



## EXPLORING THE PROCESS OF AQUA LOGISTICS IN THE MALAYSIAN AQUACULTURE INDUSTRY- A QUALITATIVE STUDY

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**ABSTRACT. Background:** The production of freshwater aquaculture fish has developed quickly and being important activity. An intensive logistics system is required to handle the shipment since the aquaculture products especially aquaculture fish are perishable. The process begins right after fish farming to final consumption. It involves a large number of stakeholders as the significant effort is required to build an efficient supply chain. However, little is known about process faced by the Malaysian aquaculture entrepreneurs during the aqua logistics activities. Therefore, this study aims to address this gap by exploring this phenomenon.

**Methods:** For methodology part, a series of 12 aquaculture companies through focus group discussion (FGD) with the entrepreneurs were done across aqua logistic business. This was done to explore the topic and refine the research questions.

**Results:** The present study discovers that there were linkages along the value chain of aqua logistics in aquaculture industry, which provides a specific recommendation to stakeholders in managing day-to-day logistics operations. Also, the findings show four main process emerging from the qualitative study, which led to the following themes, namely: [i] procurement; [ii] production; [iii] order fulfillment; and [iv] transport and distribution.

**Conclusion:** The adopted qualitative methodology provided rich information that will lead the future research. In brief, this study has contributed new knowledge to the existing literature in aqua logistics and will benefit the future studies.

**Key words:** aqua logistics, distribution, aquaculture, tilapia, transportation, agro-logistics.

### INTRODUCTION

In today's competitive business environment, good management practice in logistics, particularly in aquaculture industry could provide better products, high quality of service, optimize resources and facilities, and minimize operational costs. This is because success or failure is closely related to logistics management [Glavee-Geo, Engelseth, 2018]. Logistics deal with the supply chain process that plans, implements, and controls the efficient and effective point-to-point flow and storage of goods, services and related information, throughout the production, distribution and delivery stages, from the

initial suppliers of inputs to final customers of products. The process along the chain involves the manufacturer, suppliers, transporters, warehouses, retailers and consumers [Prasetyanti, Simatupang, 2015; Zhao, Droge, Stank, 2017].

The efficiency of product arrangement is related to logistics management in providing a flow of goods and services without any waste and interruption [Jasti, Kodali, 2015]. The difficulty in coordinating the aqua logistics activities (packaging, transportation, warehousing, inventory, and distribution) among aquaculture entrepreneurs is expected to increase in aquaculture industry. Aqua logistics covers the production (farmers),

processing, and transportation & distribution. It handles the three products such as agricultural commodities, agricultural/aquaculture products, and processed and customized products [Jensen, Nielsen, Larsen, Clausen, 2010]. Regarding aquaculture products, it should be handled and transported by highly efficient logistics and distribution channels to ensure the integrity of the production is maintained. The downstream process by the farmers is selling fresh fish at local markets. The popular dishes at the food premises in Malaysia are cooked aquaculture fish and some fresh fish are exported to the other countries.

Handling the aqua logistics system in the supply network will create new demands on logistics management, which means that new approaches and methods are needed for aquaculture entrepreneur in the aquaculture industry to understand and deal with logistics processes. In this context, stakeholders in logistics have to effectively play their respective role, so that aquaculture entrepreneur could enhance their performance. However, previous studies were focused on agro-logistics and supply chain in agriculture without concentrating to the aqua logistics system [Alfonso-Lizarazo, Montoya-Torres, Gutierrez-Franco, 2013; Gardas, Raut, Jagtap, Narkhede, 2019; Jonkman, Barbosa-Povoa, Bloemhof, 2019; Moazzam, Akhtar, Garnevska, Marr, 2018; Shankar, Gupta, Pathak, 2018; Zai, Hadiguna, Afrinaldi, 2018].

Therefore, the research in this field should be paid much attention in order to enhance knowledge. However, there is relatively little analytical work dealing specifically with the aqua logistics, particularly in Malaysia's tilapia industry. Numerous studies deal with logistics or supply chain practices in fishing industry, for example, a model of fishing supply chain management for enhancing production and distribution of fishes in Bangladesh was proposed by Islam and Habib [2013]. It was supported study by Seung and Kim [2020] developed the supply chain network model in the German fish industry.

As suggested by Guritno & Tanuputri [2017], there is a need for the current

researchers to conduct further research on this issue based on aquaculture supply chain and logistics management in other industries and study settings. Seung and Kim [2020] also recommend exploring supply chain management for seafood industries in another context for more understanding. Therefore, there are needed to study this issue. The present study seeks to promote a greater understanding of aqua logistics in the Malaysian aquaculture industry connected to transportation and distribution of tilapia production. Logistics creates and enhances the value offered by businesses by increasing products and ensuring product availability. To provide more value, aqua logistic entrepreneurs strive to improve their own logistics activities or rely on professionals. Hence, this study is important to comprehend the steps faced by aquaculture companies during the aqua logistic activity. Based on these issues, the following research question is proposed: "What is the process of logistics management for the Malaysian aquaculture industry?"

## LITERATURE REVIEW

The aquaculture sector in Malaysia has been developed since 1920's and now becomes as an important activity [Food and Agriculture Organization of the United Nations [FAO], 2018]. It has been growing rapidly in Malaysia, especially in the production of freshwater aquaculture fish. Based on record, the production of aquaculture products were increased from 260,773 metric tons [MT] in 2013 to 427,015 MT in 2017 (Malaysia Department of Fisheries [DOF], 2013, 2017]. Based the data presented by DOF, it seems the consumers accept aquaculture fish in Malaysia. Apart of sea fish, the Malaysian now considers aquaculture fish as an alternative. It shows that the production of sea fish was depleted. The main aquaculture products in Malaysia are freshwater fish and brackish water fish to be a second choice. [Ibrahim, Khan, Norrakiah, Fazleen, 2014; DOF, 2018]. The most popular aquaculture fish produced by farmers are red and black tilapia, keli and patin. The farmers in Malaysia have cultured freshwater fish in earthen ponds, floating net cages in rivers and

ex-mining pools for many years [Malaysia Department of Fisheries [DOF], 2018].

As the aquaculture industry continues growing, the logistics networking that links to farmers, marketing, transportation and distribution plays an important role to sustain the aquaculture business. It involves the processes of logistics activities such as procurement, handling, production, order processing and transportation as well as distribution [Borade, Bansod, 2007; Islam, Habib, 2013]. In addition, a proper management in managing the fish distribution is also required as the quality of fish is determined by temperature [Bhatnagar, Devi, 2013]. The main reason is that fresh fish is a perishable product that needs to be monitored during processing, storing, transport and distribution [Tingman, Jian, Xiaoshuan, 2010].

The Council of Logistics Management [CLM] defined the logistics management as 'Logistics is that part of the supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point-of-origin to the point-of-consumption in order to meet customers' requirements [Lambert, Cooper, 2000]. The main logistics activities consist of procurement, transportation, inventory management, order fulfillment, information processing, warehousing management, and dissemination from the supplier to the end consumer [Ballou, 2007]. The logistics activities are integrated with other firm functions such as marketing, sales manufacturing, finance, and information technology [Glavee-Geo, Engelseth, 2018]. As a key function of supply chain, logistics ensures raw material and goods and services in the firm are managed to improve the efficient of production to deliver better service to the customers [Baah, Jin, 2019].

## **METHODOLOGY**

### **Qualitative Method**

Qualitative methodology is defined as "any research that produces findings not arrived at employing statistical procedures or other

means of quantification" [Strauss, Corbin 1990a] where it requires the researcher to seek, understand, illuminate, and extrapolate to a comparable situation. In qualitative methodology, researchers study things in their natural settings, endeavoring to make sense or understand phenomena in terms of the meanings brought to them [Denzin, Lincoln, 2011].

In qualitative methodology, researchers study things in their natural settings, endeavouring to make sense or understand phenomena in terms of the meanings brought to them [Denzin, Lincoln, 2011]. Qualitative research comprises an empirical materials-case study, introspective, life story and personal experience, historical, and observational and visual texts that describe the problematic moments, routines and meanings of individuals' lives [Denzin, Lincoln, 2011].

Qualitative research appropriately looks for answers to questions by examining various social settings and the individuals who inhabit these settings [Berg, 2008]. Qualitative techniques allow researchers to share the perceptions and understandings of others and explore how people construct and give meaning to their daily lives. Some researchers adopt qualitative methods to examine how people learn about and make common sense of themselves and others [Berg, 2004].

### **Constructivist Grounded Theory**

The qualitative approach selection affects the theoretical foundation, data collection, and analysis methods that are suitable for a set of research objectives [Parry 2004; Patton 2002a, 2002b]. Nevertheless, the phenomenon of research in the present study is also influenced by the research design. Firstly, there was a lack of a framework that existed from which this study could be conceptualized. Secondly, only a small number of aquaculture entrepreneurs operate in the Malaysian domestic market. Thirdly, there have been limited discussions on aqua logistics within the broader logistics and supply chain literature, thus requiring a deeper understanding of the phenomenon's theoretical context. Next, an aquaculture entrepreneur in an organizational context and a logistics

function are seemed to be more complicated than the present literature. Therefore, a more in-depth investigation is required.

The present study will adopt the constructivist approach of Charmaz [2005, 2006, 2014]. The constructivist version of the grounded theory suits the qualitative inquiry, and this is a contemporary version from the original version by Barney Glaser and Anselm Strauss in 1967 [Charmaz, 2016]. In comparing constructivist and objectivist grounded theory, this approach provides a heuristic device to understand debates and divisions in the grounded theory; thus, it specifies how to move the approach further into social constructionism [Charmaz 2000, 2002, 2006]. Besides that, the constructivist grounded theory presents the 'what' and 'how' questions. They highlighted the understanding of phenomena and emphasized that this understanding must be in specific conditions studied in the research process [Charmaz, 2008]. The constructivist approach by Charmaz emphasized theory development consequential from a co-construction process that is reliant upon a researcher's interactions with the participants of the study [Charmaz, 2014].

### Data Collection and Analysis

This study used Focus Group Discussion [FGD] in collecting the research data. Regarding qualitative data collection in the social sciences, business and health research, FGD is one of the most common tools used by the researchers. [Dilshad, Latif, 2013; Merriam, 2009; Rabiee, 2004; Rodrigues et al., 2010]. By using the method of FGD, the researchers can obtain the relevant information and gain an in-depth understanding of Malaysian aqua logistics systems.

For this study, researchers organized the focus group discussion with selected twelve [12] participants. Participants' selections are based on knowledge and experiences in logistics, aquaculture systems, and tilapia production management. The data's main source is the rich and thick information to support data validity in the study. FGD was conducted at the research location, and it was

planned several weeks before the actual session.

The researcher carried out focus group sessions via interview protocol of FGD, which Merriam [2009] designed as a guideline to conduct the FGD session in the study. There were several general criteria used in the study, but not limited to.

- Overview of tilapia farming practices. It includes raw materials, operational procedures, and products;
- Types of distribution channel system;
- Distribution methods in handling, transportation, storage, and resources deployment;
- Constraints of managing the tilapia product.

The interviewers ask key question, in the same way, each time and do not probing for further data. Nevertheless, this probing is more limited compared in unstructured in-depth interviews [Ritchie, Lewis, 2003; Ritchie et al., 2014]. The interview covers the answers on the process of logistics management confronted by the Malaysian aquaculture industry. The FGD was conducted approximately 3-4 hours. A Digital recorder was used to record the data from the participants. The major themes that emerged from the data grounded were discovered through analysis by NVivo 10.

### FINDING AND DISCUSSIONS

For this study, the findings are segmented into four thematic categories that are revealed based on focus group analysis done on the issue discussed and focusing on the model process of aqua logistics management confronted by the Malaysian aquaculture industry shown in Figure 1.

Furthermore, four dominant themes were identified during the analysis which are: [i] procurement; [ii] production; [iii] order fulfillment; and [iv] transport and distribution. Each of the themes is explained as follows.

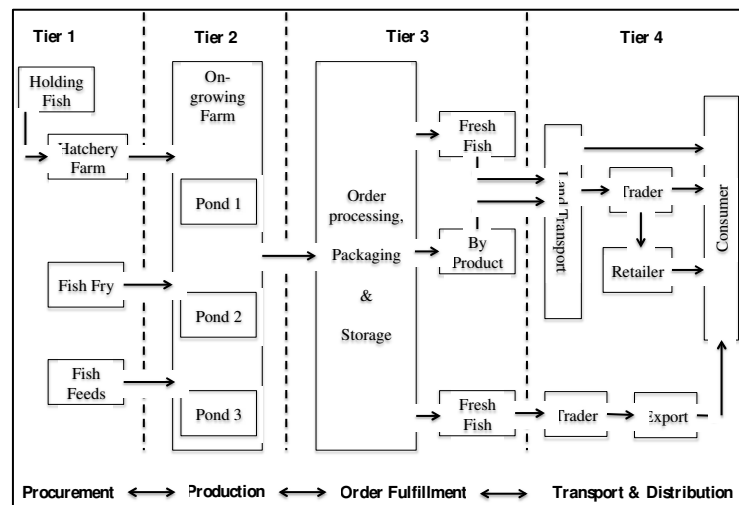


Fig. 1. Model Process of Aqua logistics of Malaysian Aquaculture Industry

### Tier 1 – Procurement

The participants agreed that aquaculture entrepreneurs must be acquainted with the procurement process in dealing with the supplier in terms of purchasing material supplies such as fish fry and fish feeds. Based on the discussion, the first step in farming freshwater fish is to locate a quality holding fish and fish fry to produce a quality finish product. This is in line with how aquaculture entrepreneurs manage the procurement process. PK12 stated:

“Farmers are required to select a quality supplier. If possible, it comes from an accredited or registered supplier with Department of Fisheries. [.....] This is to avoid a low quality of fish fry such as high mortality and maturity level. At the initial stage, the aquaculture entrepreneurs have to refer with Department of Fisheries or breeding center that able to produce a quality fish fry. Department of Fisheries are also providing fish fry with no cost”

“[.....] next cycle, the aquaculture entrepreneurs have to find it but must be knowledgeable with the procurement process”

Above method is also applied to the purchasing the holding or main fish. PK11 explained that:

“[...] usually, the aquaculture entrepreneurs have imported holding or main fish instead of fish fry. Then, this product will transfer to the breeding farm to produce a quality fish fry. [.....] but make sure the aquaculture entrepreneurs apply the import permit from Department of Fisheries”

Additionally, PK 1 stated:

“We feel around Kelantan and Terengganu .... very little in the Terengganu area .... Wholesalers will take it simultaneously. Usually, they will take freshwater fish, vegetables and fruits at the same time ... Only on the Terengganu coast. In Kuala Terengganu .... here their market distribution and procurement”

This is in line with [Hong, Lee, Zhang, 2018] where they claimed that the procurement process is a part of the logistics and supply chain. This activity is also vital in the aquaculture business, as it will determine the entire logistics process and cost [Guritno, Tanuputri, 2017]. Proper management procurement activities are needed to expose with the uncertainties, including variable lead-time, uncertain demand, and volatile price [Manuj, Mentzer, 2008].



## Tier 2 – Production

The second tier in aqua logistics is production. The sources of aquaculture fish production in Malaysia includes freshwater and brackish water culture system. In 2017, both culture systems produced 427, 015 tones, and the contribution from freshwater was 102,596 tones, valued at RM1.08 billion. Out of 102,596 tonnes of freshwater production, both tilapia products [black tilapia and red tilapia] contributed to 31% of production [Malaysia Department of Fisheries [DOF], 2017]. The participants agreed that most farmers were involved in many small-scale producers, whereby the fish production focused on one site. It was explained by PK8 that:

“Based on record, the fish production started with 2-3 small cages, and then when they have more capital, they will increase. Production is not so many, it about few tones only per cycle”.

Therefore, it would create a constraint to farmers in implementing the good practices of fish production. Although there is no specific government regulation in fish farming, the aquaculture entrepreneurs are encouraged to comply with several national standards. PK12 stated that:

“We advised the aquaculture entrepreneur to practice Malaysian Good Agricultural Practices [MyGAP]. [.....] because MyGAP covers good production handling. Fish grading accurate, fish storage, cage, fish feeding method, etc”

PK 10 also added that:

“So far not many aquaculture entrepreneurs awarded with the MyGAP, but we are in the midst of assist them to implement it. Department of Fisheries has provided full commitment to increase more MyGap practices in aquaculture industry”

PK4 stated that:

The aquaculture entrepreneurs are aware that the agencies encouraged them to increase the fish production, but it is not applied to all as the constraint of size of ponds, capital, lacking skill are facing by the them....

The above quotes clearly show that government agencies have worked hard to provide encouragement and assistance to aquaculture industry entrepreneurs. Various programs and initiatives have been implemented to boost the production of these fish farms. Past study by Little et al. [2016], the rise of unconventional and innovative foodstuffs, often joint with terrestrial livestock, with aquaculture itself the primary source of marine materials.

Additionally, Sampantamit et al. [2020] discover that Thailand's aquaculture production has increased significantly over the last few decades, and it makes a significant contribution to socio-economic development. Obviously, estimated total aquaculture production in Thailand is gradually growing from about 0.6 to 0.9 million tonnes over the last twenty years. Meanwhile, livestock shrimp is a major animal aquatic product, accounting for about 40% of total revenue aquaculture production, followed by fish (38%) and molluscs (22%). The budget exceeded decades ago; it showed that around 199470 hectares of land were used for aquaculture agriculture. Of the total area, 61% used for freshwater farms, and 39% were used for coastal agriculture.

## Tier 3 – Order Fulfillment

Participants were agreed that the order fulfillment should be in the part of fish farming logistics and supply chain. The aquaculture entrepreneurs should manage order fulfillment from the customers properly to deliver the right products with accurate order processing and quality of packaging. In the situation of local fish farming, PK7 stated that:

“Department of Fisheries is always encouraged the aquaculture entrepreneurs to use a quality packaging for delivery final products. [.....] In fact, the department has put the commitment in conducting the short course of packaging process”

In term of order processing, PK5 and PK2 explained that:

“Some of the aquaculture entrepreneurs have a contract with wholesaler to market their products. In this case, the order processing conducted by the aquaculture entrepreneurs is based on the contract between the parties. It is more regular practices but for those who market the product in retail form, order processing is normally based on the instant order”

The logistics system covers the flow of goods from the point of origin to the point of consumption. A part of that is the function of order fulfillment, including the activities of order processing, stock checking, and final product packaging and delivery [Li, 2014; Zhang, Jiao, & Ma, 2010]. The aquaculture entrepreneurs should have knowledge and competency in handling the order fulfillment. It includes managing the activities ranging from material supply to the farming site and delivering final fresh fish and by-products. It starts by receiving an order from the customers and end at the delivery point, the final products, and acceptable storage practices [Croxtton, 2003].

#### **Tier 4 – Transport and distribution**

The aquaculture entrepreneurs must quickly get knowledge in transport operations and distribution in order to improve their services, particularly in the aquaculture business. Improved transport and distribution with lower transportation cost is one of the participants' main agenda. Lower transportation cost has given the opportunities to the aquaculture entrepreneurs to access a wider range of market. Improvement in logistics has also created economies of scale in handling aquaculture products where all levels in value chain can be managed efficiently. PK 6 mentioned:

“If it is FAMA, it is more about transportation. For example, if we take talapia fish, usually, we buy on the farm at an average price of about RM 7.50 ..... this is in Lancang. Maybe you can all refer back to the FAMA Lancang operation center ... .. he is active .....

with this talapia fish, freshwater fish ... catfish ... .. Sometimes 20 cents, 50 cents per 1 kilo ... .. depends on transportation and delivery cost....”

Input from the discussion, participants highlighted that the distribution channel in local fish farming consists of distribution to end consumers, intermediaries, and direct to the processor. The aquaculture entrepreneurs have to deal and do all marketing by themselves to market aquaculture products when the first type of distribution channel is selected. There are two transportation options involved either the aquaculture products transported direct to the consumers or the consumer picking up the aquaculture products using their transport. PK 9 revealed that:

“We have set up CC and DC..Collecting Center and Distribution Center ..... the largest is located in Bangi, and the second is in Kuantan ... also in Besut ... .. we will also create all over Malaysia. The purpose is to store sea fish, we will also make a collection for freshwater fish. So, we have also created several fishing markets, mostly in the area fishing markets ... for the purpose of marketing sea fish and including freshwater fish and want to absorb into LKIM for distribution ....”

In the Malaysia aquaculture industry, participants mentioned that Federal Agricultural Marketing Authority [FAMA] is the agency authorized to be an actor for marketing and distribution of aquaculture products. The agency purchased the tilapia from the aquaculture entrepreneurs with agreed price and distribution to the retailer to market the products. Other alternative provided by the agency was the Consolidation Centre and Distribution Centre, act as intermediaries. As at to date, only three [3] centers were established in Malaysia. The objective to establish these centers is to help the aquaculture entrepreneurs to reduce cost and time. This is because tilapia products will be gathered in one place and the processors or wholesaler or retailer may pick up and transport it by their own. PK3 stated that:

“[.....] buyer may collect a tilapia product from one place. In this place, they would be

able to get all type tilapia product [.....] that our purpose to establish Consolidation Centre & Distribution Centre”

A part of the above method of transportation and distribution, participants highlighted that the aquaculture entrepreneurs were selling and distributing direct to processors. In this case, the aquaculture entrepreneurs have to ensure that the agreed schedule needs to comply during the distribution process. Thus, the aquaculture entrepreneurs have able to supply regularly. The processor will purchase in large volume in standard practice, which requires a proper transportation and distribution. This practice is due to ensure the production would not be affected and able to avoid unnecessary problems.

The other important is that aquaculture entrepreneurs can identify and access aquaculture products distribution at domestics and global level [Gani, 2017; Ottinger, Clauss, & Kuenzer, 2016)] This finding is supported by Obiero et al. [2014], most aquaculture products such as fish has sold directly to individual consumer.

## CONCLUSIONS

The research helped in identifying the logistics process in aquaculture industry, which leads to develop the model process of aqua logistics. It consists of four main components along the process, starting from procurement until transport and distribution. The research findings point out to the presence of customer-supplier relationship throughout the logistics chain. The framework developed in the study helps to understand the levels of aqua logistics in aquaculture industry. It includes roles and importance every tier of the aqua logistics level along the process.

Since this study adopted qualitative methodology instead of statistical analysis, generalization may not be appealed [Finfgeld-Connett, 2010]. Next, the sample case for this study was small, and could dent the findings. Finally, due to the nature of the qualitative, generalizations cannot be made with the other

industries unrelated to logistics. Therefore, other similar studies need to be carried out on other categories of aquaculture businesses by using other methods.

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## ANALIZA PROCESU LOGISTYKI PRZEDSIĘBIORSTW HODOWLANYCH WODNYCH JAKO CZĘŚCI AQUA-PRZEMYSŁU W MALEZJI – STUDIUM JAKOŚCIOWE

**STRESZCZENIE. Wstęp:** Produkcja ryb słodkowodnych rozwija się szybko i zyskuje coraz większe znaczenie. Intensywny system logistyczny wymaga dobrej obsługi dostaw ze względu na łatwą podatność na psucie się oferowanych produktów. Proces zaczyna się od momentu połowu aż do dostawy do końcowego konsumenta. Obejmuje swoim zasięgiem wielu uczestników, budujących wydajny łańcuch dostaw. Aczkolwiek nadal jest mało dostępnej wiedzy na temat procesu realizowanego przez malezyjskich przedsiębiorców tej branży podczas czynności w obrębie całego łańcucha logistycznego. Celem pracy jest pogłębienie i rozszerzenie wiedzy w tym obszarze.

**Metody:** Do badania wykorzystano grupy fokusowe 12 przedsiębiorstw związanych z badaną działalnością w celu analizy problemu.

**Wyniki:** Prezentowane badania wykazały powiązania wartościowe pomiędzy uczestnikami łańcucha dostaw w obrębie aqua-przemysłu, które dostarczają specyficznych rekomendacji uczestnikom łańcucha w codziennych operacjach logistycznych. Dodatkowo wyodrębniono cztery główne procesy związane z następującymi obszarami: zakupy, produkcja, realizacja zamówień oraz transport i dystrybucja.

**Wnioski:** Zastosowana metodologia jakościowa dostarczyła obfitej informacji, które będzie wykorzystana w kolejnych pracach. Rozszerza ona istniejący stan wiedzy na temat aqua-logistyki i stanowi bazę dla przyszłych badań.

**Słowa kluczowe:** aqua-logistyka, dystrybucja, hodowla ryb, tilapia, transport, agrologistyka

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