

## **Sustainable Systems and Food Security Coping Strategies in Twantay Township, Yangon Region, Myanmar**

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### **Abstract**

Global supply chains place great demands on ecosystems and natural resources, and the distance between where food is produced and consumed is often taken as evidence of an unsustainable food system. Fish and seafood are some of the most widely traded food commodities worldwide. This paper focuses on the sustainable food system and coping strategies of food in Twantay Township. The staple food of the community is rice and curry. Most people eat fish and fish products and value fish whether small or big. The aim of this paper is to discover how the locals cope with food security. Objectives are to reveal the most common fish species found in Twantay Township, to study the fishing equipment and the fish they catch and to reveal the preparation for cooking fish and eating fish. This study uses descriptive study design. To collect data, qualitative analysis and qualitative method which includes observation, individual interviews and documented data are used. According to the study, as there is a canal in Twantay region, compared with other regions, there are few shortages of water, but some fishermen fail to follow the bylaws. For example, they catch fish using battery-operated electric shock, and also during the fish breeding season. The fish farming area in Twantay covers 3,700 acres. Twantay is the region which has the most acres of fish farming area. The most common breeds are *Nga-gyin*, *Nga-myint-chin*, *Nga-tan* and so on. *Nga-myint-chin* is the chief export. The expectation of this study is to explain the local peoples' coping strategies in relation to available food resources, household income, and belief system related to food in their cultural context.

**Keywords:** sustainable food, descriptive study design, fish and fish products, coping strategies, rice and curry

## **Introduction**

A sustainable food system is a collaborative network that integrates several components in order to enhance a community's environmental, economic and social well-being (Pothukuchi and Kaufman, 1999). The food system includes the production, processing, distribution, marketing, acquisition, and consumption of food (by Staff Food News). Food security also means that the people who produce our foods are able to earn a decent, living wage growing, catching, producing, processing, transporting, retailing, and serving food.

According to the survey of the Food and Agriculture Organization (FAO), global fish production reached 158 million metric tons in 2012. Freshwater fishing business is 7% of global productions or 11.6 million metric tons. 79.5 % of this production was produced by fifteen countries led by China. Myanmar ranked third among the countries which produced most freshwater fishery products in the world in 2012. There are 48,000 acres of fish farming area in Myanmar. The fish farming area in Twantay covers 3,700 acres. Twantay is the region which has the most acres of fish farming area.

Twantay is situated in Yangon Region, with a population of about (202,221)). The majority of inhabitants are ethnic minorities. They rely on the rivers and creeks for their living and they cope with the daily lives mainly by fishing. The study area of this paper is Sustainable Food Systems and Food Security Coping Strategies for food in Twantay Township, Yangon Region, and Myanmar.

## **Rationale**

Twantay is also the region which has most acres of fish farming area. Today, millions of people depend on consumption of fish as their daily food. And in my study area, fishing in abundant rivers, canals, many ponds, ditches and burrowed pits will be presented. In this area, people can catch and eat fish. The locals have been running fishing businesses since their ancestors' times as their long-standing livelihood. As there are a lot of creeks and rivers in Twantay Township and it is also good, well-drained land, there is less contaminated water. I chose this study area because caught fish are not only enough to eat but also surplus so that they can be sold in other villages.

## **Aim**

The main purpose of this paper is to discover how the locals cope to ensure their food security.

## **Objectives**

1. To reveal the most common fish species found in Twantay Township

2. To study the fishing equipment and caught fishes
3. To reveal the preparation for cooking fish and eating fish

### **Research Questions**

1. How do the local people catch fish?
2. What kinds of fishing equipment are used?

### **Literature Review**

The FAO (2014) noted that global supply chains place great demands on ecosystems and natural resources, and the distance between where food is produced and consumed is often taken as evidence of an unsustainable food system. The study focuses on what roles fishery businesses in Twantay region play in the Myanmar economy. Fish and seafood are some of the most widely traded food commodities worldwide.

Food security happens when all people at all times have access to enough food that is affordable, safe and healthy, culturally acceptable, meets specific dietary needs, and is obtained in a dignified manner for all and produced in ways that are environmentally sound and socially just. Food security is a set of security, system and sovereignty (Hans, 2011).

Michael C. Latham (1997) said that fish and seafood, like meat, are valuable in the diet because they provide a quantity of protein of high biological value, particularly sulphur-containing amino acids. They are especially good as a complement to a cassava diet, which provides little protein. Whenever water is available, fish provide a simple way of increasing protein consumption. The stocking of fish ponds and better and more widespread fishing in river, lakes and sea should all be given greater encouragement.

Gail Feenstra (2001) said that food, human values, society and others have articulated the complex nature of the food system and its local and global dimensions, the opportunities and challenges of the economic and community development possibilities, the policy dimension, the nutrition and community food security aspects and of course, the enjoyment that comes from sharing locally grown, sustainably produced, and lovingly and tastefully prepared food. This study also investigates how the local people living in Twantay Township prepare and cook for nutrition their different kinds of fish that are locally caught, and how much they value the fish.

Maxwell et al. (1999) found that there are several direct and indirect measurements of food security such as socioeconomic measures, food consumption, anthropometry and coping strategies; a single indicator may not adequately capture the complexity of food security.

FAO (2014) described fish as playing an important role for food security and nutrition by providing food and income. However, fish, fisheries and aquaculture are often kept on the side of debates relating to food security and nutrition. The fisheries community is mainly focused on fish and related resources, and the food security community, despite the widening of the definition of food security to include dietary patterns and their influence on nutrition, is still geared mainly towards food access and availability with a focus on staple foods. This study is presented from an anthropological perspective regarding food resources, household income and belief system of the local people dwelling in Twantay Township.

### **Methodology**

This study is of descriptive design. To collect data, qualitative analysis and qualitative method including observation, individual interviews and library survey were used. In this study, how to collect food for home consumption and how to make a meal for daily food were observed and 20 males and 30 females were interviewed for their perspectives on food relating to socio-cultural and environmental conditions. The researcher also collected information and data from buyers and sellers and fishermen for home consumption. In conducting interviews and observation, many intricately related factors were employed to find out what is involved in getting food from farm and water to consumer, including the inputs, processes, and outcomes of food systems.

### **Findings**

The role of fishery products stood at fourth in GDP during the previous five years and it was also the fourth greatest resource which brought in foreign currencies. Since the majority of family units started living along the main four rivers and delta regions, the freshwater fish which were got from the inland fishery were part and parcel of daily foods and trading. 50% of fishermen and fish farmers are involved in the freshwater fishery. As the rivers, creeks, and ponds as well as the lakes and canals are abundant in Twantay Township, the main business of the locals is freshwater fishing.

#### **Fish Species**

There are about 520 freshwater fish species out of about 776 freshwater and saltwater fish species in Myanmar. The fish species found in Twantay region are: 1. *Nga-pone-nar* (mango fish), 2. *Nga-Shint* (eel), 3. *Nga-za-yaing* (striped dwarf catfish), 4. *Nga-khu* (catfish), 5. *Nga-myint-chin* (carp), 6. *Nga-*

*mwe-doe* (kind of spiny eel), 7. *Nga-poke-thin* (croaker), 8. *Nga-phe* (*Notoperus notoperus*), 9. *Nga-pa-naw* (small snake-head fish), 10. *Nga-tha-let-doe* (loach), 11. *Tilapia*, 12. *Nga-pha-ma* (kind of bream), 13. *Nga-khone-ma* (name applied to most fishes of the *Barbus spp*), 14. *Nga-thit-tone* (kind of a fish), 15. *Nga-zin-zut* (kind of small perch), 16. *Nga-be-phyu* (*Amblypharyngodonmola*), 17. *Nga-nu-than* (*Ompok bimaculatus*), 18. *Ka-tha-poe* (bar-eyed goby), 19. *Nga-phe-oung* (kind of carp), 20. *Nga-yant* (snakehead), 21. *Nga-gyin* (Hamilton's carp), 22. *Nga-phaung-yoe* (garfish), 23. *Ka-ka-dit* (giant sea perch), 24. *Japan-nga* (a kind of fish), 25. *Nga-phyin-tha-latt* (variety of gourami), 26. *Nga-gyin-lone* (a kind of Hamilton's carp), 27. *Nga-gyee*, 28. *Nga-butt* and 29. *Nga-than-chate* (dwarf catfish).

### **Diet Pattern**

The staple food for the locals of Twantay region is rice. Besides, as their main business is the freshwater fishery, fish is one of their essential foods. According to the locals, fish are not only nourishing but also are good for health. Fish contains less calories or fat than other kinds of meat. Omega 3 fatty acids in fish help our brains to function. As they prevent blood clots, they help reduce blockages in the blood vessels in the brain, and strokes.

According to a man aged 60, fish can also help alleviate depression. He said that fish is a great help not only for physical health but also for mental health. He also said that by eating fish regularly, pregnant women can help develop the baby's nervous system. A woman aged 70 said,

*"I fed my children on fish almost every day. Fish makes us brainy."*

According to the interviews, it is found that eating fish is important in the meals of Myanmar ethnic people in Twantay Township.

The following topics are the recipes or cooking style used by local people.

*Nga-be -phyu* fish (*Amblypharyngodon mola*) is usually eaten after being fried or cooked in dissolved tamarind water till it sticks to the pan. *Nga-bye-ma* (*Anabas testudineus*) can be caught in large amount in the rainy season and can be cooked sour with chili and tamarind. It is normally cooked with such spices as coriander, Shan Nan-nan (*Eryngium foetidum*), curry powder and so on. It is also known that it is cooked by mixing it with star fruit to cure the formation of gall-stones in the kidney and urinary tract. *Nga-pyet* fish (*Balcoptthalmus of dussmieri*) is generally caught in the rainy season. This fish is eaten after fresh chili powder has been deep-fried and the fish has been fried with the powder, after being mixed and cooked or after being cooked whole. This fish is eaten sour after being cooked in dissolved tamarind water. *Nga-pyet* (*Balcoptthalmus of dussmieri*) is generally caught in the rainy

season. *Nga-pa-naw* (*channa panaw*) is abundantly caught in the monsoon season. This fish is a little rare in the hot season. It was observed that people eat it principally after frying or cooking it. It is also cooked by mixing it with such vegetables as rosellas, sour acacia, etc. *Nga-yant* (banded snakehead or *ophiocephalus striatus*) is found in every season. It is known that such fish is eaten after being cooked, fried, or after the dried fish has been grilled and oiled. It is also customary to cook the heads of *Nga-yant* and drumsticks in combination, or to cook the fish together with rosellas.



Figure 1: Participate observation

The recipe for this kind of fish is the same as that for cooking *Nga-nu-than* (*callichrous pabda*). It was observed that *Nga-tha-lauk* (*tenualosa ilisha*) is normally eaten after being fried, cooked or steamed. Steamed *Nga-tha-lauk* curry is more frequently made. Tilapia (*oreochromis sp*) is usually eaten after being fried, grilled or cooked. *Nga-phe-aung/Nga-phan-ma* (*oteobrama belangeri*) is normally being fried whole, fried with added slices of onions, or cooked spicy with chili in the curry. It was also learnt that little stones coming from the heads of *Nga-poke-thin* (*otolithoides pama*) can be ground and smeared or soaked in water and drunk in order to relieve bladder stones.

*Nga-pyan-kyar* (*periophtamus orgen ti lineatus*) are usually eaten after their heads have been cut off and the remaining parts are cooked sour, mixed and cooked, or fried. *Nga-pone-nar* (*Polynemus paradiseus*) is normally eaten after being fried, cooked in an ordinary way, or cooked spicy with chili. *Nga-pyan-hmwe* (*periophtthalmus gracilis*) is the same as cooking *Nga-pyan-kyar*. *Nga-zin-zat* (*pseudambassis ranga*) is usually eaten after being fried. Another way is to fry it after being dried in the sun.

*Nga-than-chate* (*Pseudotropheus acutirostris*) is normally eaten after being fried or cooked.

*Nga-kone-ma* (*Puritus cholala*) fish is usually eaten after being fried. It can also be eaten after the dried fish has been fried. Otherwise, it can be eaten after being cooked till the gravy dries up, or cooked

spicy or sour. *Nga-khone-ma-gyi (Puntius Sarana)* is normally eaten after being fried, cooked sour with tomato and tamarind in it, or cooked sour in another way with rosellas and soap acacia. *Nga-gyin-phyu (cirrhinus mr mrigala)* is known to be available throughout the year. It was learnt that the fish is eaten after being cooked sour with tomatoes and tamarind or just fried. It was also observed that the fish is cut into pieces which are then fried with soya-bean sauce and finally eaten. It was also observed that the fish is first boiled in water, then onions, garlic and so on are added to heated oil and that all the content are combined to make gravy for Mohinga (a popular kind of Myanmar traditional snack). *Nga-khu (clarias batrachus)* is normally eaten after being cooked together with leaves of Yeyo (*Morinda angustifolia*) and oil or cooked sour in the form of fish balls. Another way is to boil the fish, remove its bones and add the remaining parts to make Mohinga gravy. Moreover, it is also cooked in the form of small pieces (which is locally known as *Nga-khu Sein-kaw* curry). It was also learnt that such fish is caught at streams and lakes and then cooked as one wishes. *Nga-daung-zin (Rasboria daniconius)* fish is normally eaten after being fried or cooked till the gravy dries up. The fish is known to be more abundant in November and December. It was observed that *Nga-phyin-sa-latt (Colisa labiosa)* is usually eaten after being fried, cooked till its gravy dries up, or cooked spicy.

*Nga-khway-shar (cynoglossus lingu)* is usually sold after being scaled. The fish is often sun-dried. It is also eaten after being fried or cooked. *Nga-thit-tone (Elcotris fusca)* is caught plentifully in October. It is normally eaten after being fried or cooked in the form of what is locally known as Nga-galay-oh-kat (that is a kind of curry cooked till its gravy dries up). *Nga-gaung-pwa (Gibelion Catla)* fish is available on the market almost all year round. It is usually eaten after being cooked in an ordinary way, fried or cooked like other kinds of fish. *Kha-tha-poe (Gloss ogobius giuris)* fish is normally eaten after being fried. Besides, its boiled soup can be eaten or drunk. It was also learnt that it is sometimes eaten after being cooked sour with tamarind sauce. It was also found out that it can be most abundantly caught in the rainy season.

*Nga-gyee (Heteropn custes fossilis)* is normally eaten after being fried spicy with chili. It is also eaten after being fried in a natural way or after the dried fish has been fried. *Nga-gyin-lone (Labeo goniua)*. It was learnt that this kind of fish is eaten in most cases after being fried, that it is available in the market in any season, that almost everybody eats it and that the recipe for cooking this type of fish is the same as that for cooking *Nga-gyin-phyu*. It was also learnt that *Nga-myt-chin (Labeo goniua)* is available in any season. The recipe for cooking this type of fish is the same as that for cooking *Nga-gyin-phyu*. *Ka-ka-dit (lates calcarifer)* fish is normally cooked in a simple way. It is fried and then cooked with soya-bean sauce. Another way is to grill and eat it.

Nga-tha-le-doe fish (*Acanthopsis*) can be eaten after being cooked till its gravy dries up, cooked to be sour, salty and spicy, or fried. *Ka-ku-yan* (*Polyne mugil Corcula*) is normally eaten after being fried or cooked in an ordinary way. It is usually cooked for the nutrients of post-natal mothers. *Nga-sa-yit* (*Lepido cephalic chthys hasselt*) is eaten after being cooked till its gravy dries up.

## **Fishing Equipment**

### ***The Most Common Freshwater Fishing Equipment***

The fishing gear used in inland fisheries has developed traditionally from small-scale fishing activities. The widespread use of fishing gear includes stationary pots, stow nets, lift nets, gill nets, line, scoop nets, bamboo traps and cast nets. This gear is specially made and can be used easily.

**Falling net** (local name '*pike-con*'), a traditional fishing gear, is mainly used by small-scale fishermen in inland fisheries. This gear is of two types: portable cast net (*let-pike-con*) and huge cast net (*mat con*). In ponds, lakes, rivers and creeks portable cast nets are generally used.

**Hook-and-line** fishing is used by small-scale fishermen in Myanmar. Most hook-and-line fishing is from small boats in rivers, streams and lakes. Hook-and-line fishing can be categorized as long line, hand line, or pole and line. Fish are caught with the use of drift long line. The length of the line is about 100 feet. At the bottom of the line, fish-hooks are hung three feet apart from one another. The most caught fish are *Nga-butt*, *Ka-ka-dit* and so on. Live *Nga-khone-ma* and *Nga-phyin-tha-latt* and so on are used as bait to catch fish. The dragnet is the most widely used fishing gear in rivers and creeks, and *Nga-poke-thin*, *Nga-dan*, *Nga-butt* and freshwater prawns are caught with this net.

**The Push Net** (locally known as *Yin-twunn*), a traditional fishing gear, is widely operated in Myanmar shallow waters, lakes, small rivers and quagmire areas. This fishing gear is simple, consisting of a triangular net forming a bag-shape, its two sides fixed to scissors-like crossed bamboo sticks. The gear is pushed forward in shallow water with either hand. Large-scale push net operated by motorized boats is not allowed in Myanmar. The main species of fish caught by push net are a variety of small fish and shrimps.

**Lift net** is a traditional small-scale fishing gear which has been operated in river side, lake and small stream areas to catch small shallow water fishes. Lift net is found country-wide in Myanmar but is used only in few areas. Lift net can be roughly classified into three basic types: portable lift net, Chinese dip net and stick-held dip net.

**Trap fishing** is one of the stationary fishing gears which have many variations in design, materials used, operation techniques and target species. There are various kinds of traps such as fish trap, prawn trap, eel trap, crab trap and filter trap.

**Gill net** has gained popularity among the small-scale fishermen in Myanmar. As its design, construction and the way to use are simple, and because of its low investment cost, it turns out to be a preferred gear for the small-scale fishermen. In Myanmar inland water, there are various ways of using a gill net. Different designs can be seen from one place to another according to the available fisheries resources. Depending on the way it's used, types of target species and its behaviors, its designs also vary, and gill net can be classified in many ways. They are drift gill net, surface gill net, bottom set gill net, set gill net and trammel net.

**Surrounding Net** has long been used in Myanmar and developed over time by the fishermen themselves. In Myanmar, it can be categorized into three different groups. They are beach seine net, surface seine net, and purse seine net without purse line.



Figure 2: Surrounding net

Fishing nets are usually formed by knotting a relatively small thread. Modern nets are usually knitted using artificial polyamides like nylon while nets of organic polyamides such as wool or silk thread were widely used until recently and are still used.

Practically, although inland fisheries can fish the whole year, the amount of fish caught may vary from season to season. During the rainy season from June to September, freshwater fish are abundant. During this time, the fish spawn a lot on wetlands and flood-plains. Yearling fish grow to full size during this season and are the target of fishing efforts. After the rainy season (October to December), the water level in most inland habitats starts to level off. This enables the fishermen to catch easily the fish grown from the previous rainy season, using various types of fishing gear. Although fishing can be

done all year round in rivers and ponds, fish are caught more readily from July to September when the water level is low.

### **Fish-catching**

In the Twantay region, mainly men run the fishing business, but women and mature children (family members) work as assistant fishermen and gradually they come to join with the men in the fishing business. Women mend the broken nets and prepare the fishing nets.



Figure 3: Preparing the fishing nets

The time spent catching fish is 6 to 9 hours a day. The owner himself performs the fishing business depending on the fishing device used. And there are also occasions in which assistant fishermen are hired. Payment is by profit-sharing or direct payment. An assistant fisherman earns about 7,000 kyats (US\$7) a day. Meals are served to the assistant fishermen by the owners of the fishing business during the fishing.

As there is a canal in Twantay region, if compared with other regions, water shortages are rare, but some fishermen fail to follow the bylaws. For example, they catch fish by battery-operated electric shock and also during the fish breeding season (locally known as *Nga-yeik-tet-chein*). Catching fish using battery-operated electric shock means catching fish in small ponds and creeks with an electrified iron rod which is connected to the battery which is put in the battery box on the fisherman's back. '*Nga-yeik-tet-chein*' means catching small fry during fish-breeding season. As some local fishermen catch fish against the prohibition, fish species have died out gradually. Furthermore, because of global climate change and the unprecedented development of fish operation techniques, there is over-fishing and fewer fish. Because wild fish resources become fewer, more fish farming businesses emerge to get a good supply of fish for people and to extract fish for longer period of time in future, Programs for Conservation of Resources have to be drawn up and implemented.

In Myanmar, fish farming businesses have operated since 1957. There are 48,000 acres of fish farming area in Myanmar. The fish farming area in Twantay covers 3,700 acres. Therefore, Twantay is also the region which has the most used acres of fish farming area in Myanmar. The most farmed fishes are *Nga-gyin*, *Nga-myint-chin*, *Nga-tan* and so on. *Nga-myint-chin* was the most exported.



Figure 4: Fish lake

### **Fish Trading**

Fish and prawn farming businesses have been operated since the year dot but for last 20 years on, fish from fish farming have become the main consumed food. Although fishermen want to catch higher-priced fish, they take any fish trapped in the net. Only a few inedible fishes are set free. Caught fish are kept in plastic buckets or in the hull of the boat. Normally, without using ice to keep the fish, the fishermen sell their catch within the day. Some sell fish retail. Fish from fish farms have developed to the extent that they can be not only consumed internally but also exported.

Fishermen sell fresh fish, and they dry fish and make shrimp paste to earn their incomes. The freshwater fish used for dried fish business are snakehead, *Nga-pa-naw*, eels, *Nga-daung zin* and Rasbora. In the dried fish business, dried fish are produced with freshwater fish such as river catfish and carp. But due to the low quality of dried fish they do not gain great support from the consumers. In the dried fish business, normally, more saltwater than freshwater fish are used. But Twantay is a main source of freshwater dried fish. Dried fish are produced and imported from surrounding villages into Twantay. A viss of dry snake-heads costs 5,000 kyats.



Figure 5: Dried fishes

As the businesses of the local people boom, they have no worries for food, clothes and shelter.

### Discussion

Fish farming is a business that contributes to the country from one side or other by providing food. Myanmar is the second largest country in South East Asia and the coastline covers 2,832 square miles. There are four main rivers and many tributary creeks and streams. In 2016-2017, the income from fish farming accounted for 605 million dollars in Myanmar; in Vietnam, it is 7,100 million dollars and in Thailand 7,500 million dollars. Small indigenous fish species have recently been considered as an important source of essential macro and micro nutrients.

In Myanmar, there are 520 freshwater fish species out of about 776 freshwater and saltwater fish species. The fish species found in Twantay region are *Nga-pone-nar*, *Nga-za-yaing*, *Nga-khone-ma*, *Nga-thit-tone*, *Nga-zin-zut*, and *Nga-be-phyu* etc.

Myanmar nationals living in Twantay Township normally use their traditional fishing methods to catch different species of local fish and then cook and eat them in a healthy way. Many local people there have made their livelihood by catching fish while complying with the regulations of the Department of Fisheries. As many years passed, they have begun to face situations where many species of fish are becoming rare. Because of this, local people have started creating coping strategies including the breeding of fish in manually constructed lakes.

### Conclusion

This study focuses on the sustainable food systems and food security coping strategies for food for the Myanmar nationals living in Twantay Township, Myanmar. Many local Myanmar people dwelling in Twantay Township rely mainly on fishing business for their livelihood. Their food consumption is

also reliant on fish and fish products. For healthy living, fish is also an integral part of their belief system which helps to improve their health and physical fitness. Economically, the long-term sustenance of the local community can also be improved by fishing and fish-related businesses like making fish-paste and dried fish. In conclusion, it was found that although Twantay region finds itself less dry than any other areas because of the existence of a canal in the region, it is currently faced with situations where many species of natural fresh-water fish are becoming scarce as a consequence of the local community's use of different coping strategies for food by catching fish continuously for many years. In addition, since the global climate has changed and new fishing methods have been developed, there has been over-fishing resulting in increasing scarcity of resources. However, it was observed that the fisheries in Twantay region are useful businesses contributing in some way to national food security. This study also presents the local community's coping strategies for food, from the anthropological perspective.

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