

# Distribution Analysis of the Supply Chain of Catfish (*Pangasius*) Agribusiness in Kota Gajah District, Central Lampung, Indonesia

Sutarni<sup>1</sup>, Fadila Marga Saty<sup>1</sup>, and Bina Unteawati<sup>1</sup>

<sup>1</sup>Department of Agribusiness State Polytechnic of Lampung, Soekarno Hatta St. No 10 Raja Basa Bandar Lampung, Indonesia

Email : sutarni@polinela.ac.id

The purpose of this research was to identify distribution chain (supply chain) activity and analyze the pattern of distribution chain flow of the agribusiness of *Pangasius* fish. The research was conducted in minapolitan area, Kota Gajah sub-district. The method used in this study was descriptive method. The research results showed that farmers activity as distributor chain of *Pangasius* was aquaculture, harvesting and post harvesting, sorting, weighing, transporting, and risk guaranteeing. The traders' activities in supply chain system were sorting, weighing, packaging, transporting, storing, and risk guaranteeing, while the retailer performed the purchasing, selling, chopping, cleaning and packaging activities. The vegetable stall vendors (which are related to include the fish in their stall) conducted few activities, i.e. only purchasing, selling, and transporting. The fish processing enterprise conducted the purchasing, cleaning, processing, packaging, and selling. The *Pangasius* manufacturing flow was divided into 4 patterns, from upstream to downstream flow, except for pattern 1 and 3, in which the product did not flow to intermediaries. Financial flows from customers to farmers with the cash payments transaction both directly and indirectly, and have not applied non cash payment transaction technology (transfer) or online banking. The information flows from upstream to downstream and vice versa, as in: the *Pangasius* supply chain runs vertically and horizontally, generated well integrated information within the supply chain. Medium of communication used by the supply chain was direct communication (face to face) and through the electronic device such as mobile phones.

## 1. Introduction

The catfish (*Pangasius*) production is obtained through freshwater fisheries, aquaculture, and ocean fisheries. The freshwater fisheries is performed through the fish pond cultivation, minapadi technique, cages, and floating net cages. Production of fish should be continuously improved in order to fulfill the needs of public consumption on animal-based food. In detail, pond-based fresh water aquaculture data by district/city is presented in Table 1.



Table 1. Pond-based fresh water aquaculture data by district/city of Lampung.

No	District / City	Area (ha)	Production (ton)	Household Number (KK)	Total Production (thousand)
1.	West Lampung	1,500.00	887.60	3,613	17,133,400
2.	Tanggamus	422.55	2,568.00	1,843	47,567,000
3.	South Lampung	454.06	1,002.20	617	12,389,400
4.	East Lampung	1,587.00	6,381.81	2,556	83,986,460
<b>5.</b>	<b>Central Lampung</b>	<b>6,158.69</b>	<b>27,373.90</b>	<b>12,046</b>	<b>350,135,150</b>
6.	North Lampung	1,935.20	1,166.33	2,111	18,700,321
7.	Way kanan	84.81	2,356.63	2,611	32,196,475
8.	Tulang Bawang	30.00	154.36	384	1,257,910
9.	Pesawaran	158.40	1,080.01	1,268	16,546,235
10.	Pringsewu	535.00	5,020.60	2,557	67,088,375
11.	Mesuji	266.76	245.66	2,232	4,367,918
12.	Tulang bawang barat	257.00	232.40	1,257	3,151,619
13.	Bandar Lampung	140.71	701.12	53	10,913,152
14.	Metro	60.00	1,708.92	1,087	19,973,020
Total		13,590.18	50,879.54	33,776	685,406,434

Source: Central Bureau of Statistics, Lampung Province, 2012 [1].

Table 1 shows the contribution of highest pond area which is Central Lampung reaching 6,158.69 ha (45.32 %), fish production reached 27,373.90 tons (53.80%), fish production value reached up to IDR 350,135,150 (51.08 %) with household participation of 12,046 families (35.66%) from the total number of family in the province of Lampung, based on statistical data [1]. The variety of fish cultivated in the ponds are *Pangasius*, dumbo catfish, *mas*, *tawes*, *indigo*, *gurame*, *mujair*, *pomfret*, and *tambakan*. Hence, the biggest fish supply is *Pangasius* at as much as 11,838 tons (35.24%). The biggest pond-based fresh water fish cultivation in Central Lampung is located in Kota Gajah district with the production reaches 4.768 tonnes (20.05%) [2] [3].

Patin (silver catfish) is the local name of *Pangasius* in Indonesia. In general, the name patin is used as for most *Pangasius* fish family. The main characteristics of Indonesian *Pangasius* in general are in the bit flat shape, scales shall, small mouth, and eagerness. The big potential of fisheries in Central Lampung in 2013 has been included in the list of minapolitan area. There are three areas include in

fisheries products development, one of them is Kota Gajah for *Pangasius* and catfish. With this determination, several areas around the potential areas have become the supporting areas.

The fishing industry in Kota Gajah, Central Lampung, was supported by the availability of sufficient technical irrigation flow, supplied along the year with good water management, local food for fish such as bekatul and barn are also available for feeding. Sutarni et al. [4] reported that the business of *Pangasius* fish aquaculture in Kota Gajah Central Lampung is profitable in the short term. Furthermore, Sutarni et al. [5] conducted financial feasibility analysis which showed that *Pangasius* fish business in Kota Gajah can be very potential to be developed in the future, it is due to the investment analysis, the net present value can reach greater than 0, the comparison between the fees and advantages are a single large (B/C ratio >1), and the internal rate of return (IRR) prevailed larger bank interest. The problems faced by the business of *Pangasius* aquaculture include; unstable tendency of price, factory-based feed price is relatively high. Fish feed industry had good chances to highly supply the fish feed to fish farmers. However, the high price of factory price force farmer to reduce the food quantity and seek for substitutional feed. The Kota Gajah farmers use alternative feed from local raw materials. The results of Sutarni et al. [5] study showed that the cost of food supply can be very high reaching up to 87%, while the fish production still depend on the seasons, causing the unstable supply to be high and low (seasonal) in the market.

The fish feed supply plays important roles in providing production of raw materials, in order to sustainably run, exactly both in quantity and quality. Fish market existence is very necessary in order to create sustainable production for market supply and demand. Local farmers who are fish supplier should be able to manage its operational plan to create sustainable supply and able to fulfill the customer demand. As the center of *Pangasius* fish producers, Kota Gajah, Central Lampung should have efficient supply chain. The supply chain performance is the ability to fulfill consumer needs by highlighting the key performance indicator based on certain time and price.

The *Pangasius* farmers, one of the supply chain member, aims to meet the final goals of chain that is customer satisfaction. The supply chain analysis is one of the famous skeleton analysis used to enhance the value add and competitiveness within the industry. In the concept of supply chain, fish farmers is seen as one of unity system (supply chain) consisting of fish farmers, intermediate traders, processing industry, and end-consumers. Supply chain is a concept where a governance system organizes the flow products, information and financial [6] [7] [8] [9].

A supply chain member of *Pangasius* fish in Kota Gajah includes farmers, intermediaries, fish processing enterprise (Agroindustry) in a limited number and not-continuous, and consumers' households. These institutional marketing has an important role in the activity of *Pangasius* agribusiness. Every member of the supply chain certainly conducts different activities. There are several researches on fish supply chain which have been done by other researchers, but research focused on fish supply chain of *Pangasius* is still rare. Therefore, supply chain research analysis of fresh and processed *Pangasius* fish products in Central Lampung is important to be conducted.

### **Aim of the research**

This study aimed to analyze the activity of *Pangasius* supply chain members and analyze the pattern of *Pangasius* supply chain in Central Lampung.

## **2. Methods**

### **Location and time of the research**

This research was conducted in the minapolitan region, Kota Gajah, Central Lampung, and supported areas such as Punggur and Seputih Raman with the 426 numbers of households that conduct fisheries activities. The research locations were determined deliberately, by considering the minapolitan area of Kota Gajah which produce the highest freshwater fish pond in Central Lampung by 4,768 tons in 2014 and known as the main processors and marketers of fish. The research was undertaken during 6-8 months from April to November 2018.

### **Research plan**

The population of this research are farmers who cultivate the freshwater fish in ponds in the minapolitan area of Kota Gajah as many as 426 households [10]. The method of collecting the sample was done through simple random sampling. The sample for fish farmers were taken as much as 10% from the population 43 households which cultivate freshwater fish and involve traders in the supply chain, the fish agroindustry and end-consumers. The method used to take the sample from traders and consumers was snowball method, knowing as following the flow of supply chain products from producers to consumers. The sample of the fish farmers refer to Singarimbun and Efendi [11] which confirmed that the amount of sample can be taken is as many as 5-10% of the population.

### **Data collection technique**

The data used in this research was divided into two: the primary and secondary data. The primary data was obtained through interviews directly to respondents/sample by using questionnaire/the question list was prepared first. Secondary data was obtained from related institutions.

### **Data analysis**

The research data was analyzed descriptively in a set of qualitative and quantitative data. Data was tabulated, mathematically and statistically analyzed based on the research aims. The data was analyzed through Microsoft Excel program. The supply chain analysis of *Pangasius* aquaculture business in Kota Gajah Central Lampung was conducted through several stages: (1) identifying the actuator of *Pangasius* business supply chain, (2) identifying the activity of supply chain members, (3) drawing the pattern of supply chain flow from the business of *Pangasius* aquaculture.

### 3. Results and Discussions

#### The target of *Pangasius* agribusiness supply chain in Kota Gajah

The target of *Pangasius* agribusiness supply chain in Kota Gajah was still addressed to country's domestic market (nationwide) and has not been to the export market. Supply chain target market was in traditional markets. *Pangasius* products were sold to Central Lampung areas such as Punggur and Kota Gajah also to Metro, Lampung, Kotabumi, and Tulang Bawang. *Pangasius* produced by farmers in Kota Gajah was commonly used for daily consumption, especially to society in middle to low segmented income. *Pangasius* is used by the society for a lot variety of local food such as pindang, fried fish, pepes, etc.

#### Member of supply chain

Supply chain can also be considered as logistics network, with key players: suppliers, manufacturers, distributors, retail outlets, and customers [12]. A primary member of *Pangasius* supply chain in Kota Gajah was freshwater fisheries farmers (and the supporting areas such as Punggur, and Seputih Raman), an intermediary, traders, retails, vegetable street vendors, fish processing enterprises like restaurants, and consumers households.

#### Fresh water fisheries farmers

*Pangasius* fish is one type of fish which is cultivated by farmers in Kota Gajah, Central Lampung. Other than *Pangasius*, several varieties of fish were also produced by farmers such as: catfish, gurame, and nila. The respondent farmers argues that in selecting the variety of *Pangasius*, there were several considerable factors such as: *Pangasius* has good market prospect, easy to market, the fish feed is not dependable to factory products indeed it can be substituted by local raw ingredient such as barn from its surrounding, the production place however is also known as rice (barn) source, and the cultivation of this fish is not too difficult.

The activity conducted by fish farmers was cultivating the fish. The raw materials used within this *Pangasius* aquaculture are: seeds, factory based fish-feed, homemade fish feed, medicine, fuel and etc. Farmers in financing the business are derived from their own capital and from loans from friends, neighbors, families and banks. The common loan scheme was Small Credit from BRI (a national-based bank).

#### Intermediaries

An intermediary/agent between farmers and collected traders in this research location was commonly called *timbang* (weigh). The intermediary plays as connector between farmers and *Pangasius* marketing products. Intermediary will receive profits from the gap price between selling price of merchant and farmers. For example, the average market price of *Pangasius* is IDR 15,000/kg, from the price agreement, intermediary will receive a commission of IDR 250/kg. This means that intermediaries will get profit from the quantity of fish sold and the gap price is the commissions. This transaction model has its weaknesses and advantages. The advantages are the intermediary traders can easily have stock of fish, the farmers which have massive production capacity will have the fish sold without delay, because the amount

of intermediaries collected by intermediaries are equal to the stock of fish, and farmers will have bargaining position. The weaknesses is the *Pangasius* distribution chain is longer, the closed information of intermediaries for the price will harmful both farmers and intermediary traders.

### **Collected traders**

The collected traders are one of important members in supply chain. The activities conducted by collected traders was sorting with famers, weighing the fish, transporting the fish from the pond to the collected traders, fish packaging within the transportation, temporarily storage which commonly located in collected traders house, and transporting from the storage to traditional market and retailers.

### **Retailers/Traditional markets**

Traditional market is a place to sell *Pangasius*. Traditional market has an important role in direct selling of *Pangasius* to customers. Traditional market locations in this research are: Punggur market, Kota Gajah market, and Metro market. There are 3-6 fish retailers in traditional markets consisting of 3-6 traders and the products sold vary like marine fish (*tongkol*, *dencis*, *simba*, etc.) or freshwater fish (catfish, *gurame*, *mas*, etc.) consumers of *Pangasius* consist of: consumers households and fish processing enterprises. Fish processing enterprises in this research includes food stalls, restaurants; while fish processing for light meals are crackers and others (which have rarely been implemented). The processed products of *Pangasius* conducted in households are *pindang* (indonesian style fish food), *pepes* (leaf wrap processed fish), fried fish and others. The retailer activity includes offering *Pangasius* fish directly to the consumer, displaying the products, weighing, chopping, cleaning, and packaging the fish.

### **Street vendor**

Street vendor contributes in distributing fish supply chain within the research location. The street vendors are divided into two: the vegetable street vendors and fish street vendors. The vegetable street vendor do only few purchase of *Pangasius* fish at 2-5 kg, but the sale is continuous. The activity conducted by vegetable street vendors are purchasing, sorting, transporting, and selling. The risk of not being sold is very small because the purchase usually through ordering directly from consumers households.

### **Restaurant/Food stalls/*Pangasius* processing business**

Restaurant/food stalls/*Pangasius* processing business have important roles in processing the fish. The most common processed food from *Pangasius* is *pindang* (Indonesian style fish soup). The activity operated by restaurant/food stalls/*Pangasius* processing business were cleaning, processing, and packaging. The main activity operated by supply chain member of *Pangasius* aquaculture in Kota Gajah is described in Table 2.

Table 2. Activities of Primary Members of Pangasius Catfish Supply Chain in Kota Gajah District.

Activity	Primary Member of Supply Chain					
	Farmer	Intermediaries/Agent	Collected Trader	Retailers	Merchant/Salesman	Restaurant/Food stalls/Processing business
Change						
Selling	X	-	X	X	X	X
Purchasing	-	-	X	X	X	X
Physical						
Harvesting, Post Harvesting	X	-	-	-	-	-
Transporting	X	-	X	-	X	X
Packaging	-	-	X	X	-	X
Storing	-	-	X	X	-	X
Processing	-	-	-	-	-	X
Facility						
Sorting	X/-	X	X	X	X	X
Market Information	X	X	X	X	X	X
Risk	X	-	X	X	X	X

Note : (X) : Conducted

(-) : Not conducted

(X/-) : Conducted by half farmers (approximately)

### Secondary member of the supply chain

Secondary member are those who facilitate the chain activities in distributing and providing raw material needed by primary member of supply chain. The main requirements of primary member in supply chain, especially fish farmer in undergoing their activities, may be derived from: traditional markets, rice milling, and fishing stores. While, the main production input utilized by farmers in cultivating the *Pangasius* are fish seeds, factory feed, local supply feed (such as salted fish, barn, corn, fish flour), agricultural chalk, agricultural machinery equipment (water pump, hose, casks, bucket, tube, etc.). Traditional markets provide almost all the raw material, equipment, and machine used to cultivate *Pangasius*, but, however, the barn is specially obtained from rice milling. The existence of rice milling in

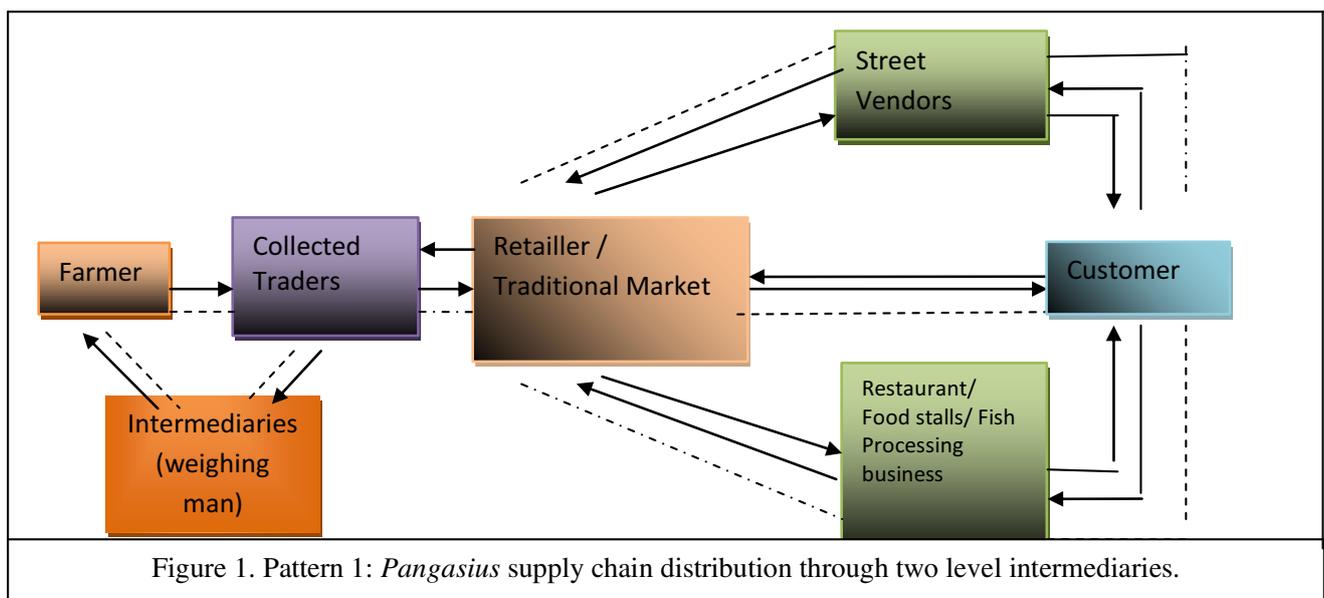
the research location is quite a lot, it is due to the fact that this area is also the center of rice cultivation in Central Lampung.

### Supply chain flow in *Pangasius* aquaculture

Supply chain is an organizational system to deliver production goods and services to their customers. This chain is also a network to many connected organization with common purpose, i.e. organizing the supply or delivery of its product at its best. There are three main aspects to be managed within the supply chain such as [12]:

1. The flow of products or goods from upstream to downstream, for example the raw materials sent from supplier to the factories, after the production finished, it is then sent to distributor, retailer, then end-customer.
2. Financial flows and other similar term which flow from upstream to downstream.
3. The flow of information from upstream to downstream or otherwise.

There are three supply chain distribution patterns in the research locations such as: the flow of products, the financial flows, and the flow of information. The flow of products runs from upstream to downstream or from farmers to the consumer. The *Pangasius* sold by farmers are those which are very fresh. While the end-customer obtained fresh fish from trading to retailer, but in some cases, consumers may asks for a fish to be ready to cooked through the process of chopping and cleaning the inside fish. Financial flow flows from downstream to upstream which is from customer to the farmers. The flow of information moves from upstream to downstream or otherwise. There are several pattern in supply chain distribution within the research locations, each of them has both the advantages and disadvantages. The supply chain distribution pattern of Kota Gajah is presented in Figure 1:



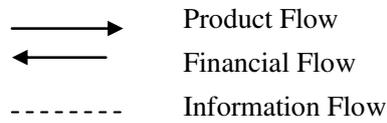


Figure 1 shows the first distribution pattern chain. The supply chain channel does not directly use an intermediary/agent. In this pattern, the flow of products flows from upstream to downstream, but *Pangasius* fish does not flow to an intermediary/agent, and only financial flow flows to intermediary/agent which then finally transferred to farmers.

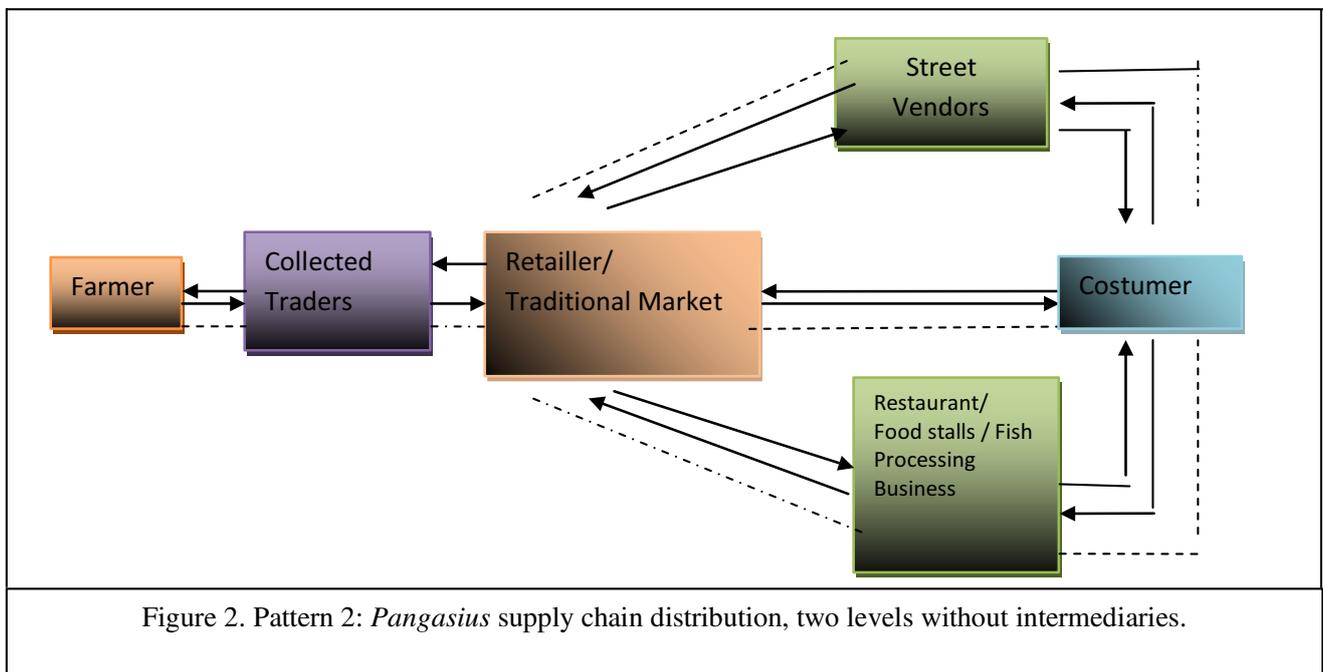


Figure 2 shows supply chain distribution pattern with two levels without an intermediary/agent. In pattern 2, intermediary traders besides being intermediaries they do the retail selling as well. However, within this pattern, there are retailers who focus only on making retail selling. The flow of *Pangasius* products run from downstream to upstream which is customer to the producer. The financial flow moves from upstream to downstream or otherwise.

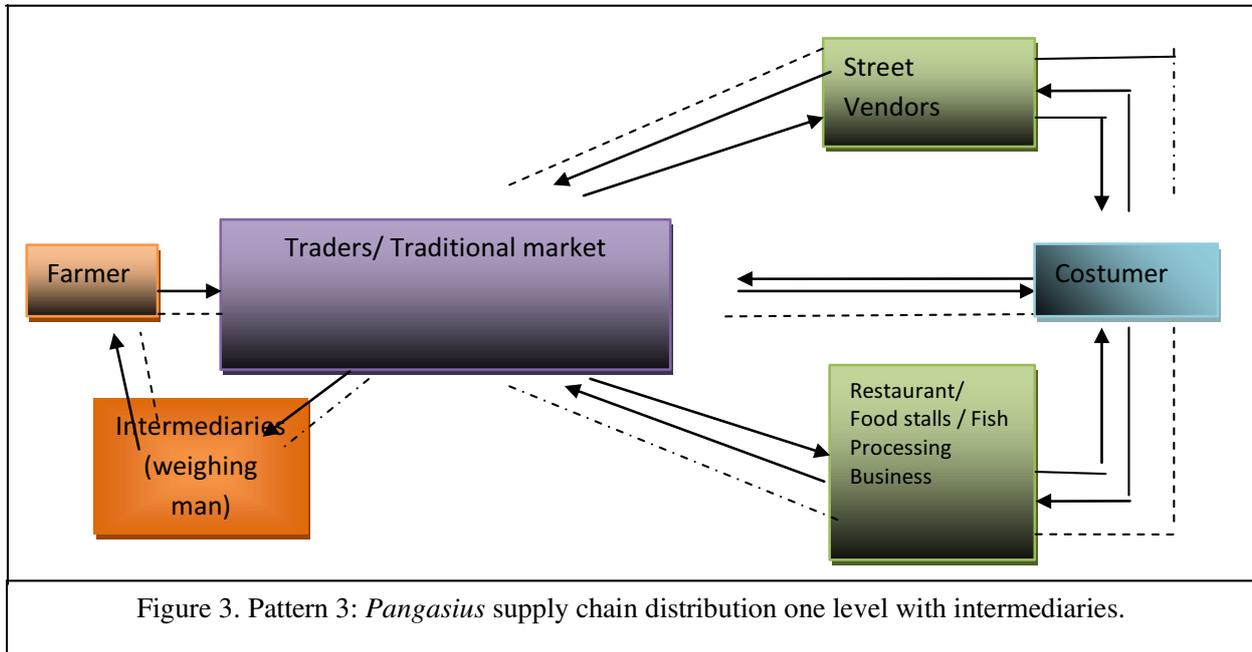


Figure 3 shows the supply chain distribution patterns in one level through the service of intermediary/agent. This flow is shorter compare to the flow both in pattern 1 and 2.

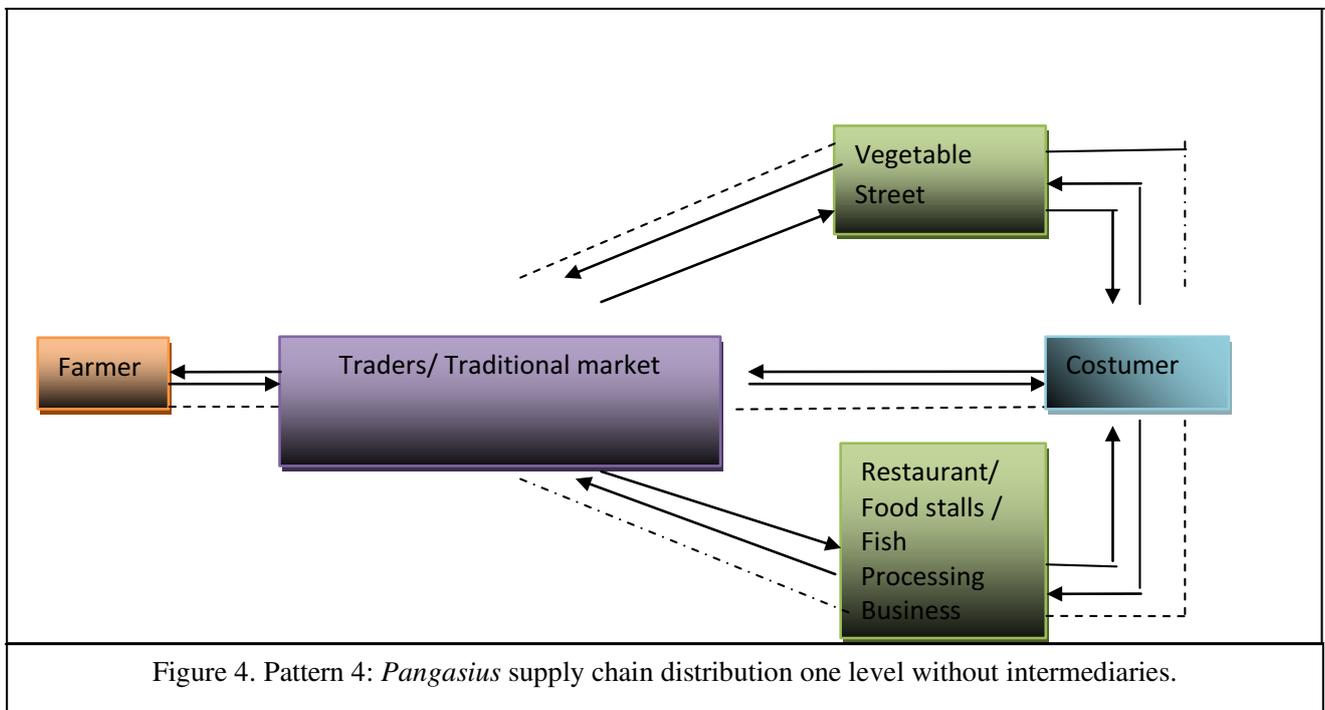


Figure 4 shows the supply chain distribution of *Pangasius* in one level without intermediary/agent. The pattern 4 is the shortest distribution channel compared to the pattern 1, pattern 2, and pattern 3. The product distribution pattern in *Pangasius* supply chain is consisted of 4 patterns indirectly. Farmers may intend to decide such a move indirectly, because there might be a consideration of intermediaries who buys their product in the farming areas, good access to information and essential good trust issues to the intermediaries needs to be well maintained, although there is no legally written cooperation contract, the altogether commitment between the merchant and farmers happen even if it is indirect, because it can cause to faster and easier selling, farmers does not have to be in risk of left-over products this due to the perishable character of fish, and the network to direct selling is limited in location, buyer/customer, or even the selling process.

### **Product flow in *Pangasius* supply chain**

The flow of products is the flow of goods from upstream to downstream. The products within this supply chain in Kota Gajah are in the form of fresh and processed *Pangasius*. The quality of product produced by *Pangasius* farmers is in the form of fresh living fish, with the quality standard 2-3 fish /kg. While the processed *Pangasius* are products produced by the primary supply chain member such as restaurant, food stalls, and fish processing business. The products of this processed fish are *pindang* (Indonesian fish soup), *pepes* (leaf wrapped fish), fried fish, fish crackers, etc. The flows of the product within this distributed supply chain in the research location are in 4 patterns, shown in pattern 1, 2, 3, and 4. The fundamental differences on those patterns are the existence of intermediaries who trade the fish to retailer, and the intermediaries who also act out as the retailer to the traditional markets. The flow of the product within this supply chain flows from upstream to downstream, except in pattern 1 and 3, the product does not flow to intermediaries/agent, and only the financials and information flows to them.

The example in pattern 1 involves the supply chain members from the farmers into intermediary traders. In pattern 1 the intermediary traders act as suppliers and does not make any retail sales in traditional markets. Pattern 1 involves intermediaries which called (in the research location) as *tukang timbang* (weighing man) or in other terms as a broker or agent, taking a role in bridging the intermediary traders and farmers, coordinating the amount of intermediaries to be equal as the amount of fish produced by the farmers. These intermediaries commonly play the role to the farmers with massive capacity of production, where the amount of *Pangasius* cannot be only sold by one intermediary. Therefore a need of coordination to share to other intermediaries has to be done.

In pattern 2, the supply chain flow of products is similar to pattern 1, the difference is no existence of intermediaries for pattern 2. It generally applies to small scale farmer, in one time selling the stock commonly run out. However, some big farmers are still selling the fish directly to the intermediaries. The limited stock of purchased fish from intermediaries may cause risk to the farmers such as: the harvested fish may not last in a day, the fish is stress due to harvesting process, the probability of die fish, and the lack appeal to eat causing the fish to reduce its weight. Pattern 3 is nearly similar with pattern 1 which involve intermediary (weighing man), the fundamental difference between pattern 1 and pattern 3 is in a way where the intermediaries act as retailers in traditional markets.

Pattern 4 is similar to pattern 3, but the pattern 4 does not involve intermediary (weighing man). The supply chain is relatively shorter.

Therefore, the flow of *Pangasius* supply chain is as follows:

1. The harvesting and post harvesting process. The flow of products is started from the harvesting and post harvesting. The ideal harvested fish is in the age range between 4-6 months.
2. The sorting process. The harvested *Pangasius* is sorted by intermediaries and farmer. The intermediaries play dominant role within this sorting activity. Sorting aims to get standard shape *Pangasius*. The base in standardization lies on the shape and size of the fish. The sorting machine has not been available so both actors usually use feeling. At this moment (in 2018), *Pangasius* prices reached IDR 15,000 for standard fish in the size of 2-3 fish/kg, while the out of standard category fish, usually 4-6 fish/kg, is purchased at the price of IDR 14,500/kg or at the gap price of IDR 500/kg. Sometimes, there are also fish which are out of those qualities above, this kind of fish will be sent back to the ponds for continuous cultivation and sold when the size is ideal at certain time.
3. Weighing. Weighing is conducted after sorting. The equipment used is hanging scales by using basket with the capacity of 40 kg, 45kg, and 50 kg per basket.
4. Transporting the fish from the aquaculture site to a fleet transport. In each weighing time, the fish is directly sent to casks which are set at the freight car.
5. Packing or packaging. The pack used for fish is a large cask. The weighed fish is accommodated to a large cask filled with water, to ensure the living state of fish during the transportation process to customers. The fish containers are drawn up on top of a car to ease the transporting process in the road.
6. Transporting the fish to the temporary storage. The packaged fish transported through the car does not experience loading-unloading, to avoid the dead fish, cost efficiency, effort, and time. Prior to the selling at traditional market, intermediaries store the fish just at the transporting car. The intermediaries have storing ponds but it commonly used for the left-over fish. The transporting time from farmer to storage happen in the late afternoon and evening, to manage the temperature and avoid the scorching tendency during the traveling.
7. Transportation from temporary storage to traditional market. The transportation generally happened in the morning, it is due to the fact that the market is started to operate in the morning.
8. *Pangasius* selling in traditional markets. Intermediaries, aside of supplying fish to retailer, some play roles as retailer as well. The buyers in traditional market commonly are vegetable street vendor, fish street vendor, food stalls, restaurant, fish processing business, and household consumers. The vegetable street vendor will sell the fish to household customers (who do not buy from traditional market) by selling door to door at housing complex. Food stalls, restaurant, and fish processing business will sell the fish in the form of processed fish products to customers.

### **Financial flow**

Financial flow is the displacement flows from downstream to upstream. The finance flows from end-customer to the fish farmers. Based on the previous figure, the pattern of agribusiness flow between pattern 1, pattern 2, pattern 3, and pattern 4 in Kota Gajah have similar finance flow; from customers to

producers. With the exception on pattern 1 and pattern 3, the distribution supply chain using intermediary/agent, the finance flow run from the intermediary to agent then to farmers.

The collected traders purchase *Pangasius* from farmers/intermediaries/agent directly without the gap of day. However, some others use the gap of time in payment. The payment is done in cash. By far, there has no legally written contract between farmers and intermediaries, the corporation is under trust among the supply chain actors. The benefits for this system to farmer is being able to receive payment directly, avoiding the risk of late payment, avoiding the probability of not being paid by customers, having capital for further cultivation, and improving the trust that intermediaries have good business capacity even if the corporation has not been officially established. The disadvantages are in big money payment which does not use banking services and may be inefficient. Therefore, from this research, it is suggested for the supply chain to use banking services as online services is considered to be safer compare to the direct cash payment.

Financial flow moves from retailer to intermediaries. The payment is done both directly and indirectly during the transaction. The trust is very high between the two actors because they do daily transaction and everyday *Pangasius* is supplied to traditional market, therefore it allows intermediaries to request for the money the day before to the retailer, not to mention that direct interaction capacity is intense. Furthermore, the financial flow moves from customer to retailer, street vendor, and fish processing business. The transaction payment is in cash form and conducted during the transaction.

The pattern 1 and pattern 3 of financial flow run from farmer to intermediaries, while the commodity does not flow to those supply chain actors. The intermediaries/agents receive commission from the fish farmers. The payment is conducted directly in form of cash during the selling transaction.

Based on the previous discussion, the financial flow of *Pangasius* agribusiness supply chains at Kota Gajah has run well, they just have not used banking/online banking system unfortunately. There is no legally written contract between the actors of supply chain, there is no financing department which manages the business among the supply chain, and the trust between the actors of supply chain is considered not so optimal. The risk faced by farmers through their financial flow within this supply chain is the late payment.

### **Information flow**

The information flow runs from upstream to downstream and vice versa. The information flows among member of this supply chains are usually about the selling price of *Pangasius*, amount of harvested fish, the capacity to supply and demand, harvesting time, the commission for intermediaries, fish quality, payment system, and human resource need for the harvesting and post harvesting. The communication is done directly (face to face) also through communication media such as mobile phone.

The flow of information runs both vertically and horizontally. One of the examples of vertical information is between farmers, weighing man, intermediaries, retailers, vegetable street vendors, fish processing business, and customer. While the horizontal flow usually happened between farmers with fish seed purchasing, and etc. The examples of coordination between fellow intermediaries are about the selling price, source of fish (from which farmer), the demand of fish from retailer, the supply fulfillment from retailer, and etc. This is in accordance with Emhar et al. [8] which mentioned that the flow of information on beef chain supply flows vertically and horizontally, meaning that the information within the chain supply is well integrated. The flow of information on *Pangasius* for pattern1 and pattern 3 is

quite intense. The existence of intermediary/agent in pattern 1 and pattern 3, which will flow the information to farmers, in contrast, is related to collected traders who buy the fish when the purchase is conducted, the amount of fish and standard fish being ordered, etc. In addition, the intermediaries will pass the information to traders, also highlighting the selling price of fish, the amount of fish ordered, etc. To some supply chain actors, this intermediary/agent is important, it is due to the existence of coordination and information related to fish marketing and both quantity as well as quality.

#### 4. Conclusions

In conclusion, the target of *Pangasius* supply chain in Kota Gajah is still addressed to domestic market (national) and not yet oriented to the export market. The *Pangasius* products will later be sold to Central Lampung, Metro, Bandar Lampung, and Kotabumi. The farmers play the role as fish farmers, harvesting and post harvesting, sorting, weighing, transporting, and risk guaranteeing. The intermediaries activities includes sorting, weighing, packaging, transporting, storing, and risk guaranteeing, while the retailers conduct the activity as purchasing, selling, chopping, cleaning, and packaging. The street vendor has least activity as only on purchasing, selling, and transporting. Finally, the fish processing business do the purchasing, cleaning, cooking/processing, packaging, and selling the processed products.

The *Pangasius* flow products run in 4 patterns, flow from upstream to downstream, except in pattern 1 and pattern 3, in which the products does not flow through intermediary/agent. The financial flow moves from the customers to farmers through direct and indirect cash during the transaction, and have not applied any transfer transaction technology or online banking. The flow of information flows from upstream to downstream, and vice versa. The flow of information on supply chain is vertical and horizontal, causing the information within the chain supply to be well integrated.

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