

## CHAPTER 5

### Local Environment Knowledge and Livelihood Strategies

This chapter examines the local knowledge as a tool for specific environmental conservation in mangrove usage and mangrove restoration. It also refers to local knowledge as a tool for livelihood strategies in the past and the combination of their traditional knowledge with new knowledge to form coping strategies in the face of the era of development. As a result, local knowledge can be maintained and regenerated with scientific knowledge as a new hybrid knowledge space.

#### 5.1 Local Environmental Knowledge

Environmental knowledge here means not only the knowledge in mangrove conservation but also the way local people use their knowledge for their culture, society, and livelihood strategies. It is believed that society, culture, and livelihood strategies are linked to historical, political, and social contexts. Thus, environmental knowledge is very difficult to produce without looking into these contexts. Environmental knowledge can come from both scientific knowledge and local traditional knowledge. This section concentrates on how local knowledge acts as environmental knowledge and how local people negotiate in the face of scientific knowledge.

Local knowledge is a kind of knowledge that is produced by local people in a specific area. It includes knowledge about soil, crop yields, pest management, water usage, farm management, natural resources use, and so on (Taylor and Loë, 2012). Local knowledge can advise the best time to plant, and harvest, how to care for plants, and what kind of soil is suitable for specific crops. It can also provide any information about how their river operates, how to predict whether or not it will rain, growth of plants, changes in the seasons, and others. This kind of knowledge cannot be learned or accumulated in a matter of days or months. It takes years to actually accumulate the knowledge of a specific area through ongoing experiences.

In Quang Phong, local knowledge acts as a tool for mangrove forest usage, social and cultural practices, and livelihood strategies, which will be discussed specifically in the next section. This kind of knowledge management can be seen in village customs regarding the environment, labor, social relations, sharing of economic interests, resolving differences, and the power of the different actors who are involved in mangrove restoration, labor management, village customs, and knowledge adaptation.

### 5.1.1 Knowledge in Mangrove Ecosystem

Before the mangroves were destroyed by the bombing in 1968-1972, the local people used mangroves as a source of their livelihood strategies and shelter during the war. They collected fire wood for their everyday life. Leaves of *Rhizophora stylosa* were collected for food, while fruit of *Sonneratia ovata* was collected for cooking. Villagers said that *Sonneratia ovata* fruit was really good for its sour to slightly bitter taste, which went well with river fish that they caught locally, while *Sonneratia ovata* leaves was also used to eat freshly. Local people also sometimes collected firewood from the forest for their personal use, as they mentioned *Bruguiera gymnorrhiza* and *Rhizophora stylosa* as good sources of high energy firewood. Additionally, mangroves were used as sources of construction materials, especially for building a house at that time. Wood of *Rhizophora stylosa* was normally used for the columns of the house.

The mangrove also provided an aquatic source of income for local villagers at that time. They caught fish, shrimp, crabs, and molluscs (oysters and snails) in the mangroves and near-by areas daily. Mangrove oysters were also cultivated on the mudflats in the mangrove from 2008-2010. Crabs were collected by women and children along the river banks and creeks in mangroves. The crabs were collected by using a bamboo trap or hooks. Local villagers normally utilized traps during high tide and stopped when the tide receded. Hooks were used during low tide and normally at night. Experienced local villagers can identify the crab hole, insert a hook, and pull the crab out. Fish and shrimp were collected by traps, lines, and nets. Traps normally were used on the bank of a rice field, river bank, and in the

mangrove mud, while lines and nets were used in the river. They also hunted birds during the day.

Although the mangrove forests had open access at the time, the village had their own regulations regarding access and use of the forest. Local villagers could access and collect aquatic resources. However, if they wanted to cut down a tree for their personal use, they needed to have permission from the local committee at that time, determined by a roundtable discussion about access to the forest in order to keep the natural resources sustained. Additionally, firewood collection was only allowed for the dead branches or trees in the forest. Mostly, the village board advised local villagers to use rice straw after harvest for energy, which still plays a traditional role of providing energy now. It can be seen that there was no official law regarding forest management during the wartime. Local villagers knew how to utilize their resources quite suitably.

Based on the experiences of using the mangrove forest, local villagers knew the time and the way to collect the seeds and seedlings as well as the way to take care of the forest effectively in the first mangrove restoration project. Planning, implementation, and caring processes were conducted by the local villagers in the 1978 project. According to a QTFAE officer, during a meeting with a group of local villagers interested in mangrove restoration, she learned the suitable time of planting, which included the tide, level of salt in the water, and the weather. They also discussed about how to collect the seeds and how to manage the nursery. Additionally, caring processes were emphasized by the participants as a necessary process in mangrove restoration.

Before the implementation process, we conducted a meeting with the local elderly in order to ask their opinions about the most suitable time and location for mangrove planting. Because of their knowledge in this area, I knew that these people had a valuable knowledge about the way to use and regenerate as well as protect the forest. (QTFAE officer, December 2014)

Mangrove restoration is usually conducted in late January or soon into February, and seeds were collected in late December because, according to the villagers, that is the best time for collecting the seeds, when they are mature enough to regenerate new growth. After collecting, they put all of the seeds into a big bag and kept it in the dark for around one month before planting. Depending on the species, they will plant by seedling or seed directly.

Table 5.1 Phenology calendar of mangrove species in Quang Phong

S	T	Month											
		1	2	3	4	5	6	7	8	9	10	11	12
RS	P				---	---	---	---					
B G	P				---	---	---	---					
A A	SV Se								---	---	---		
A M	SV Se								---	---			
SO	Se							---	---				

**Note:** S: Species; T: Type of Seed

P: Propagule , SVS: Semi-viparous seed, Se: Seed

---: major fruiting and propagule development;

■: Mature propagule age

Table 5.2 Local Knowledge Method on Mangrove Seedlings Regeneration

Name of species	Methods

Rhizophora stylosa (Đước)	Collect mature propagule and keep into a bag for 2 weeks before planting
Bruguiera gymnorrhiza ( Vẹt)	As same as Rhizophora
Avicenia alba (Mắm Trắng) and Avicenia marina (Mắm Ồi)	Collect seed and do nursery in the mangrove area
Sonneratia ovate ( Bần)	Need to do nursery in the mangrove area

When it came to implementing the planting, local villagers used their knowledge about tide duration and the weather in order to decide the most effective time to plant. This knowledge of tide duration was also applied to caring for the new growth later. According to them, the best time for planting was February because the trees were no longer small and vulnerable to external factors, such as extreme tidal movement. In February, the tide is stable, not as powerful as from September to December, and not as low as in from April to June. Additionally, the rainfall and temperature also affect the development of the mangrove trees. When the rain is too strong, the trees cannot stand because they are not mature enough, whereas, a lack of rain can cause a lower water level, which has a negative impact on the trees. Additionally, because in Quang Phong, the tide duration is half daily tide duration, which means the duration between high tide and low tide was from 3 to 4 hours. The high tide was at 8 am and 1 pm every day and the highest tide reach at 2 pm. According to a former planter, the duration of the tide movement can affect tree development and the impact oysters have on the seedlings. If the tide movement is too long, the oysters have more time to latch onto a tree, which will cause serious problems in the tree development. Therefore, the villagers have to implement the caring process frequently, including removing the shellfish from the small trees.

We built a cottage every twenty-five meters along the mangrove side in order to protect our mangrove trees because the fishers outside the village want to cut down the forest, not only because of wood but also for their own livelihood strategies. They used to catch fish and shrimp in the forest areas, so they still want to fish in this area as they used to in the past. In addition, the oyster is very dangerous for the mangrove tree, and they come with the tide every day, so we have to remove them from mangrove seedlings in order to protect the tree. And it worked well. (Former Mangrove Planter, December)

One more thing local villagers mentioned, mangrove forests help reduce the loss of their shrimp farms during the flood season. After the mangrove forest was generated, they realized that the flood level was lower and that the mangrove made a barrier to protect the shrimp farm. Therefore, the shrimp farm owners tried to regenerate the forest on their shrimp farm banks for protection. They also open the canal twice a year for natural movement of aquatic species to their farms. Shrimp farms receive a lot of benefits from the mangrove forests. The figure below shows how local villagers perceive the importance of mangrove according to environmental aspects.

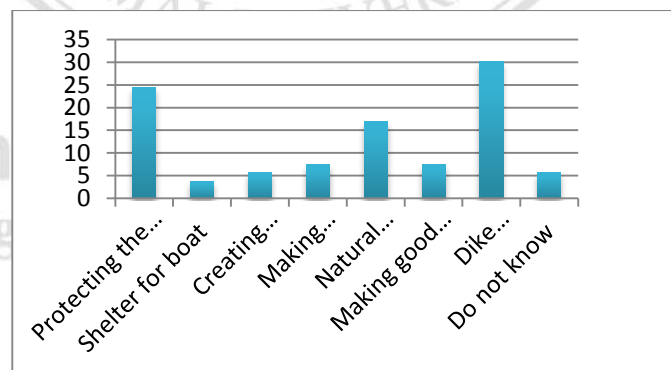


Figure 5.1 Local villagers' perception about the importance of mangrove forest according to environmental aspects

All in all, local knowledge has also played an important role in environmental knowledge from the past until now. However, the question here is whether the mangrove restoration needs only local knowledge or a

combination between scientific knowledge and local knowledge in order to have an effective outcome of the project. This will be examined in section 5.2

### 5.1.2 Custom and Livelihood Strategies in the Local Context

As mentioned above, local customs towards environment, village social structure and cultural practices as well as their labor distribution and livelihood management are all a part of local knowledge. Their customs and cultural belief were addressed in chapter 3, so in this section, the labor distribution, their livelihood practices, and their link to environmental awareness will be discussed.

Table 5.3 Basic demographic information of household in Village 6

Average number of labor	2.9
Average number of people	4.1
Average number of female labor	1.45
Average years of schooling (household owner)	6.8
Average number of children	1.59

In rural villages in Vietnam, the role of men is still dominant to that of women throughout economic, social, and cultural activities. Firstly, a household's land title is held by the household's patriarch. Secondly, the participants in the meeting activities were predominantly men. Additionally, the first mangrove restoration project was conducted by twelve members of the Veterans and Elderly Associations, who are also men, and the majority of members on the village board were also men. Lastly, the village headman has always been a man since the village was founded. However, under the era of development when people were educated about gender equality, the role of women improved and women could participate more in the village activities. Interestingly, during the period of the first mangrove restoration project in 1978, when the role of women was under a controversial debate,

the officer who was in charge of the mangrove restoration project and who managed all of the activities with the participants was a young woman who had just graduated from National Forestry University. This showed that the role of women was not always lower than men as people imagine.

Additionally, men always had the responsibility of hard and difficult work, while women had easier tasks. There were some exceptions, such as some women-led households headed by war widows or women who had entered into the military. Usually, men were in charge of land preparation and harvesting, while women sometimes did crop caring. Men fished in the river, and when women did household work, took care of children, and collected some firewood and aquatic resources. Men had the responsibility of making a living for the whole family. That was the tradition in rural Vietnam, and it still has not changed although the number of female labor and male labor is almost equal in this village with 1.45/2.9 labor per family.

Local people's livelihood was based on the seasonal calendar, and their experience had accumulated over generations. Thus, they learned to cope with the changes of weather and development. During the collective period, there were some interest groups who were divided based on ability, gender, and age, such as the agricultural group, fishery group, sewing group, and so on. Villagers did their work and received points for food vouchers. The more points they accumulated, the more rice they got from the cooperative farm. During that time, mangrove restoration was also an activity of the cooperative farm, and that is why participants received points for their work.

The traditional livelihood of local villagers here is based on the agriculture and fishery sectors. The main crops are rice, corn, and vegetables, and the seasonal calendar is still being used until now (Table 3.3). The main season of rice is from May to September in summer and autumn, and the low season is from December to April in the winter and spring. Because October and November have the highest rainfall in the area with more than 70% of the annual rainfall, vegetables are cultivated during this time and spread out to all year round. The rice seed for both high and low season is accumulated



from the low season and stored in a warehouse. Local villagers claim that May and June are the best time for drying the seed, so it normally occurs after the low season harvesting. In contrast, corn seed is stored after the high season harvest in April. It can be said that April (March in lunar calendar) is the highest season of agricultural activities in the rural area. May and June (April and May in lunar calendar) are the time for preparing the seed and the beginning of rice cultivation. Vegetables are in supply all year round for local people, especially *rau khoai lang* (*Ipomoea batatas*) and *rau muong* (*Ipomoea aquatic*). Pumpkin is only cultivated from October to April because this species thrives better in rainy season than dry and hot season. Additionally, local villagers have their traditional knowledge about weather and flood forecast based on natural signs from plants, insects, and the surrounding environment. According to an interviewee, villagers are using this kind of traditional knowledge in combination with weather forecasting on television for their livelihood activities (Table 5.3)

Table 5.4 Quang Phong traditional ecological knowledge

Vietnamese	English	Interpretation
Chuồn chuồn bay thấp thì mưa Bay cao thì nắng Bay vừa thì râm	If a dragonfly flies low, it will rain, if it flies high, it will be sunny, and if it flies average, it will be cloudy.	About weather forecasting for cultivation activities
Mau sao thì nắng, vắng sao thì mưa	If the night's sky is full of stars, tomorrow will be sunny. But if there are no stars, tomorrow will be	For livelihood activities. Depending on rain or a sunny day, they will do different activities

	cloudy	
Tháng bảy kiến bò, chỉ lo lại lụt	If ants move a lot during the 7 <sup>th</sup> month of the lunar calendar, there will be a flood.	About predicting a flood: Because ants are really sensitive to weather, when they move their nest higher, it means there is going to be a flood.
Nhất nước, nhì phân, tam cần, tứ giống	First: Water Second: Fertilizer Third: Hardworking Fourth: Seed	In agriculture, the priority of factors is water, and then fertilizer, and then the hardworking of labor, and finally seed
Tháng bảy heo may, chuồn chuồn bay thì bão	If a dragonfly flies on a cloudy day in July, a storm is coming.	About weather forecasting. In the past, they used this way to predict storms to prepare before the storm comes.
Lúa chiêm lấp ló đầu bờ Hễ nghe tiếng sấm phát cò mà lên	If there is thunder in the rice field, rice will grow well.	There will be a chemical process happened during the time of thunder in which KNO <sub>3</sub> will be created in the rice field, which is a fertilizer for rice, so that rice will grow better after that phenomena.

Local villagers also use their agricultural products to feed their livestock, chickens, ducks, and pigs. Food comes from rice, vegetables, and grass on the bank of the rice field. Pigs are raised in a fixed area, whereas chickens and ducks are raised freely in the garden where they can run everywhere to find additional sources of food. Buffalo are fed by grass on the river bank and sometimes are left on the bank of the rice field for half of a day. The main function of buffalo is working in rice fields during the land preparation

process, while pigs are raised for meat. Chickens and ducks are raised for both meat and eggs.

Additionally, as pointed out in chapter 4, the Vietnamese agriculture system witnessed one of the first evolutions in the 1980s, firstly, 'Khoan 100' in 1981 and then 'Khoan 10', about the agriculture management revolution in April, 1988, which redistributed agricultural land among the people. The local people could use the agricultural land for 10 to 15 years (Dung, 2013). According to field interviews, under 'Khoan 10' agricultural land policy had been distributed to the local villagers based on the number of people in the household. Each person received 500 square meters and, because at that time each household normally had a large number of people, each household had more than 5000 square meters of agricultural land on average. After the new Land Law was issued in 1987, and then amended in 1993, 1998, 2000, 2003, and 2013, the land certificate was issued, and local people had more rights with their land. However, after their children grew up and got married, parents normally gave their children a fair share of the land. Thus, the average land holding in the area is 1240 square meters with the average income range 8,000,000 VND per household per year (USD 381). After the costs of fertilizer, land preparation, and harvesting, each household earned about 5,000,000 VND per year (USD 238).

During Khoan 10, we received land based on the number of people in our household. Each person received one sao, so at that time, we had around twelve sao. But after that, when our children grew up, we distributed our land among them equally. So, now we just have five sao. (shrimp farmer, December, 2014)

We got the land title of our residential land in 1993, and we got the agricultural land title in 2002 after the conversion from rice paddy land into a shrimp farm. (Farmer, December, 2014)

Besides agricultural activities, local villagers also have the tradition of in-shore fishing, in which they go fishing in the river at night time, this is called

*'di te'*. They also collect marine food sources from the river bank and mangrove forest. The high season for *'di te'* is from September to November. During this period, they can go fishing around 20 times each month on average, with around 1.5-2 kg of river shrimp per night and 3kg of fish per night. With that activity, they can earn 200,000 VND (around USD 19) on average. However, during the low season, they can go approximately 10 times and with very low productivity. The reason for this seasonal shift is that during the rainy season in September and October, thanks to the strong current, the river fish follow the river current and migrate from upstream to downstream areas.

After 1986, Vietnam changed from a socialist country to a market-oriented country under the socialist direction. Although there were new coping strategies, agriculture still played an important role in the village. Some new livelihood strategies were developed, such as shrimp farming, small businesses, construction work, migrant work, and so on. The shrimp farm was incorporated in 2002 under a provincial policy of land concession. The price of shrimp was increasing dramatically at that time due to major exporting to Europe and Asia since the late 1980s, and, as a result, the central government encouraged expanding the shrimp farms (Hue and Scoot, 2008). The shrimp farm concession in this area was just a result of this policy. An area of 7.9491 hectare of the rice fields were converted to shrimp farms in 2002 in Village 6, and 43.57 ha were converted in the whole Commune. To implement this change, the rice field owners and the non-rice field owners of the converted area had a meeting to undertake a lottery to choose who would convert their rice paddy field into a shrimp farm. In the case that the land owner could not convert their land, they would receive money from those who used their land, the same amount as they would have received from their rice field in the past. This situation clearly shows the socialist construction in Vietnamese society that “all land belongs to the government,” but it also shows the autonomous role of the local government and village board in the implementation process.

According to interviews, the shrimp farms made a profit in only the first two years. With 5 sao of shrimp farms, local villagers could get 500 kilogram of shrimp at the end of the season, which helped them earn around 100,000,000 VND (around USD 5,000) per season in the first two years. After that, due to an unidentified disease, the local villagers let the shrimp farm develop naturally and collected the shrimp at the end of the season, amounting to around 8,000,000 VND (USD 400) per year. As observed firsthand, the shrimp farm embankment was very simple, and there was no regular water exchange in the pond. In addition, there was no equipment to add oxygen to the pond, which caused the slow growth of shrimp. According to Hong and San (1993), this situation made the water PH decrease to around 4 or 5, which causes the death of shrimp and other organisms. One more thing is poorly constructed shrimp ponds caused soil erosion to happen faster. As a result of it, the growth of shrimp and fish were affected. Shrimp are raised from January to May or June in the high season, and they rarely farm in the rainy season because of the annual floods from September to November. According to the shrimp farmers, although the shrimp farm has not worked very effectively currently, they would still like to continue shrimp farming. Local villagers use their knowledge about tide and weather to open the mouth of the canal in order to get natural shrimp and fish from the river. Since 2009, some local villagers have also planted mangrove trees along their shrimp farm in order to protect their shrimp farm during natural disasters. During the fieldwork, people claimed that there was only one training for the shrimp business and when the disease occurred, there was no solution for it. It seems that the local villagers' lack of knowledge of the shrimp business management, especially in water quality and disease management had been ignored by the policy makers. The deterioration of shrimp farms not only caused the death of shrimp but also had a negative impact on the mangrove forest next to the shrimp farms.

During the first two years, our shrimp farm provided a large amount of shrimp to the local market and brought in a lot of money for us. However, after that, the shrimp got a strange disease, and many

officers came to do research about this problem. But there was no solution for this until now. Nowadays, we just open the farm naturally to get the natural shrimp and fish in order to maintain our small income from the farm. (Shrimp farmer, December 2014)

Another livelihood strategy is construction working. Based on the past experience and an increase in need during the era of economic development, more and more local villagers were becoming construction workers. They not only worked in the village or Town but also worked overseas and made connections with the other villagers. There were 41 domestic construction workers and 68 villagers working overseas as construction workers out of the 365 people in the village. They mainly worked in Angola illegally with a tourist visa, while others worked in Malaysia and Indonesia legally. All of the construction workers were men aged from 25 to 50. In Angola, they mainly worked in groups of Vietnamese with a leader who is in charge of looking for new project to do, whereas in Indonesia and Malaysia, they worked for a company with a legal salary. This is currently one of the main income sources of the villagers besides the agriculture sector.

Because of over population and the need to create a livelihood, more and more local villagers are moving out from their homeland to other places in order to make a living. The original idea came from a villager who participated in a construction group in Angola in 2003. After realizing the potential profit in the area was more than in his hometown, he spread the information and helped his relatives, as well as the others villagers, come to work under his construction group. Because of that, the local income has been increasing lately. Additionally, local villagers have also developed new livelihood strategies based on their main strategies, such as merchants and small businesses. While some buy shrimp and fish to sell in the market, others buy rice and vegetables and sell to the big business men. Thus in the era of economic change, local villagers have adapted to that change effectively. For example, because of the lack of fresh water in the area, local people have their own water tank for storing rain water. They know that there are around two months, July and August, that the southwest wind

brings hot and dry conditions with a lack of rain. So, they normally keep the water from the high rainy season to use during the time of little rain.

It is believed that there have been a lot of changes in the village from the past until now, changes in the economy, livelihood, and environment. Under these changing conditions, the local knowledge is in danger of disappearing. However, the fact is that local knowledge is actually situated in the change. It is just one more piece of knowledge used to adapt to the new changes and is transformed into new kinds of knowledge. This is called the knowledge space and will be addressed in the next section.

## **5.2 Mangrove Forest Usage as a Situated Knowledge**

In an era of continuous change, local knowledge is also in the process of continuously changing, adapting, contesting, and coexisting, in which the dichotomies of traditional and modern, situational and hybrid, local and global are mixed together to create a complicated local life (Nygren, 1999: 269; Yos, 2003: 43). Mangrove forests are not only a means for survival; they also carry more meaning. Knowledge is a production of social activities and is socially constructed. It means that in different contexts and social changes, a concept can join or clash with that change.

Mangrove is an ecosystem with the internal and external interaction under the change of climate, society, and history. This ecosystem is not only interacts inside with its species, river, mudflat and so on but also interact with another ecosystem such as agriculture or aquaculture or human. Under these changes, local knowledge needs to be adapted with the new kind of knowledge. In this area, local knowledge keeps changing, contesting, coexisting with modern knowledge. For example, the sharing experiences about time for planting, suitable species for mangrove restoration, or phenological calendar of mangrove species have been kept going on in the village.

Local people use the mangrove forest with adaptive strategies. People do not use the forest products only for their livelihood; it also is a part of their traditional culture and history. Traditional knowledge is used to manipulate mangrove forests as part of their social and cultural roles. Villagers cut timber for houses or boats, catch fish and shrimp, take care of the forest trees, and show respect for the forest. They use their knowledge

variably, applying it to new situations to maintain their livelihood while still protecting the forest.

Most of the households here have extended family members, when the old generation lives with their children and their grandchildren in the same house. This is a really good opportunity to exchange knowledge and stories from the past as well as new knowledge from the young generation. It is believed that local knowledge has been transferred orally for many generations. The young generation has learned knowledge from school, while the older generation has built their local knowledge over time. In a household that I interviewed, an old man shared his story and experiences of mangrove restoration in 1978 as well as the time he was a soldier. He shared about how he and the other participants found the source of seeds, how they grew them into seedlings, and how hard they tried to protect and care for the trees under the changing weather. That is his favorite story to share in the social gatherings so that sometimes the one who was not involved in the mangrove restoration project hears the story and adds the experience to their knowledge. His son and current Farmer Association representative has also adopted this bit of knowledge about mangrove restoration. As there are studies in mangrove reforestation conducted there, and the researchers and students come to the Farmer Association representative to get information, from time to time, in helping the researchers as a research assistant he has also accumulated new kinds of knowledge from the researchers. His network with the scientists has also expanded. For example, he received thirty *Nypa* trees to plant in the mangrove area along with a guide book from Hue University of Agriculture and Forestry. In combination with knowledge he had received from the old generation, he planted all of the trees. Those trees developed well in the first two years; however, due to the impact of the flood in 2010, the majority of the trees were destroyed. This kind of application by a villager should be encouraged more.

It is believed that local villagers' experiences and new technology in mangrove restoration somehow challenge each other, but they can also work together to produce better results in some cases. That is the case of planting mangrove trees in the shrimp and river dyke. Scientific knowledge demonstrates that mangrove forest can act as natural barrier to protect the river dike and the village. Local knowledge claims that the shrimp next to the mangrove can develop better than the shrimp located farther away. In



this case, some shrimp farmer used their traditional knowledge to plant mangrove trees in the shrimp area. They collected the seed of mangrove trees and plant it along the bank of their shrimp farms to prevent erosion and create a habitat for their shrimp during times of flooding. They also open a small hole for natural development and get income from the shrimp, fish, and crab naturally present. Some of them can also catch fish along the forest edge and new river side. This shows that their knowledge has adapted to new changes. They applied the experiences from the mangrove restoration projects that they participated in and applied their traditional knowledge when the carried out this plan.

During the flood and storm season, our shrimp farm had been affected seriously. After talking with some elderly people in the village, I found the way to prevent the consequence of natural disaster. I collected the seedlings of the mangrove tree and planted them along the canal and my shrimp farm. After two years, it became a good habitat for our shrimp. The number of lost shrimp has been decreasing during the flood seasons, and I am happy with it. (Shrimp farmer, December 2014)



Figure 5.2 Mangrove tree planted by local villager in the shrimp farm bank

According to scientific knowledge, mangrove forest regeneration depends on specific factors, such as temperature, tide movement, rainfall, soil, the level of salt in the water, and sunshine. The mangrove trees can develop well from 20-30<sup>0</sup>C, with an annual

rainfall from 1800-3000mm/year (Thanh, 2010; Alksornkoe, 1993), and with flexible tide movements, because if there is no water, the water in the soil will turn to vapor and the level of salt in the water will increase. Salt levels should be between 10-25% with specific 2-11% for *Sonneratia* and *Aegiceras*, and 7.5-17% for *Rhizophora*, *Avicenia*, and *Bruguiera* (Thanh, 2010; Blasco, 1984). The level of salt in Quang Phong is 5-10%. The local knowledge claims that mangroves can develop well in the spring time when the temperature and rainfall is medium and the tide movement is not too fast. Additionally, in this area *Rhizophora*, *Avicenia*, and *Bruguiera* are dominant. Although both kinds of knowledge interpret things in a different way, they still demonstrate that they are intertwined in some points.

In summary, it is believed that each place has its own knowledge and cultural systems. Scientific knowledge or local knowledge alone cannot be a solution to complex problems; local knowledge is suitable with local context in a specific time and place. However, under the change of weather, socio-economic, environment or even through politics, there is needed strategy to not only conserve the local knowledge but also integrate it with scientific knowledge to cope with the change. This combination showed that in the case of the shrimp farm embankment, the local villagers adopted mangrove restoration to protect their shrimp farm and storm prevention. The combination also showed in the case of mangrove restoration projects that the suitable of time for planting was decided by the project manager with the consultation from Farmer Association representative and village board who are villagers. The combination also showed in the case of agriculture when the source of rice species was 49.8 percent based on local source, and the rest was based on the hybrid productivity source from DDARD. The reason in this case is that some local rice species cannot stand with the change of extreme weather in the area, while the others can. Thus, DDARD officer did a research to find the good species for preservation and develop a new hybrid species which has high productivity and can stand under the extreme weather. The rice species used for Summer Autumn season are PC6 and IR50404, when P6, XT28, and PC6 are used for Winter Spring Season. Additionally, local officer followed up the rice development process for helping local villagers when unpredictable disaster or diseases happens. Thus, when the knowledge is situated, there is a potential solution for coping with the change.

### 5.3 Participation of Mangrove Restoration as Negotiating Livelihood Strategies

Local people have used the forests as shelters, as a food source, and as a means for their livelihood strategy in the past. However, under historical and economic impact, villagers have had to adapt their traditional usages in the new era. Under this new stage of development, the local knowledge of villagers still acts as both environmental knowledge and livelihood strategies for them, while scientific knowledge just concentrates on ecological services. The point here is that the villagers must negotiate their rights in order to effectively participate in the mangrove restoration programs. In this case, people can negotiate by generating a new knowledge space to prove that local communities cannot live without mangrove forests and that they have their own knowledge to take care of the forest.

Local history has clearly shown that when the power was transferred to a different level of administration, it can turn good governance into a bad one, and vice versa. An example of a positive outcome is through the local government project in 1978 and the officer who managed the project. In the project in 1978, during the centralization period, a local officer was a good bridge between the government policy and the local context; whereas, in the new projects, too much concern on quantitative outcome drives the project to be not really effective. In the new projects, the local officer realizes there is a lack of livelihood promotion in the project but does nothing because “the policies do not mention about it and the problem of a lack of budget”. Both cases show the crucial role of local government in Vietnam - the power of local government to transfer power to and throughout the local context.

There are some successful cases about livelihood promotion in mangrove restoration in the North and South of Vietnam and SEA. Mostly, projects were conducted by NGOs. In these cases NGOs plan to involve local people from the starting point of the project. They also monitor and ensure that there is a tightly held link between NGOs, local government, and local people. Thus, in Quang Phong, local people should use their traditional knowledge to negotiate with local government first. The first point they need to concentrate on is to improve their knowledge about the law and updated government decisions and decrees. Local people have cultural and spiritual connections with their land and resources, but without land security, how can they negotiate? Sustainable

livelihood should come with security of ownership in which people can access resources. In this case, forests should be allocated to local people for livelihood promotion and mangrove conservation, the government's law showing emphasis on local livelihood.

Table 5.5 Article 47: Non-Timber Forest Products Collection in Protected Forest, Forest Protection and Development Law 2004

...
2. NTFPs collection based on:
a) Can collect NTFPs when the protected forests reach the standard of protection.
b) Can collect NTFPs without negative impact to the protection functional of the forest, except endangered species according Government law of endangered species protection.

Therefore, local people claims their knowledge as a tool to negotiate with government is constructed in the context of the economic era. They have to demonstrate that they can preserve the forest better than outsiders and that they also want to improve their livelihood security by accessing and managing the forest. They can raise honeybees or oysters, they can plant mangroves and cut down trees for selling, or they can collect fruit for selling. Environmental knowledge has to be used here as a tool to justify the management of the mangrove forest.

Furthermore, they need to maintain and extend their social network with other villages who have knowledge of mangrove restoration, so that they can strengthen their capital to better negotiate with the government. They can have a source of seeds, they can share their knowledge, and they also can have the support from the academic and NGOs sectors. Lastly, the human-nature of interaction in the village will produce a long term interaction between villagers and their nature.

#### 5.4 Summary

Environmental knowledge is a part of local knowledge, and it has been constructed by the specific context they live in. Local knowledge can be applied to mangrove

restoration; it also can be a part of traditional livelihood. In everyday practices, local knowledge is maintained. It adapts to the changes, but it is also situated in the local context. Local people are the ones who can use and adapt this kind of knowledge in the context of their environment, but scientific knowledge is always dominant in government policy. Both kinds of knowledge seem to be opposing, but they contest and intertwine in some ways. Thus, a combination of both is a solution for new policy under changing circumstances.

Local villagers seem to be vulnerable because they are lacking in the knowledge about law and policy. Additionally, the outcome of projects has been affected by local government policy more than the central government. Thus, local government should play a bridging role to introduce the policy into the local context, and local villagers should negotiate their rights by using their local knowledge.



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