

CHAPTER 5

CONCLUSION

5.1 Key Results and Findings

This research has focused upon the local knowledge that existed in the Houay Yae community regarding the management of aquatic resources within a rice field ecosystem, and in a situation of rapid socio-economic development and ecological system change. The key research findings are as follows:

5.1.1 The Importance of Aquatic Resources for Local Livelihoods

Aquatic animals present in the rice fields at Houay Yae village have played an important role in local livelihoods, being a key part of the local food culture and local ritual activities, as well as providing food security for households and contributing to household incomes. In terms of food security and income generation, at least 88 species of aquatic animals were consumed in the village, including fish, frogs, mollusks, crabs, shrimps and insects. These aquatic animals provided the primary food source for household food consumption activities in Houay Yae village, in addition to meat, pork, chicken and vegetables. The average consumption of aquatic foods per household per year was 241.43 kg of fish, 12.01 kg of eels, 59.62 kg of frogs, 112.45 kg of snails and 10.09 kg of *khuang son* (aquatic insects) –out of a total of 435.60 kg as the average household food consumption. Within this, rich households consumed 531 kg of aquatic foods, while the poor households consumed 324 kg. Aquatic animals also contributed significantly to household incomes - on average 6,001,640 kip (800 US\$) per household per year.

These findings also showed that aquatic foods have played a key role in terms of food security in Houay Yae village, supporting the Lao government's strategy for national fisheries up to 2020 and its action plan of 2006 to 2010. Outlined in the strategy was that fish consumption should represent ten to fifteen kilos per person per

year by 2005, and 22 to 27 kg/person/year by 2020 (Department of Livestock and Fisheries, 2006). Based on this view, aquatic foods served as household food security at Houay Yae village, providing an available and accessible food source of the right quality and quantity; that is safe, nutritious and acceptable to all household members throughout the year. This was linked to the concept of food security put forward by the FAO (2008), which argues that food security is the availability and accessibility to all people (and at all times) of sufficient safe and nutritious food that is enough to meet their dietary needs and food preferences and help them lead an active and healthy life.

In addition, aquatic foods also played an important role in cultural and ritual activities, whether it was the serving of traditional foods at ceremonies or is as ‘supernatural foods’ during rituals. Aquatic foods were used as ‘sacrifice food’ to pay respect to supernatural beings and ancestors during Buddhist and local customs and ritual activities, including the *boun haw khao pa pub din*, *boun haw khao sa lark*, *ta haek na* ceremonies. In addition, aquatic foods were also used during other local ceremonies; for example, *larb pa* was used at weddings, house warming ceremonies and the *basi* ceremony, because *larb pa*, from a local perspective, was not just a food but represented good luck, health and success. Furthermore, aquatic foods have an important medicinal value, one that is based on local beliefs, such as dried eels’ tails used to clean pregnant women’s head during birth, and this reflected on the reality of local rituals in Houay Yae village and those practiced over many generations and right up to the present day.

5.1.2 Socio - Economic Transformation in Houay Yae

The new economic reformation in 1986, known as “*Chintanakarn Mai*” (new thinking), focused on market orientation led to socio-economic transformation of the tourist and agricultural sectors. The agricultural sector had developed into a modern agricultural sector. As an example, practices that took place in the Houay Yae community. Tourism had flourished with a newly established tourist site at Vang Vieng, and the villager’s way of life had been changed to new forms of livelihoods such as to market based agricultural cultivation and to paid work. On the negative side, this transition led to environmental degradation and declining of

local food resources which forced local people to adapt both their livelihood and their resource use.

Local people in Houay Yae village also had to adapt in recent years in terms of their farming practices, fishing methods, food culture and livelihoods, all of which were an part of the aquatic resources management strategy used. Farming practices were an important part of aquatic resources management, and in particular, traditional farming practices, as these have played an important role in terms of providing nesting sites for the aquatic animals. Even recently adopted modern farming practices had been adapted in order to preserve and conserve aquatic animals, such as farmers maintaining a high water level in their rice fields and the non-use of chemical fertilizers, herbicides and pesticides. Farming practice adaptation in Houay Yae village reflected the aquatic resources management system used, such as the soil preparation techniques, rice field management systems and harvesting methods adopted. Soil preparation practices provided space for aquatic animals to raise their young over one or two months, and aquatic animals were collected when the rice fields were harrowed. After transplanting, the farmers maintained a high water level in their rice fields so as to provide habitats for the aquatic animals, and this system was repeated each cropping cycle.

At the same time, the fishing tools and fishing methods used had also changed and had been adapted based on the environmental and ecological changes that have taken place. At least 34 types of fishing tool were found in the study area, including the *bet* (fish hook), *toum* (rounded bamboo fish trap), *xai* (bamboo fish trap), *peun laem* and *laem sak pa* (fish guns), *ving* (dip-net), *soum sak pa* (fish coop), *mornng – hae* (fish net), *khong* (fish basket) and other indirect tools such as the 8-volt battery and diving mask. Many of these fishing tools had been used for a long time; however, some had not been appropriate in recent years given the changes that took place and were no longer used. This included the *xai*, *ving son tae*, *lun* and *mornng thien*. In order to provide enough food for their households, farmers had developed new tools, such as the *ka tong gob*, *ka tong pa* and *dang kuad pa*, and had adapted their fishing methods, such as rotating the fishing areas in time and space.

Livelihoods and the food culture in Houay Yae village were closely related to aquatic animals, and this had remained an important factor in helping to preserve

them over time. Local people had adapted their livelihoods, particularly food their culture, though many foods consumed in the past were still consumed, such as *pa daek* (fermented fish), *larb pa*, *tom-kaeng*, *aow* and *mork-mok*. Some of the more traditional foods had been adapted, such as *larb pa*, which is normally made from *pa tong* but nowadays were used from many species, such as white fish, because the level of diversity of such animals had declined. Many people in Houay Yae village now worked in the district town after having completed their farming activities, such as working in hotels and restaurants, working as housekeepers, working on construction sites as wage laborers, and working in the tourism sector as tour guides and taxi drivers.

These adaptation methods reflected local people's diverse cultural ecology in Houay Yae village, one which was adaptable and had been able to change to deal with the changing conditions faced by them. Local people had presented several potential adaptation methods, such as their farming practices, fishing gears and fishing methods used, as well as their food culture, in order to adapt to their environments. Sutton and Anderson (2010) pointed out that cultural practices could be seen as adaptive, because they represented the potential methods of adaptation available to humans, such as technologies, organizational forms, political and social systems, those used to adapt to their environments.

5.1.3 Local Knowledge on Aquatic Animals

Local knowledge on aquatic animals was a form of intellectual property for the local people in Houay Yae village, particular knowledge associated with the making and use of fishing tools, the gathering methods used, the classification of aquatic animals, and also the cooking and processing of food, as well as their beliefs in relation to aquatic animals and their collection and utilization. This knowledge had been passed down from generation to generation. At least 34 types of fishing tool were used in the village, including the *bet* (fishhook), *xai* (bamboo fish trap), *toum* (rounded bamboo fish trap), *peun laem* and *laem sak pa* (local fish gun); the *ving* (dip net), *soum sak pa* (fish coop), *mornng* (fish net) and *khong* (fish basket), and all these reflected aspects of local knowledge regarding the making and use of such tools. Local people possessed knowledge on how to use their fishing tools based

on observations and beliefs, and these played an important role in their gathering methods.

Furthermore, locals also possessed knowledge on the classification of aquatic animals based on their characteristics and their purpose within local livelihoods, the culture, food culture and their daily life activities. For example, *maeng ta lua* was a type of farming tool used traditionally. At least 88 species of aquatic animals had been classified by local people across six groupings, these being fish, frogs, mollusks, crabs, shrimp and aquatic insects. Aquatic animals were also classified based on their habitats and size and reflected how local people could use them as a part of their food cooking and processing activities. This local knowledge on the food culture was a part of their local identity and was still utilized at the time of the study. Local knowledge in terms of beliefs played an important role within local livelihoods, and particularly in terms of the use of fishing tools and the collecting methods used, such as the type of bamboo used to make gathering tools, *phoe chao nam vang pa*, *sok kheung meu* and also food taboos. These practices also helped preserve and maintain biodiversity in Houay Yae community.

5.1.4 Local Knowledge as Situated Knowledge

The Houay Yae community's livelihood involved the use of local resources and, in particular, aquatic resource management. The community used on local knowledge for the making and using of fishing gears, the gathering methods and the cooking and processing of food. At least thirty four types of fishing tools were used in the Houay Yae community and are categorised into eight groupings: *bet* (fish hooks); *xai* (bamboo fish traps); *toum* (rounded bamboo fish traps); *peun laem* and *laem sak pa* (fish guns); *ving* (dip – nets); *soum sak pa* (fish coops); *mornng* and *hae* (fish nets) as well as *khong* (fish baskets). These fishing tools were produced by local people as part of their knowledge production processes that are culturally situated. The tools have evolved over time as a result of changing environmental contexts and differing market demands. An example of the change is *ka tong sorn pa*. This research has revealed that certain types of traditional fishing tools used in the past, for example, *lun*, *ving son tae*, *xai* (bamboo fish traps) and *soum sak pa* (fish coops), have become obsolete due to their ineffectiveness in a context of modernization, rapid

climate change and negative environmental impacts that have caused decline in the aquatic habitat of the area. Many traditional fishing gears were utilized during processes to secure their livelihood; for cultural activities and for ritual activities. Examples of these tools are: *ka tong kob* (frog collecting tool), *ka tong son pa* (a type of dip-net), *dang kuad pa* and *peun laem* and *laem sak pa* (fish guns). The *ka tong sorn pa*, *ka tong kob*, *dang kuad pa*, and *laem sak pa* and *peun laem* (fish guns) were new forms of technology that were created from situated knowledge and adapted to the evolving ecosystem. A *ka tong sorn pa* was a fishing tool made from bamboo and dip-net and looked like a half of circle and was more effective than *ving* (dip-net) in catching fish on channels and streams. A *ka tong kob* was a frog catching tool effective as a catching tool for collecting frogs and was made from small bamboo stems around three to five meters long with a dip-net at the end of its stem. A *peun laem* and *laem sak pa* were new fishing gears suitable for catching in deep water and the *dang kuad pa*, a fishing tool made from bamboo stems and green nets was a new technology that replaced *ving sorn tae* (similar to a dip-net).

The knowledge of fishing methods was rooted in the knowledge of the Houay Yae community that was accumulated over time and handed down from generation to generation. This situated knowledge expended time, space access boundaries and fishing rotation. The research showed that local people in the Houay Yae community had rotated their space access boundaries and time based on the observed knowledge that was divided into the four zones, namely, Houay Yae, Nalongkuang, Phatang and Hinkhanmark. The rotation of collection was based on aquatic species such as fish, frogs, snails and eels were collected in rainy season. The *khuang son* (mixed aquatic insects), part of the situated knowledge and based on time and space was collected in the dry season.

The knowledge of this community is known as situated knowledge and has been adapted and changed as a result of development practices such as modern agricultural practices and tourism development. According to Nygren (1999), Beckford and Barker (2007), local knowledge is situated knowledge because it can be viewed as a continuous process of change, adaptation and contestation, and combines the traditional and modern, the situational and the hybrid, and local and global knowledge. All of these are integrated to create a complex local life.

Local knowledge as situated knowledge is defined as a process of negotiation in local resource use in the context of development and modernisation including the implementation of modern agricultural practices and tourism development to support livelihoods. Local people in Houay Yae community have adapted their local and culturally situated knowledge to create new forms of fishing gears that was appropriate to the changing aquatic resource landscape including tools and methods used. The process of knowledge production was used to negotiate modern knowledge in resource use including the use of electric shock tools and fish poisons. At the same time, local knowledge was employed by different actors, on different purposes based on capital, labour. The traditional fishing tools were produced by local people for their use to catch aquatic foods and these tools represented local identity; local food culture and the local community. Local foods were exploited by the tourism authorities for tourism purpose and this was a process of negotiation so that the tourism industry could benefit from this local knowledge. This process is in line with Nygren (1999) who, after studying migrant peasants in south eastern Nicaragua, asserted that knowledge production was a process of social negotiation that involved multiple actors and involved complex power relations.

5.2 Theoretical Discussion of the Findings

Many scholars had discussed the concept of cultural ecology, local knowledge as situated knowledge and household food security, which I have applied in order to study the situated knowledge that existed in relation to the management of aquatic animals found within a rice field ecosystem in central Laos. My aim was to develop a deeper level of understanding regarding the study community and its adaptations in terms of living and the management of the natural food sources to be found in the area. I have also explored the important role aquatic animals played within local livelihoods, the adaptation methods used by local people and the local knowledge applied to the management of aquatic resources at Houay Yae, particularly given the rapid socio-economic developments and ecological system changes taking place in the area. Based on the results of my study, I found that aquatic resources within the rice field ecosystem played a crucial role in the livelihoods of local people, particularly in terms of household food security, cultural and ritual activities, and

health. People in Houay Yae village have had to adapt their fishing tools, gathering methods and food culture in recent years based on their local knowledge, including their understanding of gathering tools and gathering methods, and the classification and use of aquatic foods.

In the 1970s, the concept of food security first appeared, because of the presence of a global food crisis. The concept then developed into issues around household food security in the 1980s, with natural food resources seen to play an important role in helping to meet food security needs. Legwaila et al. (2011) stated that plants play an important role in food security, as they provided an important source of food for low- or middle-income people, and have been consumed for a long time in order to supplement their diets. These plants were also a good source of income, thereby improving the standard of living of local communities. In addition, such plants contain vital nutrients and essential vitamins, important for the proper maintenance of human health, especially for children who are often vulnerable to malnutrition and disease. In Houay Yae community, natural food resources played a crucial role in household food security, in terms of providing food and nutrition, and also provide a source of income. This is in line with the findings of Kenichiro et al. (2004) who claimed that natural biological resources played an important role in household food security, in terms of not only providing a wide range of food and nutrition, but also providing an important source of cash income and securing year-round acquisition of staple foods, particularly among poor people.

Furthermore, Halwart (2006) argued that wild and gathered foods provide important diversity, nutrition and food security. Food resources from rice field environments such as animals and plants are harvested from in and around the rice fields. The aquatic resources found in rice-based ecosystems that met food and nutritional needs, should be integrated into national agricultural system that embraced an ecosystem approach and played an important role in supporting the agrobiodiversity of local people and the environment. Cultural ecology as a concept is the study of the ways in which culture is used by people to adapt to their environment (Sutton and Anderson, 2010), and had been widely studied by scholars, particularly in terms of local practices and resource management systems. Berkes, Colding and Folke (2000) stated that indigenous people developed practices in terms of resource

use based on their knowledge and perspectives, with traditional ecosystem management practices covering multiple species management, resource rotation and landscape management. The various practices used within traditional knowledge and management systems could be classified as: (i) adapting for the generation, accumulation and transmission of knowledge, (ii) the use of local institutions to provide leaders/stewards, plus rules for social regulation, (iii) mechanisms used for the cultural internalization of traditional practices and (iv) the development of appropriate world views and cultural values.

These traditional practice systems were a form of adaptive management that placed an emphasis on feedback learning, along with the management of uncertainty and unpredictability that is intrinsic to all ecosystems. Armitage (2003) stated that traditional resource management practices rely on the principles of adaptive management, and he suggested that the maintenance of traditional agro-ecological systems, and the associated adaptive resource management strategies used by local groups, can be effectively applied, combining traditional knowledge, adaptive management and conservation process. These strategies needed to be linked to the development aspirations of traditional groups, such as self-determination, the acquisition of land rights and being able to control the impacts of changes in livelihood systems.

In this case study, local people had a culture that interacted with and was closely related to the use of natural resources for food, and this was a key part of their local livelihoods. They have recently had to adapt to the rapid socio-economic and ecological system changes taking place in order to maintain a standard of living and meet their basic needs, and this adaptation had included the use of gathering tools, the use of time and space, as well as their local food culture. In terms of adaptation, many scholars have applied the concept of cultural ecology to explain the relationship between local people and natural resources and its management under changing conditions. In addition, this research found that aquatic animals played an important role in local livelihoods, supporting household food security and household incomes, as well as providing cultural and medicinal value. They also contributed to Buddhist and local customary activities. At least 88 species of aquatic animals were found in and around Houay Yae village, including fish, frogs, mollusks, crabs, shrimps and

insects, and these were the main household food consumption items, with 4.64 kg of fish, 0.23 kg of eels, 1.15 kg of frogs, 2.16 kg of mollusks and 0.19 kg of *khuang son* being consumed per household per week. These findings were similar to those of Garaway (2008, cited in Nurhasan 2008) in Champasak and Savannakhet provinces in Laos, in which the average fish consumption found in the study was 41.61 kg per person per year in Champasak and 26.65 kg per person per year in Savannakhet province. In addition to fish, 34.31 kg of amphibians were found to be consumed per person per year in Champasak and 12.78 kg per person per year in Savannakhet province. A similar picture emerges for mollusks, but Champasak consumed significantly more (13.14 kg/person/year) when compared to Savannakhet province (6.57 kg/person /year) (Garaway, 2008 - cited in Nurhasan, 2008). In a similar vein, Gregory et al. (2007) found, in a case study carried out in Xiengkhouang and Laungprabang provinces, that 36,5 kg per person per year of aquatic animals were consumed in Xiengkhouang province and 29 kg per person per year in Luangprabang province.

I also found that local people in Houay Yae village had adapted the methods they used to catch aquatic animals, including their use of gathering tools, the gathering methods used and the food culture practiced, based on the rapid socio-economic developments and ecological system changes taking place, those which have driven the local people to develop an adaptive aquatic resources management system within the local rice field ecosystem. The results was similar to those found by Berkes, Colding and Folke (2000), who found that indigenous people developed practices in terms of resource used and were based on their knowledge and perspectives, with traditional ecosystem management practices including multiple species management, resource rotation, succession and landscape management.

Moreover, I also found that local people's knowledge played an important role in the adaptation methods used, including knowledge on the making of gathering tools, the fishing methods practiced, as well as the classification of aquatic animals and their utilization, such as cooking and processing. In addition, their cultural beliefs had an influence on their local livelihoods in general, and in particular the management of aquatic resources, such as the procedures and taboos applied when collecting and using aquatic animals. This knowledge played an important part in

helping to conserve aquatic biodiversity. My study also supports the results of the study carried out by Yos (2003), who argued that local knowledge was not only ideal and essential, but also a situated knowledge that was practiced through cultural diversity. Moreover, local knowledge in terms of resource management was a part of the relationship between human beings and nature and reflected a development process based on learning from the truths found when experiencing livelihoods, selections, ceremonies and facsimiles, and could be passed from generation to generation. It is this knowledge that became the traditions, beliefs, ceremonies, methods of thinking and value systems required to manage a livelihood within a sustainable development framework.

5.3 Recommendations

I would like to make the following recommendations for future research efforts.

1. The number of aquatic species and their quantities, as assessed by local people, is usually over-estimated. Therefore, re-checking by taking samples from those gathering the products, then weighing and identifying them, could resolve this problem, and help accurately assess household aquatic food consumption levels, and such foods' contribution to household incomes.

2. The agricultural intensification practices and land use changes that have taken place in the study area are the main causes of the destruction of aquatic resources and their habitats. More research is needed on the relationship between aquatic food resources and food security, in order to better develop the sustainable methods needed to use and manage these resources.

At present, the diversity and quantity of aquatic foods are declining in the study area due to over-exploitation and habitat destruction, with ecological system destruction being the main cause of the latter. As a result, I would like to make the following policy recommendations with regard to the preservation of aquatic food resources.

1. Government and non-government organizations should encourage local people in the study area to conserve aquatic animals, and in particular those residing within the rice field ecosystems, through the use of education programs. In addition,

leading groups in the community should take responsibility for taking care of such aquatic resources.

2. Any development planning in the area, particularly in terms of food security and poverty reduction, should not overlook the traditional role aquatic resources play in helping to provide both cash and non-cash incomes to the local household economy.

3. Agricultural practices are considered very important for the livelihoods of local people, contributing directly to the sustainability of aquatic biodiversity in the study area. As a result, the District Agriculture and Forest Extension Office should promote alternative organic agricultural practices and good agricultural production techniques, those which can benefit the local people's health and also the local ecological system, both important factors in the conservation of biodiversity.

4. The creation of a 'fish sanctuary' managed by the local people would represent an effective way to use and conserve aquatic resources. With the communal sense of belonging created, people would use aquatic resources more efficiently and prevent outsiders from exploiting them.

5. Sustainable aquatic resource conservation and use should be promoted and subject to more research.