide a product that is cheap, good quality, on time, and vary [5].

3. TRADITIONAL MEAN OF COCONUT SUPPLY CHAIN

3.1 System workflow
In order to obtain decent selling value, coconut growers who are copra producers need to produce copra product that meet the high standard of quality, through several baking processes and also have to constantly look for the best cooperation buying price they offered. In the process of selling, the peasants need to deliver copra product from baking place situated in the middle of the plantation field, to the village where it is collected on the barn. Then they need to look for local cooperation which could buy copra at decent price, regarding the quality of the product.

The workflow of the supply chain from the perspective of coconut oil company, depicting supply chain from purchasing raw material up until it produces coconut oil is as follows.

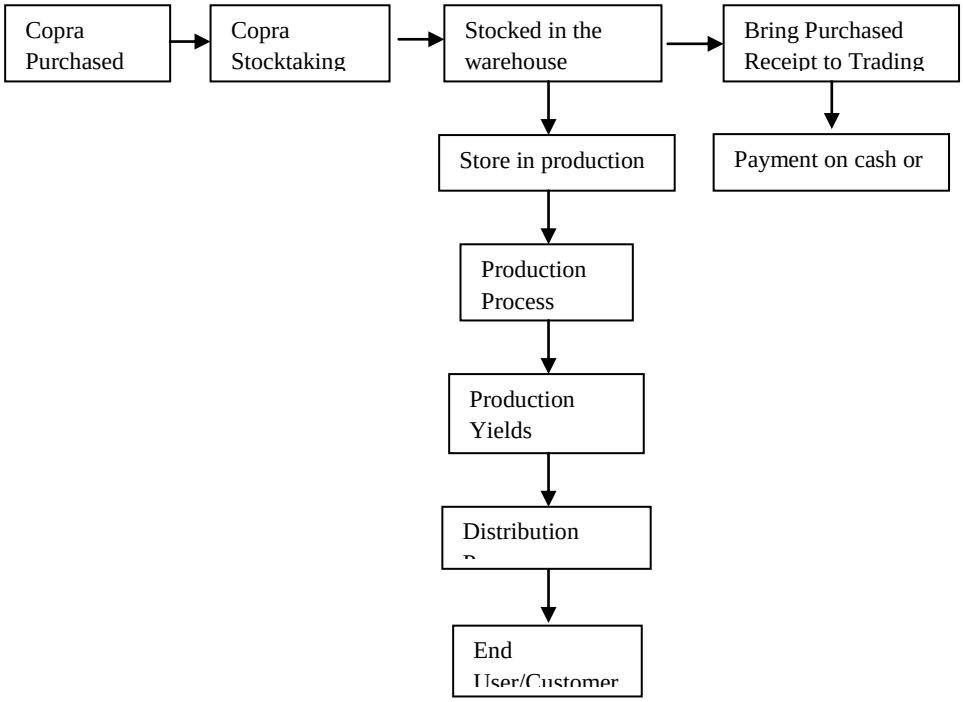

Fig 1: Workflow of copra product supply chain in the coconut oil company

3.2. Context Diagram of the System

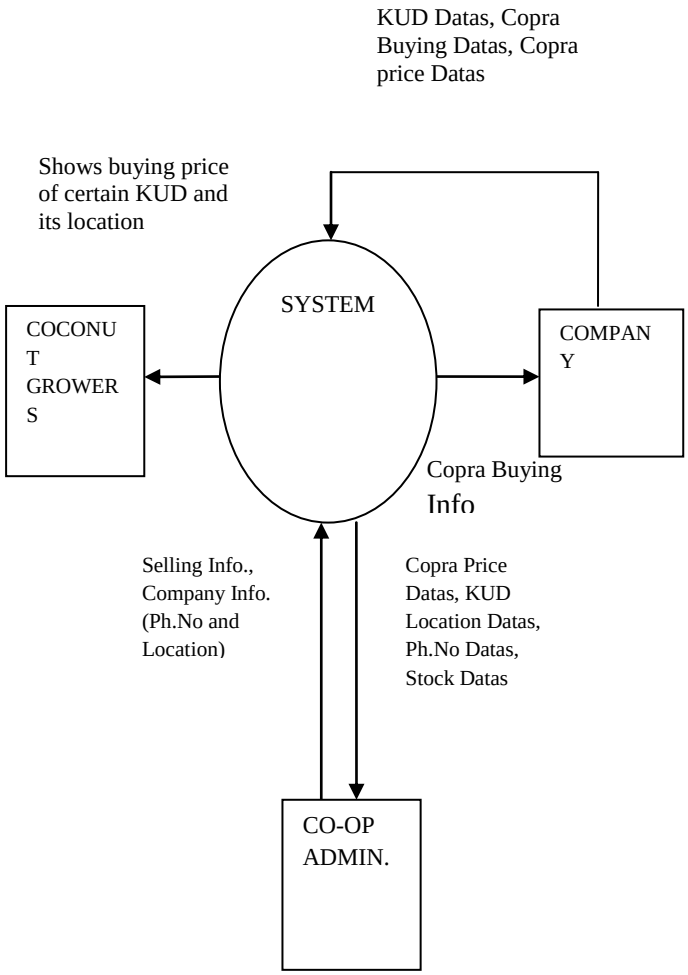

Fig 2: Context Diagram of the Supply Chain System from Coconut Growers, Company, and Cooperation perspective

The Context Diagram above explained about how the workflow of supply chain starts from coconut grower (seller)

as system user looking at copra price at a certain village-based cooperaton (KUD), then if the seller agree to the buying price offered, the KUD as a system member will then input the quantity they buy with a price agreed by both seller and buyer, along with their KUD's information. The total stock available at the KUD will be generated directly for stock control purpose and for wholebuyers (eg.coconut oil company) to get informed about stock availability on each KUD.

3.2. System's Use Case

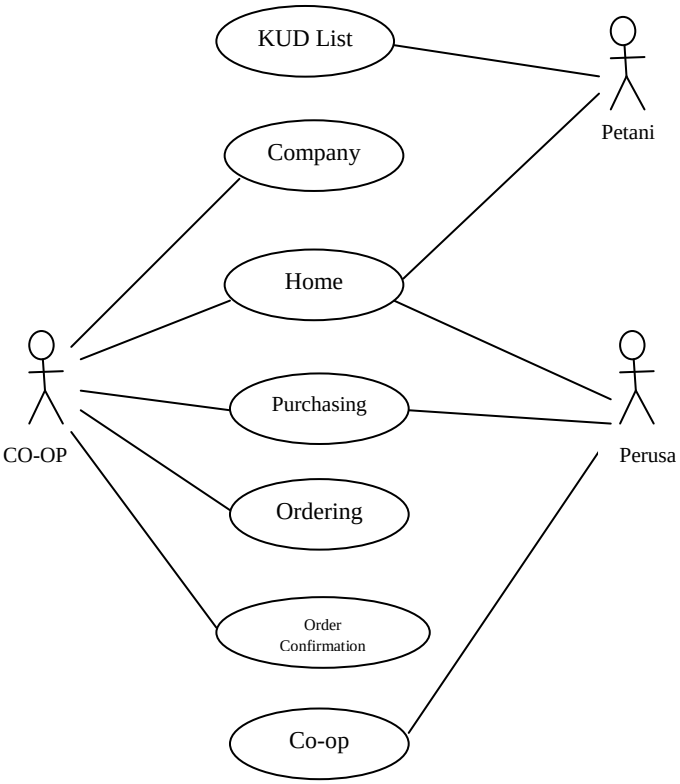

Fig 3: Use Case diagram of Supply Chain from Cooperation and Company as actors

Objects derived from Use Case diagram above indicate that KUD (co-op) has larger privileges on using the system than coconut growers and companies. This is obvious since KUD is in the middle chain, which leads to a more dynamic role. KUD is also held an important support for coconut growers as they provide leasing and also sell fertilization product as a good price.

While the common practice depicts on this Use Case is beneficial to the three parties involved, the system does not accommodate other mean of selling just like direct selling.

4. POPULAR MEAN OF COCONUT SUPPLY CHAIN AS A NEW TREND

4.1 Interview results in 2018

Coconut fruit will be sold to private buying agent that already order the fruit in advance. Some of the agents already give money to the coconut growers far before harvesting season, as a mean of lease to the peasant. However the money does not come without a warning. The growers should agree to the price they both shake hand for. Most of the case, the peasant gets lower that they should, but they should do this cycle because they need income to support their field's cultivate cost as well as their daily needs as a family.

The agents buy a fresh cocounut fruit or the one that is already processed as copra. The agents vary from a large scale buyers down to the small scale buyers. Large buyers could provide big lease, but they get most of the benefit. To get best price for their copra, the farmer needs to produce copra at the lowest water-contain as possible, and also following the common process of producing good copra through food fumigation.

A single selling of copra should be 2 to 3 tonnes, with a price of around Rp.1.500.000,- per 100 kilograms.

An example of how the agent calculate the price of the copra and pay to the farmer is as follows:

The agent set the base price per 100 kg, for example Rp.1.000.000,- and after setting the price based on kg weight, then examining percentage water contained in of the copra. The reduction will be calculate from the water percentage within the copra product.

Example :

Copra farmer yield : 200 kg

Agent setting price : Rp. 1.200.000,-

ɔpra water contained : 3 %

So, 200 kg x Rp.1.200.000= Rp.2.400.000 – (Rp.2.400.000 x 3%) = Rp.2.400.000-Rp.72.000 = Rp.2.328.000,-

The reduction of Rp.72.000 is consider as significant.

But, the process of quality check is repeated on the company purchasing copra. In addition, the company runs thorough check of copra quality, before they agree to a certain price to be paid to the farmer.

As an insight, a hectare area of a field could produce 3-5 tonnes of copra in a quarter of year. Usually growers own at least 1 hectare of land. So, actually copra farmers have good income if they manage their financial wisely; the subject of social science to study further.

On the other hand, some few amount of the coconut product is processed traditionally by the farmer to be a coconut oil used for cooking.

4.2 The Workflow Diagram

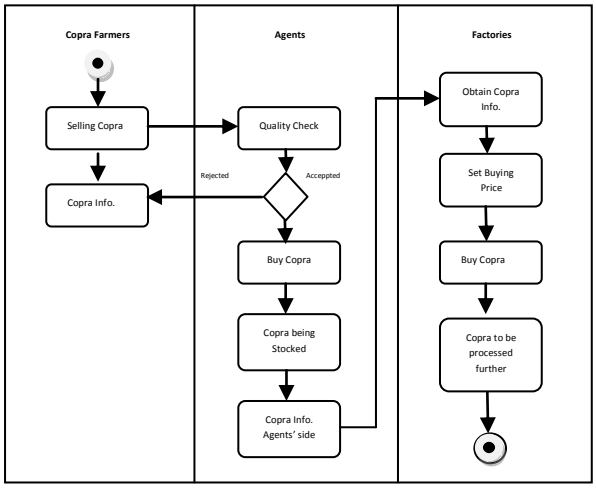

Fig 4: Workflow of the newly trend copra supply chain

The diagram depicts how copra product being transferred from copra farmer up to the factory. It can be seen that agents plays main role as the broker. The model shows the almost similarity to the traditional approach explained earlier. The difference is, agents are active in seeking the farmer and end user company/factory they are selling the copra to.Dynamic price and competitiveness will emerge on this type of marketplace.

4.3 Data Flow Diagram (New Trend)

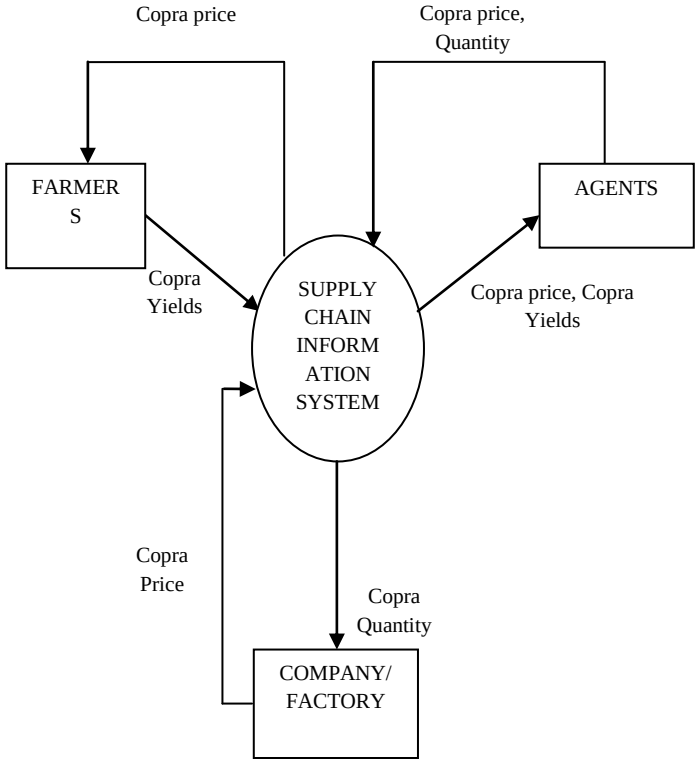

Fig 5: Data flow diagram of the new supply chain for copra product from farmers, agents, and company view

After examining the workflow, we can create Data Flow Diagram for the newly trend supply chain system. The model is the will be developed to produce class diagram as well as Entity Relationship Diagram (ERD) for database purpose.

It is clear that agents has 2 queries per assign line, while farmer and company just have 1 per line.

4.4 Use Case of the new trend

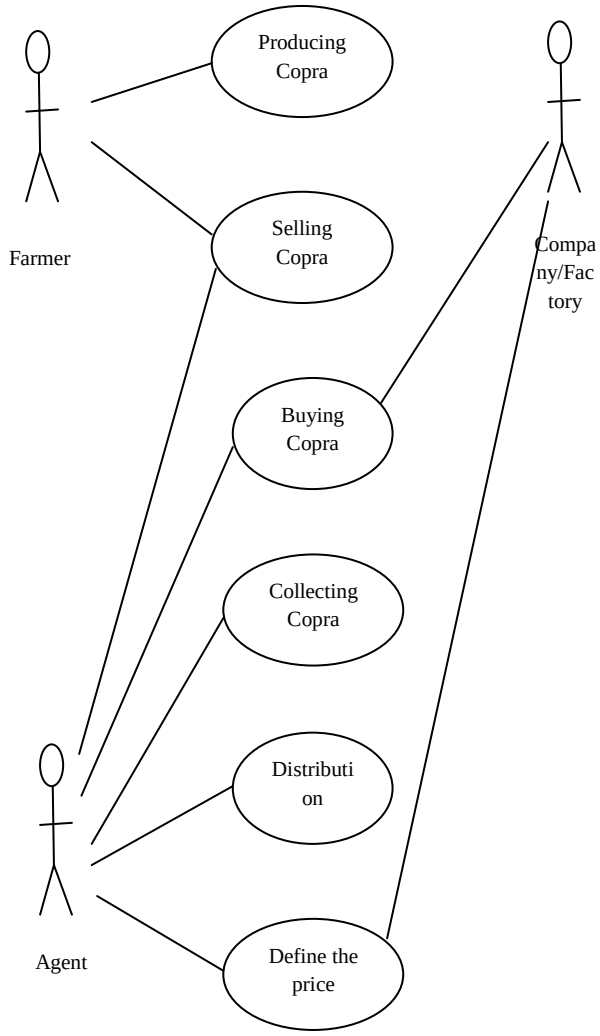

Fig 6: Use Case diagram of the new supply chain for copra product

There are 6 objects use by 3 actors on this model, the top one seemed ambiguous but mentioned that company could also re-package the copra and further processed it just before selling it.

4.5 The ERD (Entity Relationship Diagram)

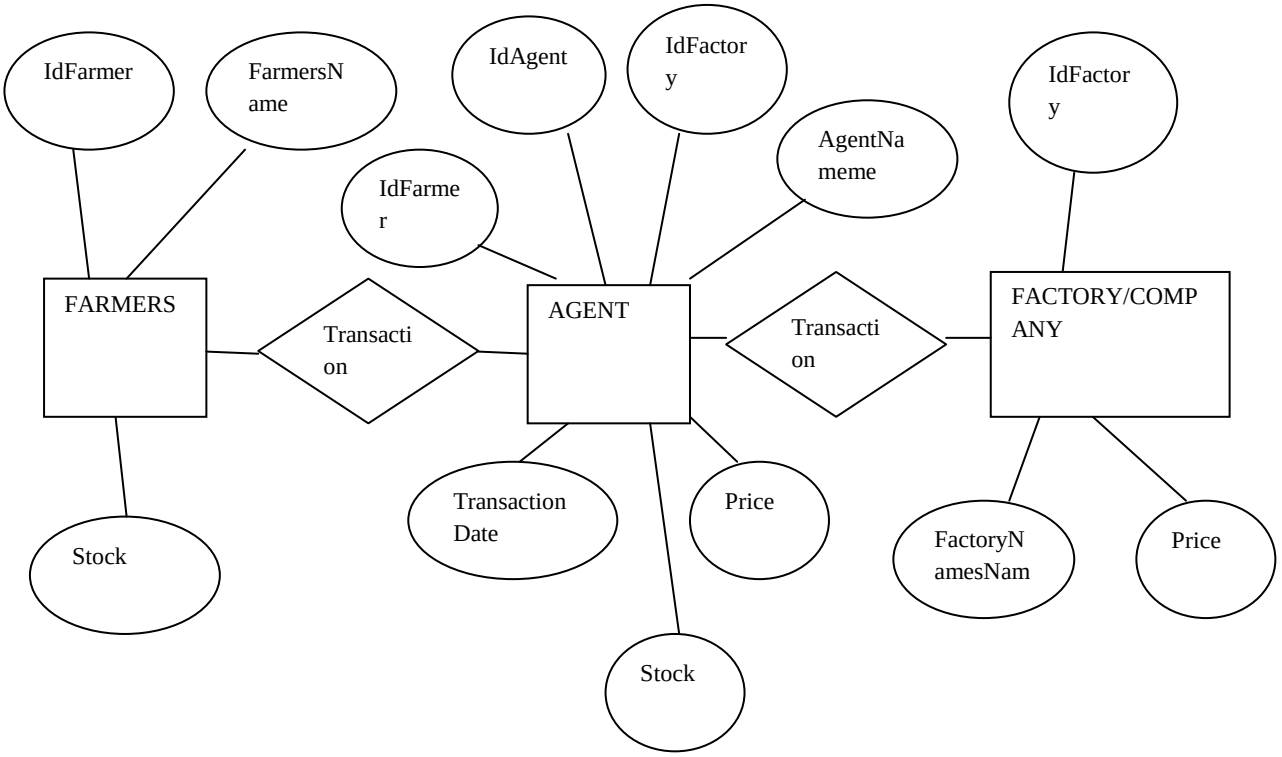

Fig 7: ERD of the new supply chain for copra product

The ERD produced will be a foothold for the next database development processes, while also addressing other known models such as sequence diagram, collaboration diagram, state chart diagram, and some other testing pattern widely used.

5. DISCUSSION

While traditional selling system and its supply chain may be the norm for many copra farmers for years, some farmers start to sell their product directly to the agents and/or to the company/factory. There are pros and cons to both means of trading. However, the modern way of supply chain still evolve to the point that marketplace could be done securely, and can be accessed via handheld devices. Both parties (seller and buyer) can also known each other location and other information before agreed for a transaction.

6. CONCLUSION

To conclude, there could be just a single system of Copra Supply Chain in the province of North Sulawesi, Indonesia. The main reason is, the system could also accommodate traditional Supply Chain.

In this mean time, there are still not yet a Copra Supply System installed and used.

The system being developed on the models as described are hoping to benefit the region.

7. ACKNOWLEDGMENTS

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