

Studies on Incentives for Sustainable Community Fisheries Management in Southeast Asia

**(東南アジアにおける持続可能な
コミュニティー漁業管理推進手段に関する研究)**

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Abstract

Fisheries in the Association of Southeast Asian Nations (ASEAN) provide significant amount of fish and fishery products to the World. However, the fisheries resources are in the declining state and fish habitat has been affected from destructive activities. The solution to these fishery problems is still an issue. Fishery ecolabel to maintain sustainability of fisheries is only implemented in a few ASEAN fisheries. Many ASEAN countries have decentralized fisheries management authority to local community fishers. However, lack of fund hampers the implementation of fishery co-management plans between the government and local fishers' organizations. In addition, management of fisheries in Southeast Asia is still weak in Monitoring, Control, and Surveillance (MCS). The scientific data and information are insufficient or fragmented. An overall research question here is whether or not influences from outside of ASEAN could be a tool to promote sustainable fisheries in the local community.

This study has the purposes to analyse fishery legislations of Southeast Asian countries related to the European based international standards on fishery ecolabeling certification scheme (namely, GSSI Essential Components for Fisheries Certification Standards) in support for the future establishment of fishery ecolabel in ASEAN countries. It aims to study the characteristics and perceptions of community fisheries for a finance program provided to local savings group by an NGO in the United States of America and assess its potential to promote participation of community fishers in sustainable fisheries management. In addition, the study is to do experimentally design and implement data collection scheme for monitoring status and trend of fisheries.

In this context, the fisheries legislations of ASEAN countries relating to fisheries management were examined and the provisions that are relevant to the required criteria of the GSSI benchmark tool are reviewed. The data and information about two selected community fisheries and savings group in Kampong Chhnang Province, Cambodia was gathered and analyzed. A new approach of scientific data collection and analysis was designed to sample and analyse the bagnet fisheries in Tonle Sap River. Data of water levels was also analysed.

As results, fisheries legislations such as various laws, government ordinances, sub-decrees, and local rules and regulations of ASEAN countries available in the FAO database, were examined in relation to fisheries management requirement of the GSSI global benchmark tool, and it was found that many of the legislations have provisions to support community fisheries in their countries. The characteristics of the community fisheries and the perception of savings groups in two community fisheries, namely Peam Popech and Phlong, in the Kampong Chhnang Province, Cambodia were analysed and described. Fish catch per lift (e.g., per unit fishing gear), per month and by species of 73 dai (e.g., local fishing gear) units, and the number of lifts per 24 hrs. in 1994 and 1995 were estimated. The overall catch was estimated to be 18,410 tons.

The review of ASEAN fisheries legislation reveals that the legal frameworks in ASEAN member states generally provide a fair basis for their fisheries to meet the requirement of the GSSI fisheries certification standards. The legislation allows an establishment of local fishery organization by local community fishers with the support of relevant institutions. The legislation provides direction to ensure optimal use of the available scientific information in fishery management. The perception of the community households about the savings group was generally good. At the same time, some changes in the

perception toward the saving group were identified and they were influenced by the characteristics of community fisheries and other factors such as education, income, and livelihood activities. The result of fish catches estimates and change of species composition were discussed in comparison with the past findings. The link between high fish catches and water level was also discussed.

It can be concluded that the fishery legislation of ASEAN countries has fulfilled most of the GSSI requirement. Fishery ecolabel may be an opportunity for providing incentives for sustainable community fisheries management. Understanding the characteristics of community fisheries and savings group is important attributes for considering to provide incentives for community fisheries management. The savings group is to mobilize fund within and outside the community fisheries to generate fund for fishery management and family economic investment. The new scientific data collection and analysis design gives a confident and reliable information of fishery resource status. This method shall be adopted as a model of a regular scheme for monitoring the status and trend of a fishery. Previous studies showed that participation of local stakeholders to decision-making process had positive effects for the conservation of local resources. This study reinforces this knowledge. In addition, this study found that influences from outside of ASEAN could be a tool to promote sustainable fisheries in the local community when local community people share the views and objectives of the tool. To do so, providing scientific information is essential. ASEAN secretariat provides critical support in capacity building and technical assistance to ASEAN fisheries management.

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Chapter 1: General Introduction

1.1. Background of the study

Fisheries in Southeast Asia contribute significant fishery production, job creation and economic development in ASEAN region and the World. Southeast Asia was among the top fishery producer in the World from 2010 to 2015 (Chan et al. 2017). In 2015, the ASEAN fisheries contributed 22% to the total fishery production of the World (199.7 million metric tons, SEAFDEC, 2017) with value of US\$ 38,728 million (excluding Cambodia, Laos and Vietnam) (Table 1) (SEAFDEC 2015). The regional fishery production increased annually from 33.6 million tons in 2011 to 43.9 million tons in 2015 (Table 1.1) (SEAFDEC 2015). The annual average rate increased 2-7.2% (SEAFDEC 2015, Funge-Smith et al. 2012). Komatsu (2013) had observed the production increased from 2006 to 2010 with the rate of 6% and the value increased 20%. In 2015, aquaculture contributed the most (55%), the marine capture fishery, 38% and inland capture fishery contributed small proportion (7%) to the total ASEAN fishery production (Figure 1.1) (Table 1.2) (SEAFDEC 2015).

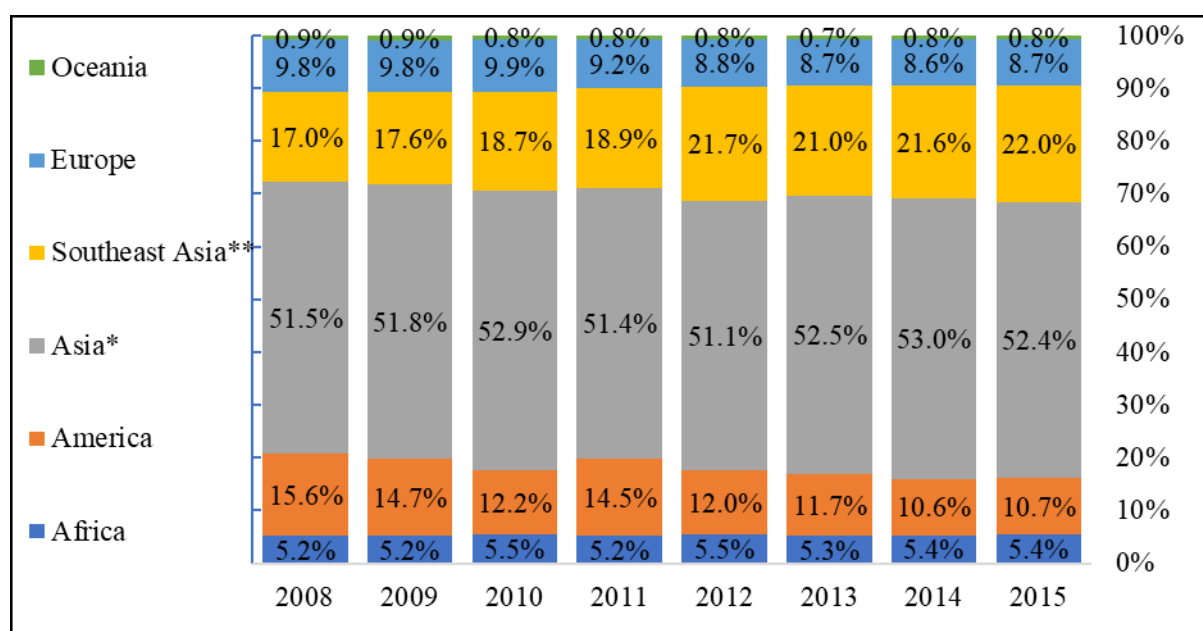


Figure 1.1. Fishery production by continent from 2008 to 2015 (million metric tons)

Table 1.1. Total production and value of capture fisheries and aquaculture in Southeast Asia in 2011-2015

	2011	2012	2013	2014	2015
Quantity (MT)	33,654,492	39,491,091	40,150,808	42,117,647	43,998,242
Value (US\$1,000)	44,814,170*	45,457,879**	41,892,690***	42,722,414****	38,728,905***

Remark: * Data not available from Lao PDR **Data not available from Cambodia and Lao PDR, ***Data not available from Cambodia, Lao PDR and Vietnam, ****Data not available from Cambodia and Viet Nam

Source: (SEAFDEC,2017)

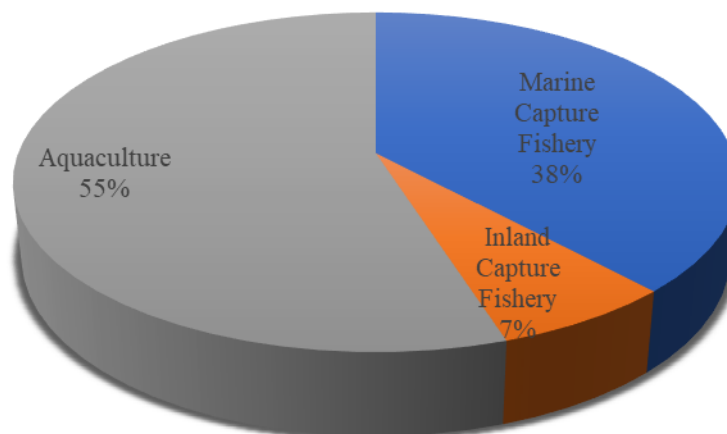


Figure 1.2. Percentage Contribution by sub-sector of fishery production in Southeast Asian region in 2015 (Source: SEAFDEC. 2017)

Table 1.2. Production and value of marine and inland capture fishery and Aquaculture of Southeast Asia in 2015

	Quantity (MT)	Value* (US\$1,000)	Value/quantity (US\$/MT)
Marine capture fishery	16,762,392	19,481,510	1169
Inland capture fishery	3,058,821	3,520,590	1523
Aquaculture	24,177,029	15,726,805	770
	43,998,242	38,728,905	

Remark: * Data not available from Cambodia, Lao PDR and Vietnam **Computation of price excluding Cambodia, Lao PDR and Vietnam. Source: (SEAFDEC,2017)

ASEAN fisheries play important role in trading. The fish export had increased from USD 0.5 billion in 1976 to USD 20.8 billion in 2013 (Chan et al., 2017). The ASEAN shared 15.1% (USD 20.8 billion) of global fish exports and 5.2% (USD 6.9 billion) of global fish import in 2013 (Chan et al. 2017). Komatsu (2013) observed that the ASEAN fishery export was more than 14% of the global export volume. Vietnam (USD 8.0 billion) was third among

the top five fish exporters in the world in 2014, more than Thailand (USD 6.6 billion) (Chan et al., 2017). The global fish export in 2014 was worth US\$148 billion (FAO 2016).

The marine fishery production mainly came from trawl and purse seine nets (Komatsu 2013). All ASEAN countries also utilized driftnets, gillnets, and pole and line (Komatsu 2013). In 2015, marine capture fisheries production of the ASEAN region came from many types of fishing gears. With available information from Brunei Darussalam, Malaysia, Singapore, and Thailand, trawls contributed the most of about 44.8%, purse seines 30.5%, gill nets 13.5%, hook and line 1.6%, seine nets 1.3%, falling nets 1.2%, traps 1.0%, push/scoop nets 0.6%, lift net 0.5% and other gears 1% to the total marine capture production of all fishing gear types (Figure 2) (SEAFDEC 2017).

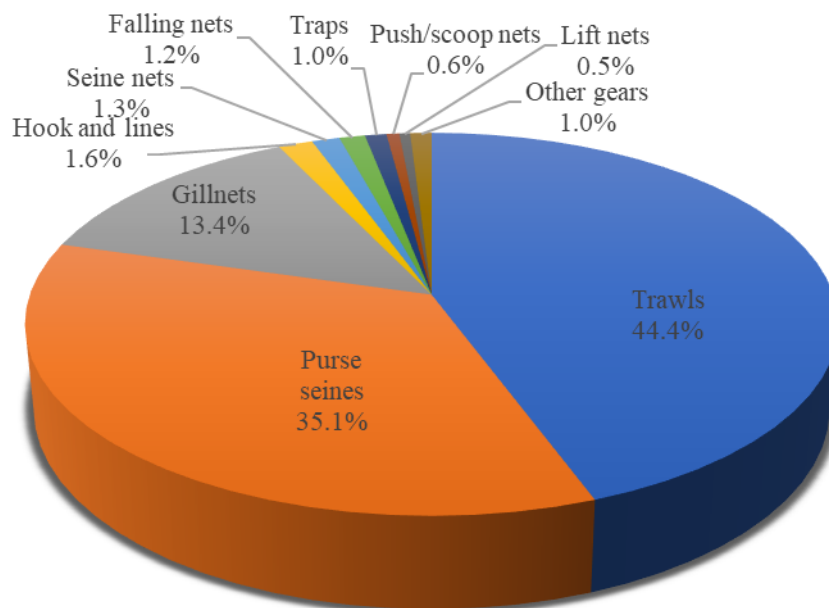


Figure 1.3. Percentage of fishery production by gear types

The fisheries and aquaculture in Southeast Asian region provided employment to at least 6,111,389 fishery workers. FAO (2016) reported that there was 56.6 million people engaged in the global capture fisheries and aquaculture in 2014 (FAO 2016). Garces et al., (2015) reported that the ASEAN Fisheries provided job to 30 million people (Garces et al.

2008). In 2015, the countries had the highest number of fishery workers, were Myanmar 3,216,300 people, next Indonesia 2,724,690 people and then Malaysia 170,399 people (SEAFDEC, 2017). The number of fishery workers in other Southeast Asian countries was not available. The workers were employed in marine and inland capture fisheries and aquaculture. In these regards, the fisheries utilised almost 1 million motorized and non-motorized fishing boats in inland and marine waters (Table 3) (SEAFDEC, 2017).

Table 1.3. Number of fishing boats in ASEAN region in 2015

No	Name of country	Number of power-boats	Number of non-power-boats	Total number of boats
1	Indonesia	460,658	165,050	625,708
2	Cambodia	58,087	40,606	98,693
3	Malaysia	53,165	3,046	56,211
4	Myanmar	N/A	N/A	28,455
5	Vietnam	N/A	N/A	28,719
6	Thailand	N/A	N/A	25,002
7	Philippines	N/A	N/A	6,371
8	Brunei Darussalam	N/A	N/A	36
9	Singapore	N/A	N/A	30
	Total			869,225

The fisheries and aquaculture in Southeast Asia have an important contribution to the region and the World. However, sustainability of the fisheries resources in Southeast Asia is a concern about (Komatsu 2013). What is a sustainable fishery? The term “sustainability” has given different definition (FAO 2016) had discussed about the definition and it is as follow:

The World Commission on Environment and Development defines “sustainability” as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The United Nations defines “three pillars” of sustainability: social, economic and environmental”. There is general agreement defines sustainability when a system can continue to provide a long-term benefit to society. For fisheries, a fishery system can continue to meet the needs of future generation as food, employment, income, and livelihood and maintaining fishing communities.

1.2. Statement of the problems

Fisheries in Southeast Asia contribute a large proportion of fish production, employment and trade to the Southeast Asian region and the World; however, the fisheries face many challenges and is summarized as follow:

1.1.1. Decline of Fishery Resources:

The marine fisheries resources in Southeast Asia has been in a declining state. The fisheries resources in Southeast Asia has suffered from overfishing and destructive fishing practices (Garces et al. 2008, Burke et al. 2002). Garces et al., (2008) reported that the marine species richness had been reduced in the area from the coral triangle of Southeast Asia eastward across the Pacific Ocean and westward across the Indian Ocean. The marine species were found so far very rich in the central Philippines Island and the second biodiversity richness was in the area between Peninsular Malaysia and Sumatra (Carpenter and Springer 2005). However, Stobutzki et al. (2006) reported that the total biomass in the marine waters of Malaysia, the Philippines and Thailand had declined to 10%, some area may decline up to 22% (Stobutzki et al. 2006, Stobutzki* et al. 2006). The decline of fish resources was due to overfishing. Many fish species in Southeast Asia were overfished (Burke et al. 2002). For instance, in Indonesia, Malaysia, the Philippine and Singapore, more than 80% of the population lived within 50 km of coastal area, many of them relied on coastal resources for food and livelihood (Burke et al. 2002). Many fishers were subsistent, like the case of Indonesia, small-scale fishers shared 95% of the total marine fisheries production (Burke et al. 2002). The excessed fishing capacity of each Southeast Asian countries was at different level, for instance, it was between 86% and 207% in Java sea of Indonesia and between 120%

and 130% in the Philippines (Garces et al. 2008). The experts and scientists from SEAFDEC and FAO shared the view that the coastal areas in the Gulf of Thailand, the coasts in the

The Philippines, the internal seas of Indonesia, the coasts in the southern part of Myanmar, and the South China Sea were either heavily depleted or overfished (Komatsu, 2013). Pomeroy et al., (2007) mentioned that it was universally recognized that the coastal fisheries resources in Southeast Asia had been overfished and thus they were severely depleted (Pomeroy et al. 2006). The decline of fishery resource in combination with the use of the high fishing technique has led to further depletion of the resources (Pomeroy et al. 2006). Destructive fishing practices can change the ecosystem complexity or reduce benthic organism abundance (Botsford et al. 1997). In addition, the employment of highly effective fishing gear can capture almost all living organism from the waters (Pomeroy et al. 2006).

In addition, the inland fisheries along the Mekong River have also been threatened. The evidence of overfishing is that fish catch per fisher declined by 50% as compared the catch of 1995 to 1940s (Allan et al. 2005). With the increased fishing pressure, small cyprinids species dominated in the fish catch of Tonle Sap fisheries and the composition of large migratory fish species had declined (Allan et al. 2005).

1.1.2. Habitat Degradation:

There was evidence that the fish habitat in Southeast Asia was degraded and threatened. Species richness and abundance was found associated with a complexity of flooded forest, seagrass, coral reef and mangrove habitat (Nagelkerken et al. 2000, Honda et al. 2013, Correa et al. 2008). Habitat, especially in floodplains, is important for many fish species as breeding and feeding grounds and taking refuge (Welcome et al. 2010). However, fish habitat has been affected from the changes of flows, loss of breeding ground, destructive activities,

deforestation, loss of mangrove forest and seagrass, reclamation of waters, effect of water-related activities and structure, pollution, extraction of coral and sand for construction and creation of navigation channel (Allan and Fleckor 1993, Garces et al. 2008, Burke et al. 2002, FiA. 2010). Garces et al. (2008) reported that some 70% of mangrove forest, 11% of coral reefs, at least 60% of seagrass bed were lost in Southeast Asia in the last century (Garces et al. 2008). Specifically, 41% of mangrove forest in Indonesia and 75% in Thailand was destructed (Garces et al. 2008). Burke et al. (2002) reported that 88% of coral reefs in Southeast Asia was at medium or higher threats (Burke et al. 2002). The reefs were destructed by impacts of pollution from ports, oil spills, blast fishing, trawling, garbage disposal, and navigation (Burke et al. 2002). The use of trawl to capture shrimp and fish was widespread in Southeast Asia, especially in the Gulf of Thailand (Burke et al. 2002).

Facing these fishery problems, we must find the way to manage, conserve and develop the fisheries resources to serve the need of the people for food and livelihood to the future. In this context, FAO has provided advises and management guidelines. The relevant important fisheries management ones are:

- Code of Conduct for Responsible Fisheries (CCRF) (FAO, 1995)
- Guidelines for Ecolabelling of Fish and Fishery Products from Marine/Inland Capture Fisheries (FAO, 2009) and
- Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (FAO 2015)

The ASEAN has made efforts at national, regional and international levels to manage and conserve fishery resources to maintain its sustainability. Realizing the important basis of

the Code of Conduct for Responsible Fisheries (CCRF) (1995) which unanimously adopted on 31st October 1995 by the FAO Conference and with the assistance of the Southeast Asian Fisheries Development Center (SEAFDEC), Member Countries of the Association of the Southeast Asian Nations (ASEAN) had conducted a number of regional consultations to facilitate implement the CCRF at national level since 1998, regionalized the CCRF and adopted Regional Guidelines for Responsible Fisheries in Southeast in Asia in 2003, focusing on fishery management, including Monitoring, Control and Surveillance (MCS) (SEAFDEC 2003) and establishment of MCS network (SEAFDEC 2012). To further enhance the practice of the CCRF, the Senior Officials of ASEAN-SEAFDEC Member Countries met in Bangkok, Thailand on 16th June 2011 adopted “Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region toward 2020 (SEAFDEC, 2011). In addition, the ASEAN has also addressed the need to consider developing the MCS-network to combat Illegal, Unreported and Unregulated (IUU) in their adoption of Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 in 2011 (SEAFDEC, 2011).

In the recent attempt to manage fisheries sustainably, the Association of Southeast Asian Nations has developed and adopted Strategic Plan of Action on ASEAN Cooperation On Fisheries 2016-2020 (ASEAN 2016). The plan consists of 6 strategic thrusts with program and activities (ASEAN, 2016) which is as follow:

- Enhance quality and quantity of production with sustainable “green” technology, resource management system and minimise pre- and post-harvest losses and waste
- Enhance trade facilitation, economic integration and market access
- Ensure food security, food safety, better nutrition and equitable distribution
- Increase resilience to climate change, natural disasters and other shocks

- Assist resource constrained small producers and SMEs to improve productivity, technology and product quality, to meet global market standards and increase competitiveness in line with the ASEAN Policy Blueprint on SME Development
- Strengthen ASEAN joint approach on international and regional issue

But fishery ecolabel and Monitoring, and Control and Surveillance (MCS) which are the FAO tools to maintain sustainability of fisheries, are a gap in the above action plan. In an effort to sustain fisheries, non-governmental organizations and retailers have tried to promote fishery ecolabel as a tool to ensure fishery products come from a sustainable fishery (FAO 2016). This is to provide both a reward to a well-managed fishery and to improve fishery management (FAO 2016). Promoting the implementation of fishery ecolabel will contribute to the implementation of the CCRF because fishery ecolabel is developed based on the CCRF (GSSI, 2017). Fishery legislations and policy is a factor influence fishery management (Pomeroy et al., 2001, Nielsen et al., 2004). Therefore, this study is to analyse the aspect of ASEAN fishery legislation in support of the future establishment of fishery ecolabel in ASEAN.

The management of fisheries in Southeast Asia is still weak in Monitoring, Control, and Surveillance (MCS). The Monitoring involves observing, collecting, and analysing fishery data and information, the Control is related legal framework, the Surveillance is associated with the compliance of fishery regulations (SEAFDEC, 2003).

FAO (2014) had pointed out that implementation of the MCS) face the issues of human and financial resources in a number of countries. The scientific data and information are insufficient or fragmented, based on which a fishery policy and regulation are formulated (Komatsu, 2013). The management measures are not appropriate and the fishery monitoring and enforcement are still weak (Komatsu, 2013). To effectively and sustainably manage the

fishery resource is to monitor the status and trend of fishery resources and take effective action to respond to the changes (FAO, 2016). The monitoring of status and trend of fisheries is not in agenda of ASEAN for fisheries management. In this context, it requires a scientific data collection and analysis scheme for monitoring status and trend of the fishery as input for decision-making in fishery management.

Shortage of budget hampers the implementation of the MCS. Lack of budget and incentive is an obstacle to implementation of fisheries management. Small-scale fisheries cover 90% of the global (FAO 2016) and ASEAN fisheries. Community fisheries has been established in ASEAN countries to decentralize fisheries management responsibility to community fishers (Pomeroy, et al. 2001, Nasuchon and Charles, 2010, FAO, 2015). It is important to get involvement of community fishers in decision-making process, planning and activity implementation (Flewwelling et al., 2002). But the community fisheries are lack of fund and incentive for their implementation of their fishery management action plan. Promoting savings group has experience to give encouragement, incentive and support solving the problem of budget shortage for the implementation of fisheries management. The savings fund is found to be useful and give important motivation and success to community fisheries (Kurien 2017). Saving group has also given a support to alternative livelihood development to relieve pressure on fisheries resources.

1.3.Objectives of the Study

This studies have the following purposes:

1.3.1. To analyse fishery legislations of Southeast Asian countries related to GSSI Essential Components for Fisheries Certification Standards in support for the future establishment of fishery ecolabel in ASEAN countries which is the opportunity to provide price premium to community fishers for sustainable fishery management. This study provides the revision of the ASEAN fishery legislation related to the GSSI fishery ecolabel. The study gives the

relevant legal support in the future establishment of fishery ecolabel in ASEAN countries. The ecolabel has increasingly become important tool to enhance sustainable management of fisheries and forest (Roheim et al., 2011). It provides essential aspects for academic analysis and aid the development of other standards and certification for a specific fishery within a particular legal framework (Gulbrandsen 2010, Foley & Hébert, 2013, Foley 2012, Ponte 2012). It is rather significant to give the understanding of fishery ecolabel to policy makers of how to get involvement of community fishers and the establishment of an institution for managing fishery resource sustainably (Gardiner & Viswanathan 2004). This study identifies the relevant strong points and gaps of ASEAN fishery legislation with regards to GSSI benchmark tools. This legal aspect consideration contributes an input to the implementation of ASEAN fishery policy and Resolution on the future of SEAFDEC: vision, mission, and strategies towards 2030 (SEAFDEC 2018).

1.3.2. To study the characteristics and perceptions of community fisheries to find possible tools to promote participation of community fishers in sustainable fisheries management. The study on the analysis of the characteristics and perception of community fisheries provide a significant review of the internal rules of the savings group reflecting the opinions and perceptions of the savings group members to sustain the operation of the savings group. This is to give an insight to enhance the sustainable financial operation of community fisheries through mobilization of fund inside and outside in the community fisheries. The savings group contribute a source of funds for fishery livelihood development and community fisheries management. The study contributes the understandings and knowledge of community fisheries characteristics and the savings to literature because, to date, there are no documented case studies of savings groups for community fisheries. The savings fund is catalyst for promoting development process, scaling up the targeted activities and building up

the community collaborative network (Archer, 2012). This is to bring the sustainable community fisheries forward to the future.

1.3.3. To design and implement data collection scheme for monitoring status and trend of fisheries. The third significant contribution of this study is to give the scheme of data collection and analysis for monitoring the status and trend of fisheries. Data collection and analysis is the Monitoring part of the MCS (Flewwelling et al., 2002). It is an important scientific data an information input for formulating fishery legislation and developing implementation plan of fishery management (Flewwelling et al. 2002). The data and collection scheme provide a system for monitoring status and trend of a particular fishery and in ASEAN as general (SEAFDEC 2017). This knowledge is to contribute to the implementation of Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 of the ASEAN in enhancing capacity, and improving statistical data and information compilation and exchange (SEAFDEC 2011).

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Chapter 2: The Study on Fishery legislations in ASEAN countries and global ecolabelling certification standards

2.1. Introduction

Small-scale fisheries are crucial for fish nutrition and livelihood needs of ASEAN people. In 2014, fisheries in Asian countries constituted nearly 53.0% of the global fishery production (SEAFDEC 2014). Southeast Asian countries supplied approximately 21.6% with the production ranging from 33.5 million metric tons in 2010 to 42.2 million metric tons in 2014 (SEAFDEC 2014). Vietnam, Myanmar, the Philippines, Thailand, and Malaysia are among the major marine capture producers in the world (FAO 2016). Fisheries activities provide livelihood to millions of people. For instance, Myanmar, Indonesia, and Malaysia together have at least six million fishers (SEAFDEC 2014). Fisheries and aquaculture activities in Asia provide livelihood to 11% of the global population (SEAFDEC 2017). Furthermore, 80% of the Asian fishers are small-scale, artisanal fishers (FAO 2001). Millions of Asian fishers depend on fishing for livelihood needs and domestic food consumption (Kurien 2000). In addition, the income from fishing is used as capital, which is invested in other economic activities to generate additional income (Lieng et al. 2018). In 2014, 84% of the world population engaged in capture fisheries and aquaculture was from Asia (FAO 2016). However, the future sustainability of fisheries raises the concern whether fish and fisheries products shall be obtained using responsible fishing practices (SEAFDEC 2017).

Ecolabelling has become an increasingly well-known method for managing fisheries sustainably; various ecolabelling certification schemes have been established in the past decade, resulting in confusion among consumers on how to recognize a credible seafood certification scheme (GSSI 2015). The Global Sustainable Seafood Initiative (GSSI) is a solution to this problem by providing a benchmark for certification schemes that involves a

process of assessment by independent experts (GSSI 2015). When a seafood certification scheme achieves the GSSI recognition through the benchmark process, it can be considered internationally credible. The GSSI global benchmark tool was developed based on the Code of Conduct for Responsible Fisheries (CCRF) of the FAO, the FAO guidelines for Ecolabelling of Fish and Fishery Products from Marine/Inland Capture Fisheries, and the FAO Technical Guidelines for Aquaculture Certification (GSSI 2015). The tool includes the essential and supplementary GSSI components that allow a certification scheme to have a diverse approach and the existence of different schemes (GSSI 2015). The benchmark framework has the following four sections (GSSI 2015):

- A. GSSI Essential Components and GSSI Supplementary Components for Governance of a Seafood Certification Scheme
- B. GSSI Essential Components and GSSI Supplementary Components for Operational Management of a Seafood Certification Scheme
- C. GSSI Essential Components and GSSI Supplementary Components for Aquaculture Certification Standards
- D. GSSI Essential Components and GSSI Supplementary Components for Fisheries Certification Standards

The requirements of A and B are not directly related to the producers (i.e., fishers) but to organizations that provide certification scheme or those of retailers and distributors; C addresses aquaculture produces. Since the focus of this study was ASEAN capture fisheries interested in receiving certification from existing scheme-owners benchmarked by GSSI, only essential component D is considered. Moreover, GSSI supplementary components are not required for GSSI recognition (GSSI 2015).

Until now, only a few ASEAN fisheries have received certifications from GSSI recognized schemes [8, 9]; one such certification is granted by the Marine Stewardship

Council (MSC). The possibility of receiving the fisheries certification depends on numerous factors, such as the status of fisheries resources, institutional capacity and arrangement, national and regional fishery policies, and the legal framework [(Blasiak et al. 2017, Swartz et al. 2017)]. Therefore, this study examined legislations in ASEAN countries relating to fisheries management to provide reviews for the provisions that are relevant to the required criteria of the GSSI benchmark tool. The study aims to elucidate the status of GSSI-related fishery legal framework to ASEAN countries and help them adopt foreign experiences and opportunities for the future establishment of fisheries certification in the region.

2. 2. Status of ASEAN Fishery Legislations

Numerous fisheries legislations of ASEAN countries, namely Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam, are available in the FAO database. Fisheries legislations include various laws, government ordinances, sub-decrees, and local rules and regulations. The national fisheries legislations were examined in relation to fisheries management requirement of the GSSI global benchmark tool. For instance, the fisheries legislations of Vietnam were reviewed, revealing that the 2003 Vietnamese Fisheries Law 2003 was a decision on approval of program for protection and development of aquatic resources and an ordinance on management and conservation of aquatic resources (Pomeroy et al. 2009).

2.2.1. Management organization

The GSSI benchmark tool specifies governance and management standards for certified fisheries (GSSI 2015). Specifically, the GSSI standard requires the existence of a fishery management organization or an equivalent arrangement (GSSI 2015).

Many ASEAN fisheries legislations support local fishing/ communities to establish their fisheries management organizations. These legislations encourage community fishers to get

involved, provide opinions, and share experiences in fisheries management. The capacity building of local community fishers is legally supported. In Cambodia, Indonesia, Laos, the Philippines, Thailand, and Vietnam, these fishery legislations support community fishery organizations at different levels.

In Cambodia, the Royal Decree on the establishment of community fisheries (RGC 2005) allows local community fishers to establish their fisheries organization. Law on fisheries (RGC 2006), sub-decree No. 25 OrNorKrorBorKor on community fisheries management (RGC 2005a) and guideline No. 316 on community fisheries (MAFF 2007) define the rights, roles, and responsibility of a community fisheries organization to participate in fisheries conservation and management [14, 15, 16]. Community fisheries have the duty to formulate a working plan of their activities (RGC 2005a). The state of the community fisheries management has been continuously monitored, evaluated, and reviewed (RGC 2005a). The government has the function to not only facilitate the implementation process of community fisheries but also provide assistance and capacity building to the communities (RGC 2005a).

In Indonesia, the government prioritizes poverty reduction, social welfare, and capacity building of local community fishers. Regulation No 2/PERMEN-KP/2013 (RI 2013) supports the establishment of a guideline for strengthening fishery-related business of local community fishers, who are also encouraged to participate in the management of fisheries resources (art. 60) (RI 2007); thus, the traditional culture and fishers' interests are respected and protected (art. 17&60) (RI 2007). Community fishers are allowed to participate in law enforcement (art. 60) (RI 2007).

In Laos PDR, the Fisheries Law of 2009 allows fishers to establish fisher communities (art. 48) (Lao 2009). The communities assume their specific roles and responsibilities (Art. 48) (Lao 2009), granting fishers the right to participate in fisheries management (art.51) (Lao 2009) and protecting and respecting their local tradition and culture (art.28) (Lao 2009). The

fisheries management organization is established at provincial and district levels (art.43) (RI 2007). Local fishers are legally permitted to participate in research surveys and the policy formulation process (art.17) (Lao 2009).

In the Philippines, Republic Act No 8550 (1998) (RP 1998) allows the community fishers to establish a fisheries management advisory body at the local level with assistance of local non-governmental organizations and other concerned agencies (sec.69) (RP 1998). A fisher representative is legally supported to provide comments and suggestions concerning fisheries management at local and national levels (sec.70) (RP 1998). The Department of Agriculture and local authority is responsible for providing capacity building to community fishers, such as data collection, research, marketing, and livelihood activities (sec.24) (RP 1998).

In Thailand, the Royal Ordinance on Fisheries permits community fishers and encourages other stakeholders to participate in fisheries management, conservation, and utilization (sect. 8, 12& 25) (Th 2015). Local community fishers receive support and capacity building from the government (sect. 25) (Th 2015). In Vietnam, local community fishers are encouraged to participate in fisheries monitoring, enforcement and conflict resolution by the Vietnamese Fisheries Law of 2003 (SRV 2003). The fisheries are authorized to be managed by local authority (art. 15 (3) (SRV 2003).

2.2.2. Participatory management

The GSSI standard requires a participatory and transparent fishery management system (GSSI 2015). Fisheries legislations of Cambodia, Indonesia, Lao PDR, and Thailand encourage local community fishers to participate and employ their local knowledge and experience in fisheries management. In Cambodia, the 2005 sub-decree of community fisheries management encourages community fishers to use their local experiences; community fishers share their local knowledge through meetings, workshops, consultations, data collection, and actual application in fisheries management in their own community

fishing grounds (RGC 2005a). In Indonesia, Articles 17 and 21 of the 2014 amendment to Law No. 27/2007 on the management of coastal areas and small islands respect local community fisher's interest and their customary law (RI 2007). Article 17 of the Wildlife and Aquatic Law of Lao PDR promotes the participation of local community fishers in data collection and surveys (Lao 2007). In addition, section 25 of the Royal Ordinance on Fisheries of the Kingdom of Thailand encourages the contribution of local community fishers in policy formulation (Th 2015).

2.2.3. Small-scale and/or data limited fisheries

The governance and management of small-scale fisheries must be conducted in accordance with the GSSI standard, considering the data availability and limitations for different types and scales of fisheries (GSSI 2015).

Provisions in the fishery legislations of Cambodia, Indonesia, and the Philippines define different management systems for small-scales fisheries. According to the Cambodian Fisheries Law of 2006, the management system of small-scale fisheries is different from those of medium and large-scale fisheries. Small-scale fishers are not required to obtain fishing license and can fish in open access areas year-round (art.31, 32, 44, 45, 65, and 95) (RGC 2006). In Indonesia, small-scale fishers are legally empowered and the focus is on improving their livelihoods. Small-scale fishers in Indonesia can operate without a fishing license, are exempted from taxes, and can easily obtain loan for their fishing operation and fishery business (art. 26, 48, and 62) (RI 2004); their capacity is built through training and education (art. 60) (RI 2004). In the Philippines, small and medium, commercial fishing vessels are defined to operate in their own zone (sect. 18) (RP 1998); small-scale fishers are legitimately given incentives with loans for their business operation and receive capacity building (sect. 34) (RP 1998). Nevertheless, fishery management legislations in ASEAN countries do not provide clear statements on the treatment of fisheries with limited data; in

particular, the management rules for fisheries with limited scientific data are not always well-established.

2.2.4. Management objectives and the best available scientific evidence

The GSSI standard requires the existence of management objectives and seeks outcomes that are consistent with the long-term sustainable use of fisheries resources (GSSI 2015). The standard also requires that management objectives to consider the best scientific evidence available (GSSI 2015).

Fisheries legislation in Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Singapore, the Philippines, Thailand, and Vietnam promote fisheries data collection and research survey and the use of the best available scientific information for the decision-making process in fisheries management. Fisheries legislations of Cambodia, Indonesia, Lao PDR, and Thailand encourage the integration of local knowledge of the community fisheries in fisheries management.

The promotion of fisheries data collection and research survey and the use of the best available scientific information are a characteristic of fisheries legislation in many ASEAN countries. Article 64 of the 2009 Fisheries Order of Brunei Darussalam provides a legal ground for conducting fishery-related scientific research (BD 2009). Similarly, Article 9 of the 2006 Cambodian Law on Fisheries grants legal support to conduct scientific fisheries research, providing basic fisheries information for considering fisheries management practices (RGC 2005a). Articles 46, 47, and 52 of Fisheries Law No 31/2004 of Indonesia instruct to conduct fisheries research and development by gathering fishery information and statistics (RI 2004). Article 18 of the 2007 Wildlife and Aquatic Law of Lao PDR encourages fisheries research to obtain fishery information and statistics (Lao 2007). Articles 6, 19, and 37 of the 1985 Fisheries Act No. 317 of Malaysia promote the use of fishery scientific

information in developing management plans for turtles, inland fisheries, marine parks, and marine reserves (GM 1985).

Sections 14, 65, and 82 of the 1998 Fisheries Code of the Philippines define the function of institutions and institutional arrangements as collecting fishery data and information and research for management and development. Sections 9 and 12 of the 2015 Royal Ordinance on Fisheries of Thailand make it obligatory for the national government to collect fishery data and timely update fishery statistics using best scientific information available in fishery management and conservation (Th 2015).

Articles 5 and 14 of the 2003 Fisheries Law of Vietnam provide encouragement to conduct fisheries research and fishery resource assessment for policy formulation to ensure sustainable fishery management of Vietnamese fisheries (SRV 2003). The Fisheries Act of 2002 in Singapore does not task or provide a legal base to conduct fisheries research; however, Article 25 of the Act presents a condition for scientific research on fisheries (RS 1966). In Myanmar, instead of providing support to fisheries research, Article 17 of the Myanmar Marine Fisheries Law No. 9/90 regulates license holders who wish to conduct fisheries research in the exclusive economic zone of Myanmar (UM 1990). License holders are required to obtain permission before conducting fisheries research in Myanmar waters (UM 1990).

In general, fishery resource management in ASEAN countries entails protection of certain endangered species, habitat conservation, closed fishing season, and restrictions on some fishing gears to ensure sustainability of fisheries resources, food security, and livelihood need of the people. Scientific information is essentially used to formulate fishery codes, rules, and regulations. The fishery sector is managed with the responsibility of provincial and local fishery divisions and governments. Fishery management decisions are based on the provisions in the legal framework.

2.2.5. Management system compliance

In compliance with the management system, the GSSI standard requires fisheries to be operated according to national and international regulations enforced in an effective manner (GSSI 2015).

Fishery legislations of most ASEAN member states (namely, Brunei Darussalam, Cambodia, Indonesia, Lao PDR., Malaysia, the Philippines, Thailand, and Vietnam) have a law to promote and comply with their national jurisdiction and the implementation of regional and international law and agreement.

At the national level, Brunei Darussalam governs fishing and fisheries research under the provision of the 2009 Fisheries Order and the International Fishery Agreement, of which Brunei Darussalam is a member (No. 17, 18 and 19) (BD 2009). Cambodia strengthens sustainable fishery management through compliance to national policy and the provision of the 2006 Fisheries Law (art. 6) (RGC 2006). In addition, Cambodia enforces the management of the aquatic environment in accordance with agreement, conventions, and international treaties in which the nation has participated (art.14 & 22) (RGC 2006). Indonesia has a legal support for cooperation framework with neighboring countries and regional and international organizations on conservation and development of fishery resources (art. 10) (RI 2004). Lao PDR has a legal policy to promote the implementation of the provision of the 2009 Fisheries Law, agreement and international convention to which Lao PDR is a signatory (art. 5 and 8, Lao PDR, 2009; art. 9 and 43) (Lao 2009). Malaysia complies mainly with the provision of the 1985 Fisheries Act and the international agreement in which Malaysia is a participant (No.17) (GM 1985). In the Philippines, fisheries are managed under the provision of the existing laws, rules, and regulation, and in compliance with international agreement, treaties, and conventions to which the Philippines is a signatory (sect. 26, 28, 65, 67, 74, 77, 86, and 119) (RP 1998). Thailand commits to implement fisheries management and conservation in

compliance with international laws, obligations, and standards to which Thailand is a signatory (sect. 4, 8, 21, 47, and 104) (Th 2015). Vietnam manages fisheries mainly in accordance with the provision of the 2003 Fisheries Law and the agreement to which Vietnam is a signatory. Articles 1 and 49 of the Vietnamese Fisheries Law 2003 allow foreign fishing vessel to fish or conduct research in their national waters only with authorization and in accordance with the International Fishery Agreement (SRV 2003).

2.2.6. Transboundary stocks

The GSSI standard requires the existence of bilateral, sub-regional, or regional fisheries organization or arrangement, where the fishery stock is transboundary, straddling, or highly migratory stock (GSSI 2015).

As for the management of transboundary stocks, ASEAN countries have multiple bases for regional collaborations. The Southeast Asian Fisheries Development Center (SEAFDEC) is an autonomous inter-governmental body established in 1967; its mandate is “to develop and manage the fisheries potential of the region through the rational utilization of resources to provide food security and safety to the people and alleviate poverty through transfer of new technologies, research, and information dissemination activities.” At regional level, ASEAN member states have adopted a Joint ASEAN-SEAFDEC Declaration to promote regional fisheries cooperation, including the strengthening of transboundary fishery management in 2016 in Bangkok, Thailand (SEAFDEC 2016). For the sustainable management of the Mekong River Basin, particularly transboundary fisheries resource, an inter-governmental organization of the four riparian countries (namely, Cambodia, Lao PDR, Thailand, and Vietnam) have jointly signed the agreement for the cooperation of management in 1995 (MRCS 1995).

2.2.7. Continuous review

The GSSI standard requires that management measures and their relevant interactions shall be regularly reviewed by considering different uses of inland and marine resources (GSSI 2015).

Fisheries legislations of Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, and Thailand provide legal grounds to continuously review fisheries through regular reporting, consultation meeting with relevant, stakeholders or the designated committee, and inspecting fisheries management implementation. The fisheries plan for fisheries management in Cambodia is consulted and reviewed by local and international stakeholders (including FAO), thereby encouraging consistency with the current national fisheries policy, the current status of fisheries, and the best available fisheries scientific information. Article 7 of the Cambodian Fisheries Law 2006 determines that the law enforcement have to be inspected (RGC 2006). The implementation of the community fisheries has also to be monitored and evaluated annually (art. 61 and 62) (RGC 2006).

Articles 45, 65, and 66 of Law No. 45/2009 Indonesia assign a responsible person and fishing port to monitor the Fisheries Law enforcement (RI 2009). Article 50 of the 2009 Fisheries Law of Lao PDR provides the responsibility of fisheries management and enforcement to a committee comprised of a representative of fishers and local authority at district and provincial level (Lao 2009). Section 6 of the 1985 Fisheries Act of Malaysia advises that fisheries shall be continuously reviewed so that it is compatible with the best scientific information available, and the fisheries conservation and management principle (GM 1985). Section 16 of the 1998 Philippine Fisheries Code advises that the management measures of the municipal/city government shall be consulted and reviewed to inspect the consistency with national fisheries policy and this Fisheries Code (RP 1998). Section 5 of the Fisheries Order of Singapore defines that the fisheries activities plan has to be continuously

reviewed so that it is consistent with the best scientific information available and the national government policy (RS 1966). Section 24 of the 2015 Fisheries Ordinance of Thailand defines that Fisheries Management Plan shall be established in pursuant to fisheries management approach and current fishing capacity and scientific information (Th 2015).

2.2.8. Ecosystem structure, processes, and function and endangered species

The standard requires data and information about the impact of the fishery on ecosystem structure, processes, function and endangered species to be collected and stored in accordance with international standards and practices (GSSI 2015).

Many Articles of fisheries legislations in ASEAN member states, particularly Brunei Darussalam, Cambodia, Lao PDR., Myanmar, Malaysia, Thailand, and the Philippines address the conservation of aquatic resources and protection of fisheries ecosystem. Fish stock enhancement is legally supported by establishing conservation area and protection of brood stock and the conservation and protection of the ecosystem; in particular, the preservation of endangered species is stated in No. 31(a), 38, and 64(1) of the 2009 Fisheries Order and in the fisheries regulation 2002 of Brunei Darussalam; moreover, in Articles 1, 19, 20, 22-28, 48-52, 57, 76 of the 2006 Law on Fisheries in Cambodia. Article 20 of the Cambodian Fisheries Law define the permitted mesh-size of at least 1.5 cm. The prevention of killing and capturing of endangered, threatened, or extinct species is stated in Article 50 of the Wildlife and Aquatic Law of the Lao PDR., in fisheries regulation 1999 and No.26 and 61 of the 1985 Fisheries Act of the Government of Malaysia, No. 34 of the Freshwater Fisheries Law 1991 of Myanmar, and Section 66 of Royal Ordinance on Fisheries of Thailand.

In the Philippines, the fisheries ecosystem and function are maintained and protected by laws for the sustainability of the aquatic resources. A critical habitat or fisheries grounds where fish spawning and breeding is essential, is defined by laws to be designated for protecting and enhancing fish reproduction and growth. (sec.81) (RP 1998). Moreover, the

capture or trade of a vulnerable and endangered species, particularly the conservation of which is of international importance, is not allowed (sec.11) (RP 1998) (sec.102) (RP 1998). Fisheries related activities that may harm the ecosystem and function are not permitted (sec. 97 and 99) (RP 1998) (sec. 92 and 94) (RP 1998a).

2.2.9. Enhanced fisheries

According to the GSSI standard, the natural reproductive stock components of enhanced stocks are not overfished and not substantially displaced by stocked components (GSSI 2015).

Cambodia, Indonesia, the Philippines, Thailand, and Vietnam provide a legal basis to support the enhancement of fish stock through fish stocking. The Cambodian fishery legislation promotes the enhancement of wild fish stock through fish releasing events to raise awareness of the importance of fishery and to encourage fish stocking in a closed waterbody (art.17) (RGC 2006). This fish releasing event is held annually at national and provincial and also community fisheries level. In Indonesia, the following laws are related to fish stocking: Article 7 of Law No 45 grants a legal support for improving fish stock in the Indonesian waters (RI 2009); Article 15 of Law No 31 instructs to control the introduction of fish stock in Indonesian waters (RI 2009); Article 14 of Law No 45 provides a provision for the development and use of sperm plasma of fish resources in the context of ecosystem conservation and breeding to improve fishery resources in Indonesia (RI 2004). In the Philippines, Section 65 of the 1998 Fisheries Code instructs to conduct research on finding ways to enhance fish stock (RP 1998). Similarly, Section 24 of the Royal Ordinance on Fisheries of Thailand asks the Department of Fisheries to seek approaches for enhancing fisheries management (Th 2015). In addition, Article 8 of the 2003 Vietnamese Fisheries Law encourages the production of fish fry to be released in a natural habitat for enhancing fish stock (SRV 2003).

2.2.10. Precautionary approach

A precautionary approach must be widely practiced to protect and manage aquatic resources and their environment (GSSI 2015). The precautionary approach recommended by the GSSI fisheries certification standard is addressed only in the 2015 Fisheries Ordinance of Thailand, which suggests that Fisheries management measures shall be implemented based on the best available scientific information and in compliance with the combination of precautionary approach to achieve the maximum sustainable yield (sect. 4(5), 12, and 55) (Th 2015).

2.2.11. References points and stock assessment

The GSSI standard requires that the fisheries management objectives of certified fisheries must define the target reference points or proxies for the stock under consideration, based on the best scientific information available (GSSI 2015).

The standard further notes that reference points or proxies must be consistent with the maximum sustainable yield (MSY) (GSSI 2015). The MSY is a theoretical concept, widely used in fishery management and stated as a target to achieve in the objectives of the FAO CCRF [34, 35]. The CCRF also asks to consider the uncertainties relating to reference points in the implementation of the precaution approach (FAO 1995).

Support for the application of total allowable catch (TAC) and MSY as a point of reference are addressed in the fisheries legislations of Indonesia, the Philippines, Thailand, and Vietnam. Article 7 of Law No. 45/2009 of Indonesia offers the legal ground to define the status of fisheries resources and TAC in the fisheries management area of the Indonesian waters (RI 2009). Rule 7.1 of the Philippines 1998 Fisheries Code stipulates the policy support to determine MSY and TAC of major fisheries of the Philippines through stock assessment (RP 1998). In addition, Section 8 of the Philippines 1998 Fisheries Code asks to

define TAC or catch ceiling limit at a specified time and area (RP 1998). Section 30 of the Royal Ordinance on Fisheries of Thailand suggests a task to identify the points of reference for sustainable fisheries management (Th 2015). In Vietnam, the application of TAC is stated in Article 11(1) and 14 of the 2003 Fisheries Law (SRV 2003). Instead of determining the TAC or catch limit, Section 13(6) of the 1985 Fisheries Act of Malaysia asks to define the fishing effort (GM 1985).

2.3. Discussions

2.3.1. Potentials and current gaps of ASEAN fisheries to meet the requirements of GSSI

The above review reveals that the legal frameworks in ASEAN member states generally provide a fair basis for their fisheries to meet the requirement of the GSSI fisheries certification standards. Fisheries legislation is an essential foundation for the future establishment of ecolabelling in ASEAN countries. Evidence suggests that the fisheries legal framework is important for meeting the MSC fisheries certification standard (Pérez-Ramírez et al. 2012). Therefore, ASEAN fisheries have a fair potential to meet the requirements provided by the GSSI standards. At the same time, several gaps can be identified through the above reviews between the existing ASEAN legal frameworks and the GSSI requirements. As noted in the previous section, “precautionary approach” is not clearly mentioned in most of the legal frameworks in ASEAN countries. Furthermore, no specific provisions on “adaptive management” in fisheries were found in the legal systems for ASEAN member states.

In addition, “reference points on fisheries management objectives” that are consistent with MSY can be another problematic requirement for ASEAN fisheries. As noted above, the fisheries legislations of only four ASEAN countries (Indonesia, the Philippines, Thailand,

and Vietnam) provide support in the application of TAC and MSY. Setting TAC based on MSY or equivalent prefixed reference points would be generally difficult for many ASEAN fisheries that are characterized as fisheries targeting multi-species using small boats. Moreover, insufficient number of scientists and lack of resources to calculate TAC or MSY for a wide variety of local fish species could be a limiting factor; many small boats and landing locations could make it difficult for management authorities to provide sufficient enforcement activities to cover them.

Eliminating these gaps through the efforts of local fisheries management bodies is one option to cope with this situation. Many ASEAN countries encourage participatory managements. If the resource users find incentives to introduce higher level of management measures, the potential for receiving ecolabelling certification under the GSSI recognition would become higher. The past experiences show that many ecolabelling fisheries were established with an initiation of local communities, fishery associations, fish distributors, whole sellers, and fish retailers with a support from NGOs [(Swartz et al. 2017), (ISARIBI 2008)]. Thus, there is a realistic chance of eliminating gaps for ASEAN fisheries.

A strong political will to modify the existing legal framework would be another option to eliminate the gaps between existing ASEAN legal frameworks and the requirements of GSSI. Although the participation in the ecolabelling scheme is on a voluntary basis [38, 39], the possibility of its establishment in ASEAN countries could depends on fishery policies and government positions on whether to include it as a strategy for the sustainable management of fisheries. The roles and responsibility of a fisheries management authority have been stipulated in fishery jurisdiction. The ASEAN governments so far have promoted the implementation of the FAO CCRF in the ASEAN region. ASEAN Sectoral Working Group on Fisheries (ASWGFi) was formulated under the ASEAN community; it meets at least once a year to discuss common fisheries issues and the strategic planning framework. SEAFDEC

provides critical support in capacity building and technical assistance to ASEAN fisheries management and development. Thus, both ASWGF and SEAFDEC play essential roles in facilitating and supporting ASEAN fisheries management. Concerted actions by ASEAN political leaders can further advance the possibility for their fisheries to receive ecolabelling certifications that are recognized by GSSI.

2.3.2. Cost and benefit for ASEAN fisheries to receive certification based on GSSI standard

Potential benefits for fisheries in ASEAN countries are discussed with respect to the relevance of GSSI standards on the following three aspects: economic, social, and environmental aspects.

First, in the economic aspect, an advantage of ecolabelling is that it can introduce a price premium of the labeled products in the market. When the benefit of price premium is properly transferred from retailers to producers, it can be a source of finance to be used for sustainable fisheries management. A study on price premium for certified Alaska Pollock products in the UK seafood market shows that the premium provides fishery producers an incentive for sustainable fishing practices (Roheim et al. 2011). If proper arrangement and implementation are carried out, this certified fishery will provide a sustainable funding source to community fishers for managing fishery resources at the community level. However, most small-scale fisheries gain no incentives from price premium in ecolabelling practices (Wakamatsu and Wakamatsu 2017). Community fisheries established in ASEAN countries would provide participation opportunities to community fishers in responsible fishing practices. It is widely known that the participation of fishers in responsible fishery co-management is one of the keys for successful management in fisheries. The past barrier in community participation is a lack of funding and incentives for implementing their activity plan. Ecolabelling can be a tool for attaining sustainable finance in community fisheries.

Second, regarding the social elements of fishery management, many provisions of ASEAN fishery legislations support an establishment of community fishers or fisher associations. Most fishery legislations of ASEAN countries allow cooperation and participation of fishers in fishery research and surveys, including the integration of local fisher knowledge and experiences. Local fishers' ecological knowledge is an important practical information input in planning fishery management action (Torres-Guevara et al. 2016, Mackinson and Nottestad 1998, Johannes et al. 2000, Mackinson 2001). Cooperation and assistance in fishery research as well as partnership enable fishers to better understand research results and assessment needs. Social participation is an important factor influencing the success of natural resource management (Islam et al. 2018). This was seen in the case of the fishing cooperatives in Baja California Sur, Mexico, Fogo Island in the Canadian Province of Newfoundland and Labrador (NL) (Foley and McCay 2014), and the red rock lobster MSC certified fishery in Mexico, the first MSC certified community-based fishery in a developing country (Pérez-Ramírez et al. 2012). In addition, the experiences of the lobster MSC certified fishery provide participation incentives, such as sharing a profit, decision-making, and rural community development (Pérez-Ramírez et al. 2012).

The study on the red lobster fisheries in Mexico reveals that after receiving the MSC certification, the fisheries gained international recognition, negotiation power for government support, autonomous operation, and good relationship with local authority (Pérez-Ramírez et al. 2012). The study on stakeholders' perceptions and lessons learned from the MSC certified fisheries in Argentina suggests that the MSC certified fisheries has increased participation in implementing a bottom-up action plan and knowledge distribution among relevant stakeholders (Pérez-Ramírez et al. 2012a). The positive changes brought by fisheries certification are support in promoting community fisheries development and management in ASEAN countries.

Third, in the environment aspect, a study on the improvement of the environment through fisheries certification (Tlusty 2012) indicates that a single fisheries certification has marginal impact on the overall condition of the fisheries environment. The MSC was formulated in 1997 (Wilkins 2012, Blasiak 2017), and by December 2016, 306 of 389 fisheries that participated in the program have been certified (Wang and Chang 2017). In the ASEAN region, Ben Tre clam in Vietnam, Vietnam Blue Swimming Crab, Indonesian Pole & Line Tuna, and Indonesia Tuna were certified by the MSC. These fisheries target specific species.

However, obtaining fishery certification involves costs. Foreign experiences indicate the requirement of high expertise, skill, capacity, and associated costs for the establishment and implementation of ecolabelling in fisheries. Ecolabelling in fisheries was implemented in Africa, the Nordic countries, Australia, and Japan. The experiences of MSC certified fisheries suggested several challenges in the establishment and implementation of fisheries certification (Gulbrandsen 2009). The actual situation of ASEAN fisheries is that it is complex with multi-species, multi-types of fishing gear, and many landing sites (RI 2004, Sainsbury 2008, Gardiner and Viswanathan 2004)]; moreover, a majority of small-scale fisheries involve transboundary fisheries management. Most fishers belong to the low income group; they find it difficult to pay the fishery certification costs (Pérez-Ramírez et al. 2012, Gardiner and Viswanathan 2004)]. This is true for not only ASEAN fisheries but also Japanese fisheries (Swartz et al. 2017) and the shrimp exploitation co-op at Fogo Island, Canada (Foley and McCay 2014). It is also reported that even for Tungkang sergestid shrimp fisheries, which is regarded as a well-managed fishery in Taiwan, MSC ecolabelling may not yield benefits because of the potential high cost associated with the MSC certification (Wang and Chang 2017). Likewise, small-scale fisheries in many countries can hardly afford to pay for the certification process (Wakamatsu and Wakamatsu 2017). In some cases, fishers may receive support from NGOs or governments [24, 36]; for instance, the Cambodian fishery

legislation permits community fisheries to receive funds from governments, NGOs, charity, and other donors (RGC 2005a).

2.4. Conclusion

This study examined the fisheries laws and other relevant information in ASEAN member nations to identify current gaps between their existing legal frameworks and the GSSI benchmark requirements. The fishery legislation of ASEAN countries has fulfilled most of the GSSI requirement. The legislation allows an establishment of local fishery organization by local community, community fishers or fishery association and local authority with the support of NGOs and research institutions. The government has the function to coordinate, advice, and provide technical support to local fishery organizations.

The legislation provides direction to ensure optimal use of the available scientific information in fishery management as well as local and traditional fisheries knowledge. Many Articles in the ASEAN fishery legislation address the conservation and protection of endangered species, fishery enhancement, and ecosystem protection. Transboundary fish stock is managed under the ASEAN-SEAFDEC fishery agreement for marine fisheries and under the 1995 Mekong Agreement for the management of water resource and fisheries among the Mekong Riparian Countries, namely Cambodia, Lao PDR, Thailand, and Vietnam.

Although some gaps are identified between the ASEAN fisheries legislation and the requirement of the GSSI benchmark tool, eliminating these gaps through the efforts of local fisheries management bodies and political wills of ASEAN leaders can be plausible options. The scientific information on fisheries and fishery management shall be updated for some of the fisheries, and the need for technical supports from experts in this area.

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Chapter 3: Savings-Group Improvements Contribute to Sustainable Community-Fisheries Management: A Case Study in Cambodia

3.1. Introduction

Rice and fish are staple Cambodian foods and have a long history in Khmer culture (Thuok and Lieng 2008). Cambodian fisheries are mainly freshwater fisheries. Most rural Cambodians are both farmers and part-time fishers, with the fisheries providing food and family income. Cambodia still has a high poverty rate, although it has dropped from 47.8% in 2007 to only 13.5% in 2016 (WB 2005). Fishing is easy to start and only requires a small capital input. The number of fishers has subsequently increased (Swan and Greboval 2005). In the 1940s, when the Cambodian population was 3.2 million, there were 0.36 million fishers (Van Zalinge et al. 2002). As the population increased to 10.7 million in 1995, the number of fishers increased to 1.2 million (Van Zalinge et al. 2002). However, fish catches have gradually declined (Thuok and Lieng 2008, Lieng and Van Zalinge 2002, Hortle et al. 2004, FAO 2002). Fisheries were affected by habitat and environmental degradation and destructive fishing practices, as well as the increase in fishing effort (Van Zalinge et al. 2002). Conflicts occurred between villagers and fishing-lot owners (Baran 2005). In 2001, the Cambodian government introduced fisheries reform, abolished all fishing lots in 2012, and handed the resources over to rural fishers to manage under community fisheries. Under fishery-policy reform and the decentralization and de-concentration policy of the Royal Government of Cambodia, community fisheries have been given the responsibility of managing their exclusive fishery zones and utilizing these fishery resources for their livelihood needs in a sustainable manner (RGC 2006). These community fisheries must design and implement an action plan to conserve and manage fishery resources in their exclusive fishery areas (RGC 2006).

However, there were many challenges in the implementation of community-fisheries management. Community fishers have very limited capacities to implement community fisheries and exercise their fishery rights. Lack of funds to implement comanagement and conservation plans, such as patrolling for illegal fishing and protecting fish stocks, can be another challenge for community fisheries. There was high fishing pressure. Law enforcement was not so effective. Furthermore, destructive fishing practices occurred in many locations, fish catches per fisher declined, and fish habitats gradually degraded. Flooded forests, which are an important element of fish habitats, were cleared for agricultural land and firewood. They were also intentionally burned for hunting or lost to other accidental fires. Climate change increased flooding and drought, which caused fish to die off in the dry season. Participation in community-fisheries management was very limited owing to poverty and budget constraints. Community fishers led stressful lives and poverty discouraged their participation in community-based fishery management.

Community fishers can apply for loans from several sources for their family needs. Private loans and many microfinance institutions, such as ACLEDA Bank Plc., Hattha Kaksekar Ltd., PRASAC Microfinance Institution Ltd., AMK Microfinance Institution Plc., and VisionFund provide loans to rural communities. Savings groups are groups of people who establish a secure place for borrowing and saving money. The amount of money depends on the ability of the group. Loans are given to group members at low interest rates and without collateral. Savings groups have been established in many community fisheries (RFLP 2013). The Sustainable Communities International program co-operated with the Cambodian Fisheries Administration's Department of Community Fisheries Development to help build 10 community fisheries in the Kampong Chhnang Province of Cambodia. The program assisted in establishing and strengthening community-fisheries savings groups to meet the urgent budget needs of fishers and contribute to sustainable fisheries management (Swan and

Greboval 2005). Community members readily welcomed the savings groups. However, previous studies do not document the success and failure of savings groups in community fisheries, although one study by OXFAM about savings groups in agriculture was published in 2012 (OXFAM 2012).

There are several potential problems related to current savings groups. Members may disagree about access to loans or the capacity of committee members or leaders (OXFAM 2012). Some members may be unable to procure loans (OXFAM 2012). Fishers invest the loan amounts in purchasing fishing gear, gas, small businesses, house repairs, boat repairs, and in meeting urgent family needs. Therefore, these loans are not only used for the benefit of community fisheries, but also for the personal needs of individual members. Therefore, studies on savings groups in these community fisheries would provide a more comprehensive understanding of these facilities and highlight important considerations for improving the implementation of savings groups and community fisheries in the Kampong Chhnang Province. The results from this study could also be beneficial to community fisheries in other areas. The objectives of this study are to explore the livelihood activity, fishery resources, and management characteristics of two rural community fisheries, Peam Popech and Phlong, in the Kampong Chhnang Province, and to understand the community members' perception of savings groups and loans in these two community fisheries.

3.2. Materials and Methods

3.2.1. Study Sites

This study was formulated to seek the perceptions of two rural community fisheries about how to improve the implementation and arrangement of their savings groups. Two community fisheries were selected from the 10 communities located in the Tonle Sap floodplain supported by the Sustainable Communities International program. The selection of

the two communities was discussed with local fisheries officers for convenient access and communication. They had no distinct characteristics. Descriptions of the two chosen community fisheries are as follow:

3.2.1.1. Peam Popech Community Fishery

This community fishery was established on 16 February 2005 and is located in Peam Popech Village, Kaoh Thkov Commune, Chol Kiri District, Kampong Chhnang Province, Cambodia (Figure 1). At the time of this study, the village had a population of 1428, which is equivalent to 267 households. The community fishery was managed by 11 committee members. All 11 committee members were also members of the savings group. The committee met 2–3 times per month to discuss issues, such as the action plan, to make implementation arrangements, plan fishery patrolling if there were reports of fish poaching, or for conflict resolution. The community fishing ground extended for 1423 ha. The community's conservation areas covered 35 ha in the lacustrine zone and another, 3 km along a river and the width of the river. There were 15 patrolling members. Patrolling members carried out their patrol activities twice a week.

3.2.1.2. Phlong Community Fishery

The Phlong community fishery is in Phlong Village, Peam Chhkaok Commune, Chol Kiri District, Kampong Chhnang Province, Cambodia (Figure 1). The community was established in 1997, with 808 members in 209 households. It was managed by 13 members of the community-fisheries committee. The fishing ground of the community extended for 701 ha with 3 ha as a fish-conservation area. Flooded forest covered 25 ha of the community fishing ground. Patrolling members of the community carried out patrol duties to protect the fishery resources 3-4 times per month.

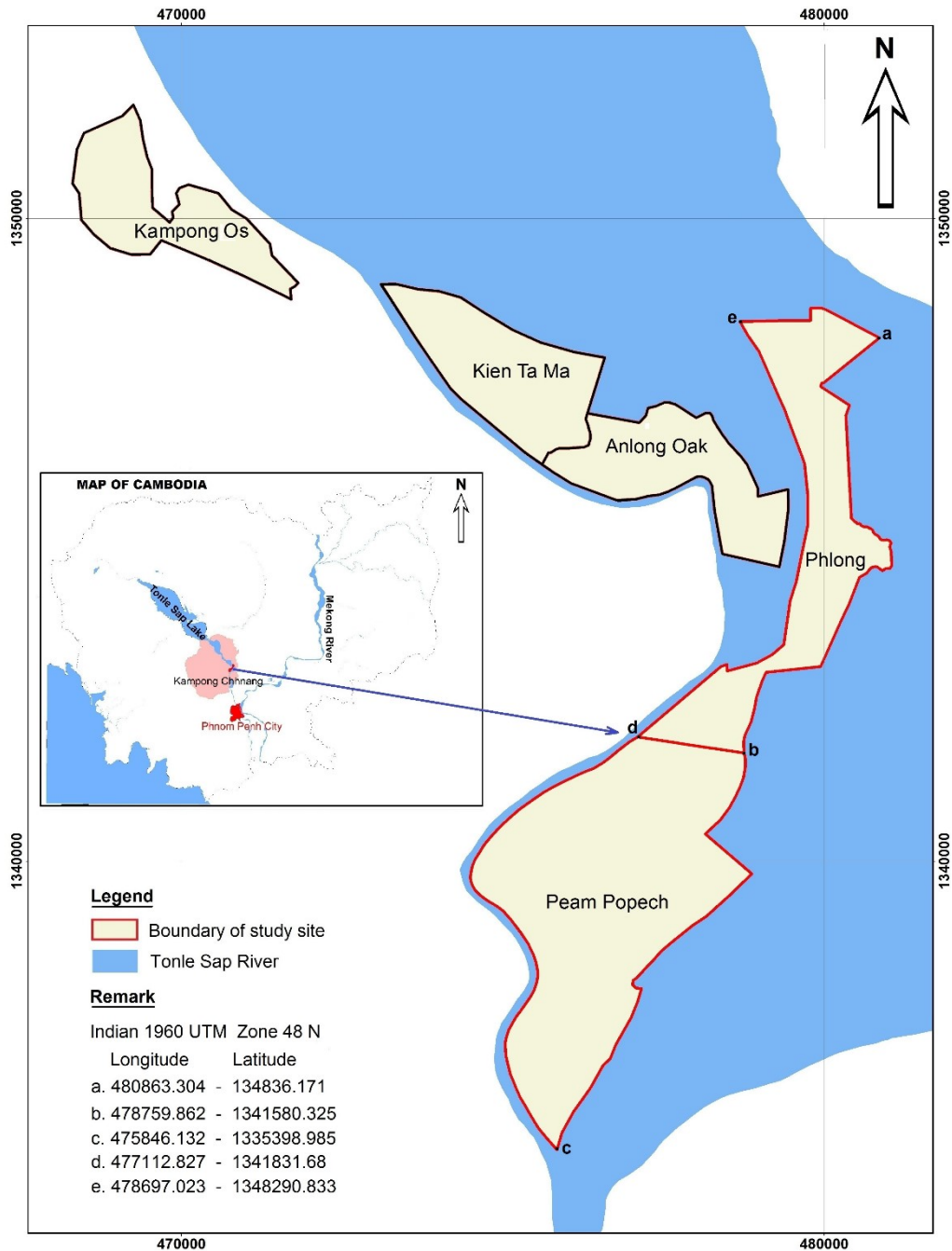


Figure 3. 1. Map showing the locations of the Peam Popech and Phlong community fisheries. Source: map produced by Mr. Jotra Sou, Fishery Administration, Cambodia (Sou 2018).

3.2.2. Data Collection and Analysis

The data for this study were gathered using a questionnaire (Supplementary Questionnaire S1). The questionnaire was formulated to collect information about education, income, livelihood activities, rice and other cropland, fish consumption, the status of fishery

resources, and the savings group. The information about farmland was collected because most members were farmers as well as fishers.

A total 160 households were opportunistically selected for interviewing, of which 77 households were in the Peam Popech community and 83 households in the Phlong community. This represented 29% and 40% of the total households, respectively. The participants in the interviews were 53% men and 47% women in the two communities, respectively. The interviews were conducted from 22–29 March 2016. Ms. Aimee Mori, from the University of Tokyo, designed and conducted the data collection. Fisheries officers of the Cambodian Fisheries Administration assisted in interviews with the community fishers.

The data were entered into Excel spreadsheets and examined using Pivot Tables (2016 Microsoft, Redmond, WA, USA). They were analyzed using descriptive statistics. The Chi-square test (X^2) was used to compare categorical data, such as age, education, income, livelihood activities, occupation, fish-consumption patterns, household assets (farm- and cropland), status of fisheries, engagement in social community, and the distribution pattern of savings and loans between the two study sites (Peam Popech and Phlong community fisheries) and between the dry and wet seasons with the significant level of 0.05.

3.3. Results

The results of the study showed the characteristics of the community fisheries, fishery resources, and the savings groups in two community fisheries, namely Peam Popech and Phlong, in the Kampong Chhnang Province, Cambodia. The statistical results of the survey are presented in Tables 1 and 2 below.

Table 3.1. Characteristics of the Peam Popech and Phlong community fisheries in the Kampong Chhnang Province, Cambodia.

No.	Indicator	Variable	Peam Popech	Phlong
1. Characteristics of the community fisheries				
1.1.	Community-fisheries members	Total number of community fisheries members (households)	267	209

1.2	Interviewees	Total number of interviewees (households): 160 households	77	83
1.3	Sex	Number of interviewees:		
		Men	35 (47%)	48 (59%)
		Women	40 (53%)	33 (41%)
1.4	Age (years)	Number of people by age group		
		15–25	3 (3.9%)	3 (3.7%)
		26–35	10 (13.0%)	26 (32.1)
		36–45	23 (29.9%)	16 (19.8)
		46–55	31 (40.3%)	20 (24.7)
		56–65	8 (10.4%)	12 (14.8)
		66–75	1 (1.3%)	4 (4.9%)
		76–85	1 (1.3%)	0 (0%)
1.5	Education	Education level of the interviewees		
		No education	6 (7.8%)	13 (16.7%)
		Not finished primary school	43 (55.8%)	40 (51.3%)
		Finished primary school	14 (18.2%)	12 (15.4%)
		Finished junior high school	13 (16.9%)	13 (16.7%)
		Finished senior high school	1 (1.3%)	0 (0%)
1.6	Household income from fishing in dry season	Number of households getting income from fishing		
		No income from fishing	19 (26%)	16 (19.3%)
		0–30%	45 (61.6%)	45 (54.2%)
		30–70%	9 (12.3%)	21 (25.3%)
		70% up	0 (0%)	1 (1.2%)
1.7	Household income from fishing in wet season	Number of households getting income from fishing		
		No income from fishing	18 (24.7%)	16 (19.3%)
		0–30%	45 (61.6%)	40 (48.2%)
		30–70%	9 (12.3%)	24 (28.9%)
		70% up	1 (1.4%)	3 (3.6%)
1.8	Livelihood activities in wet season	Number of households that received income from different livelihood activities in wet season		
		Rice farming	63 (29.4%)	64 (30.5%)
		Crops	41 (19.2%)	17 (8.1%)
		Factory worker	10 (4.7%)	10 (4.8%)
		Construction worker	9 (4.2%)	10 (4.8%)
		Fish trade	16 (7.5%)	20 (9.5%)
		Fish processing	12 (5.6%)	15 (7.1%)
		Fishing gear making	0 (0%)	0 (0%)
		Livestock	41 (19.2%)	51 (24.3%)
		Other	23 (10.7%)	23 (11.0%)
1.9	Livelihood activities in dry season	Number of households that received income from different livelihood activities in dry season		
		Rice farming	9 (6.4%)	9 (6.3%)
		Crops	10 (7.1%)	4 (2.8%)
		Factory worker	8 (5.7%)	8 (5.6%)
		Construction worker	12 (8.5%)	12 (8.3%)

		Fish trade	17 (12.1%)	21 (14.6%)
		Fish processing	11 (7.8%)	13 (9%)
		Fishing gear making	5 (3.5%)	0 (0%)
		Livestock	35 (24.8%)	48 (33%)
		Other	34 (24.1%)	29 (20.1%)
1.10	Occupation in dry season	Number of occupations per household in dry season		
		0 occupation	4 (5.2%)	7 (8.4%)
		1 occupation	27 (35.1%)	33 (39.8%)
		2 occupations	29 (37.7%)	25 (30.1%)
		3 occupations	12 (15.6%)	12 (14.5%)
		4 occupations	5 (6.5%)	5 (6.0%)
		5 occupations	0 (0%)	1 (1.2%)
1.11	Occupation in wet season	Number of occupations per household in wet season		
		0 occupation	0 (0%)	1 (1.2%)
		1 occupation	4 (5.2%)	10 (12.0%)
		2 occupations	30 (39.0%)	30 (36.1%)
		3 occupations	26 (33.8%)	30 (36.1%)
		4 occupations	12 (15.6%)	9 (10.8%)
		5 occupations	4 (5.2%)	2 (2.4%)
		6 occupations	1 (1.3%)	1 (1.2%)
1.12	Fish consumption in dry season	Number of households that reported different weekly consumption levels of fish in dry season		
		Not consumed	1 (1.3%)	1 (1.2%)
		Less than 3 days	1 (1.3%)	3 (3.7%)
		3–5 days	40 (53.3%)	44 (54.3%)
		Everyday	33(44.0%)	33 (40.7%)
1.13	Fish consumption in wet season	Number of households that reported different weekly consumption levels of fish in wet season		
		Not consumed	0 (0%)	2 (2.4%)
		Less than 3 days	5 (6.5%)	2 (2.4%)
		3–5 days	32 (41.6%)	33 (39.8%)
		Everyday	40 (51.9%)	46 (55.4%)
1.14	Household assets	Size of owned farmland (ha) *		
		0–0.5	3 (4.2%)	21 (32.8%)
		0.5–1	13 (18.3%)	7 (10.9%)
		1–1.5	32 (45.1%)	10 (15.6%)
		1.5–2	9 (12.7%)	5 (7.8%)
		2–2.5	10 (14.1%)	8 (12.5%)
		3–3.5	4 (5.6%)	9 (14.1%)
		4–4.5	0 (0%)	2 (3.1%)
		4.5–5	0 (0%)	2 (3.1%)
1.15		Size of owned cropland (ha)		
		0–0.5	6 (12.5%)	1 (5.3%)
		0.5–1	13 (27.1%)	5 (26.3%)
		1–1.5	18 (37.5%)	10 (52.6%)
		1.5–2	2 (4.2%)	1 (5.3%)
		2–2.5	6 (12.5%)	1 (5.3%)

		2.5–3	1 (2.1%)	1 (5.3%)
		3–3.5	1 (2.1%)	0 (0%)
		3.5–4	1 (2.1%)	0 (0%)
2. Status of fishery resources and management				
2.1	Status of fisheries resources	Status of black fish abundance compared to the past 10 years *		
		Serious decline	37 (48.1%)	38 (45.8%)
		Small decline	22 (28.6%)	40 (48.2%)
		Remain stable	2 (2.6%)	1 (1.2%)
		Small increase	6 (7.8%)	1 (1.2%)
		High increase	10 (13.0%)	3 (3.6%)
2.2		Status of white fish abundance compared to the past 10 years*		
		Serious decline	36 (46.8%)	39 (47.0%)
		Small decline	23 (29.9%)	40 (48.2%)
		Remain stable	1 (1.3%)	1 (1.2%)
		Small increase	9 (11.7%)	1 (1.2%)
		High increase	8 (10.4%)	2 (2.4%)
2.3		Size of white fish compared to the past 10 years		
		Much smaller	35 (45.5%)	45 (54.2%)
		Smaller	38 (49.4%)	33 (39.8%)
		Remain similar size	1 (1.3%)	4 (4.8%)
		A little bigger	2 (2.6%)	1 (1.2%)
		Much bigger	1 (1.3%)	0 (0.0%)
2.4		Size of black fish compared to the past 10 years *		
		Much smaller	17 (22.4%)	38 (46.3%)
		Smaller	55 (72.4%)	38 (46.3%)
		Remain similar size	2 (2.6%)	5 (6.1%)
		A little bigger	2 (2.6%)	1 (1.2%)
		Much bigger	0 (0%)	0 (0%)
2.5	Engagement in social community	Number of households engaged in an association *		
		Community fisheries	70 (90.9%)	80 (96.4%)
		Farming association	0 (0%)	2 (2.4%)
		Savings group	42 (54.5%)	20 (24.1%)
		Women's group	16 (20.8%)	9 (10.8%)
		Water management community	12 (15.6%)	8 (9.6%)
2.6		Number of households engaged in different number of associations		
		Not engaged in any association	5 (6.5%)	3 (3.6%)
		Engage in 1 association	24 (31.2%)	51 (61%)
		Engage in 2 associations	32 (41.6%)	19 (22.9%)
		Engage in 3 associations	12 (15.6%)	8 (9.6%)
		Engage in 4 associations	4 (5.2%)	2 (2.4%)
3 Savings and Loans				
3.1	Financial status	Concern about getting a loan from a microfinance institution		
		Agreed fully	55 (72.4%)	54 (65.9%)
		Agreed somewhat	3 (3.9%)	7 (8.5%)
		No idea	4 (5.3%)	9 (11.0%)
		Disagreed somewhat	1 (1.3%)	3 (3.7%)

		Disagreed completely	13 (17.1%)	9 (11.0%)
3.2		Savings should be available to all community members		
		Agreed fully	25 (33.3%)	37 (44.6%)
		Agreed somewhat	28 (37.3%)	30 (36.1%)
		No idea	4 (5.3%)	2 (2.4%)
		Disagreed somewhat	12 (16%)	8 (9.6%)
		Disagreed completely	6 (8%)	6 (7.2%)
3.3		For the benefit of the community as a whole, not everybody can have equal access to savings		
		Agreed fully	16 (21.3%)	26 (31.3%)
		Agreed somewhat	34 (45.3%)	37(44.6%)
		No idea	4 (5.3%)	6 (7.2%)
		Disagreed somewhat	19 (25.3%)	9 (10.8%)
		Disagreed completely	2 (2.7%)	5 (6%)
3.4		The appropriate distribution of loans should be prioritized over individual relations with community fisheries *		
		Agreed fully	31 (40.8%)	46 (55.4%)
		Agreed somewhat	24 (31.6%)	28 (33.7%)
		No idea	3 (3.9%)	3 (3.6%)
		Disagreed somewhat	17 (22.4%)	4 (4.8%)
		Disagreed completely	1 (1.3%)	2 (2.4%)
3.5		Was the leadership of the savings group strong? *		
		Agreed fully	32 (42.7%)	33 (40.2%)
		Agreed somewhat	25 (33.3%)	42 (51.2%)
		No idea	2 (2.7%)	1 (1.2%)
		Disagreed somewhat	16 (21.3%)	6 (7.3%)
		Disagreed completely	0 (0%)	0 (0%)

* denotes the existence of the difference between Peam Popech and Phlong based on the Chi-square test (X^2) with the significant level of 0.05.

Table 2. Hypothesis testing of the income of the households.

No.	Variables	Dry Season vs. Wet Season
1	Number of households getting income from fishing	Peam Popech Phlong
2	Number of households getting income from other livelihood activities	Peam Popech * Phlong *

* denotes the existence of the difference between the dry and wet seasons based on the Chi-square test (X^2) with the significant level of 0.05.

3.1. The Characteristics of the Community Fisheries

3.3.1.1. Education

The level of education of the community-fishery members in this study is defined in accordance with the official determination of Cambodian education. They were similar

between the two communities, with more than half of the members not having finished primary school (55.8% in Peam Popech and 51.3% in Phlong) and 7.8% in Peam Popech and 16.7% in Phlong with no education at all (Table 1, No. 1.5). Other characteristics of the two community fisheries are described below:

3.3.1.2. Income and Livelihood Activities

Number of households getting income from fishing was similar between the two communities and between both the dry and wet seasons (Table 1, No. 1.6 and 1.7, Table 2, No. 1), although fish was expectedly less abundant in the dry season. Small-scale fisheries can legally operate year-round in both the wet and dry seasons in lakes and river. The majority of the households, 61.6% in Peam Popech and between 48.2% and 54.2% in Phlong, gained up to 30% of their income from fishing in both the wet and dry seasons (Table 1, No. 1.6 and 1.7).

The community fishers made their living from integrated livelihood activities, such as farming rice and other crops, factory work, construction work, fish trading, making fishing gear, and livestock farming, depending on the opportunities available in both the wet and dry seasons (Table 1, No. 1.8 and 1.9; Table 2, No. 2). The livelihood opportunities in the two communities were different in both the wet and dry seasons (Table 2, No. 2). Community members up to 33% earned their living from farming rice, other crops, and livestock (Table 1, No. 1.8 and 1.9).

One household may have up to six occupations a year (Table 1, No. 1.10 and 1.11). Some households, 35.1% and 39.8% in the dry season (Table 1, No. 1.10) and 5.2% and 12% in the wet season (Table 1, No. 1.11) in Peam Popech and Phlong, respectively, reported only one occupation. However, most households reported 2 occupations, 37.7% and 30.1% in the dry season (Table 1, No. 1.10) and 39% and 36.1% in the wet season (Table 1, No. 1.11) in Peam Popech and Phlong, respectively.

3.3.1.3. Fish Consumption

Most households in both community fisheries (39.8%–55.4%) preferred eating fish 3–7 days per week in both the dry and wet seasons (Table 1, No. 1.12 and 1.13). Less than 6.5% of the households consumed fish fewer than 3 days per week (Table 1, No. 1.12 and 1.13).

3.3.1.4. Land Use for Agriculture

In both communities, 10.9% to 45.1% of households owned 0.5–1.5 ha of farmland (Table 1, No. 1.14). Up to 3.1% of households owned 4–5 ha of farmland and 5.6% to 14.1% of households owned 1.5–4 ha of farmland (Table 1, No. 1.14). Farmland is mainly rice farmland in lowland flooded areas. In both communities, a small number of households (up to 12.5%) owned 0.5–4 ha of cropland (Table 1, No. 1.15). The majority of households (26.3–52.6%) possessed 0.5–1.5 ha of cropland (Table 1, No. 1.15). Cropland is the home lot and land near homes in upland areas, and usually used for planting vegetables and other crops and raising animals. The size of farmland was different between the two communities (Table 1, No. 1.14).

3.3.1.5. Status of Fishery Resources and Management

Most households (28.6–48.2%) in both communities had slightly different opinions that both black and white fish had undergone either a small or a serious decline in abundance in the past 10 years (Table 1, No. 2.1 and 2.2). Few households (less than 13%) observed stable or increased abundance of fish (Table 1, No. 2.1 and 2.2). Most households (22.4–72.4%) in both communities perceived that both black and white fish had reduced in size (Table 1, No. 2.3 and 2.4). Only a minority of households (less than 6.1%) claimed that fish size remained stable or increased (Table 1, No. 2.3 and 2.4). The opinion about abundance of white fish and size of black fish was different between the two communities (Table 1, No. 2.2 and 2.4). The black fish are sedentary fish species, which is black in color and tolerant of bad water quality,

such as the striped snakehead (*Channa striata*) and blackskin catfish (*Clarias meladerma*). The white fish are migratory species, which are white in color and sensitive to changes in water quality, such as the thicklip barb (*Probarbus labeamajor*) and iridescent shark catfish (*Pangasianodon hypophthalmus*). These terms are usually used by rural Cambodians.

Almost all households (90.0–96.4%) in both communities engaged in fishery management as members of community fishery (Table 1, No. 2.5), although their livelihood did not fully depend on fishing. Only up to 2.4% of the households were members of the farming association (Table 1, No. 2.5), although rice farming was their most important livelihood activity. The second-highest percentage of households (54.5% in Peam Popech and 24.1% in Phlong) was members of a savings group. Several households, 20.8% in Peam Popech and 10.8% in Phlong, were members of women’s groups (Table 1, No. 2.5). Each household could be involved in up to four different social associations, namely, community fisheries, farming association, savings group, and the women’s group (Table 1, No. 2.6). Most households (22.9–61%) engaged in only one or two social associations (Table 1, No. 2.6). The engagement in social community was different between the two communities (Table 1, No. 2.5).

3.3.2. Savings and Loans

Most community members (72.4% in Peam Popech and 65.9% in Phlong) expressed their concerns about obtaining a loan from a microfinance institution (Table 1, No. 3.1). A minority of the community members had little or no concern about this (Table 1, No. 3.1). This level of worry was similar between the two communities (Table 1, No. 3.1). The majority of members (33.3–37.3% in Peam Popech and 36.1–44.6% in Phlong) suggested that savings should be made available to all members of the community (Table 1, No. 3.2).

The remaining households (2.4–16%) had no opinion or suggested an opposing idea (Table 1, No. 3.2).

For the general benefit of the community fisheries, most community members (21.3% and 45.1% in Peam Popech, 31.3% and 44.6% in Phlong) fully or partially agreed that all members of the community should not have equal rights to access the savings (Table 1, No. 3.3). The minority of households (less than 25.3%) held the opposite opinion about access rights to savings (Table 1, No. 3.3.).

The majority of members (31.6% and 40.8% in Peam Popech, 33.7% and 55.4% in Phlong) fully or partially agreed that the distribution of savings should be prioritized over each individual's relationship with the community fisheries, such as contribution to community fisheries including participation in fisheries-management activities, patrolling for illegal fishing, conservation of fishery resources (Table 1, No. 3.4). Most community members (33.3–42.7% in Peam Popech and 40.2–51.2% in Phlong) felt confident that the leadership of the current savings group was strong (Table 1, No. 3.5.). Less than 21.3% of the members had little or no confidence in the leadership of the savings group (Table 1, No. 3.5). The opinion about the appropriate distribution of loans and the leadership was different between the two communities (Table 1, No. 3.4 and No. 3.5).

3.4. Discussion

4.1. Characteristics of Community Fisheries

The characteristics of community fisheries have important implications for livelihood development and fishery resource management. Fishing is a vital source of livelihood in rural communities (Sok et al. 2012). Allison et al. (2012) mentioned that success in encouraging the participation of community fishers in fishery management requires that it address a direct threat to their livelihood (Allison et al. 2012). Community fishers will become involved in

community-fisheries management when they expect their livelihood to improve (Marschke and Berkes 2005). In addition, Allison et al. (2012) also reported that many factors that promote involvement in fishery management can be outside the scope of fishery policy or management institutions (Allison et al. 2012). Some factors discussed here have no direct connection to fisheries. These include education, income, livelihood activities, and savings groups.

Most community-fisheries members were not highly educated and the percentage of households that had not completed primary school was much higher than the Cambodian national rate (51.3% and 55.8% vs. 25.8%) (NIS 2014). However, the noneducation rate was lower than the national rate (7.8% and 16.7% vs. 22.5%) (NIS 2014). The 2013 Cambodian population census reported that the literacy rate was lower in agriculture, forestry, and fisheries (NIS 2014). Education is essential for sustainable economic development (NIS 2014). Human capacity and skill development is a key element in promoting livelihood development and participation in community-fisheries management (Kurien 2017). Low skill and education levels are a challenge in the implementation of fisheries comanagement.

Community fishers utilize fish for food and to earn family income (Allison et al. 2012). Fishing is linked closely with rural-community livelihoods. Cambodians eat 67 kg fish/person/year (Hortle et al. 2004). This study found that rural-community fishers ate fish 3–7 days per week. This frequency of fish consumption was consistent with the 2013 agriculture census in Cambodia, which reported that 90% of farming households in the Tonle Sap region engaged in fishing for fish, snails, crustaceans, crabs, freshwater shrimp, etc., for family consumption and ate fish and other seafood four days per week (FAO 2015). A study by WorldFish (2016) reported that a household with insufficient income consumed floodplain resources such as snails, shellfish, crabs, and snakes more frequently than other meats, such as wild animals or birds (Mousset et al. 2016). Those resources can be found in the flooded

grassland, marshland, and deep pools or small lake habitats in the Tonle Sap Floodplain (Lieng et al.2005). The report added that Cambodians ate more than twice as much fish as pork, chicken, or beef (15.7 kg/person/year for these three items) (Mousset et al. 2016). Notably, when food and income is not secure, fishers will employ destructive fishing methods, as demonstrated in Bangladesh (Islam et al. 2018). Surprisingly, 83% of interviewees in the Philippines said they would not stop fishing although other occupations could generate higher income (Pomeroy et al. 1997). People value fisheries when it is vital for their livelihoods (Van Holt et al. 2016).

In addition to food consumption, fishing provided an annual family income of around US\$589–1433 (NIS 2014). The money gained from fishing is not only used as family cash income, but also to buy fuel, rice seeds, and fertilizer for rice farming. The income from fishing contributed to a household requirement but provided only part of the family income because a household generally needs five times as much as the income from fishing, when considering the Cambodian GDP per capita in 2016 (US\$1269.9) (WB 2018). The average family size in Cambodia is five persons (NIS 2014). Tietze (2016) found that in most cases, fishing did not provide sufficient income for the household's needs (Tietze 2016). Diverse economic activities were necessary to fulfill family needs, and most community fishers both fished and farmed. When a household has access to diverse income opportunities, it is less sensitive to the effects of climate change (Ndhlovu et al. 2017) and when a community depends highly on nutrition, income, and employment from fishery, they are more sensitive to the effects of climate change (Islam and Sallu 2014). Typically, a household has more than one occupation, and may grow crops, run a small business, or raise cattle, pigs, chickens, or ducks in their home lots. Seventy-eight percent of the households in the Tonle Sap region raised livestock and/or poultry (NIS 2009). They performed other fishery-related activities, such as fish processing and marketing (RFLP 2013). Hap et al. (2016) and MeKenney and

Tola (2002) reported that there was a need for community fishers to perform many economic activities to earn a living (McKenney and Tola 2002). The diversified livelihoods of these rural communities were also reported by Marschke and Berkes (2005) (Marschke and Berkes 2005). This study found that most rural households in the two communities owned farmland of approximately 0.5–1.5 ha and cropland of a similar size. This finding was similar to the 2013 census of agriculture in Cambodia, which found that rural Cambodians owned an average of 1.64 ha of farmland (OXFAM 2012). Rice-production yield, on average, is 4.2 tons per hectare (OXFAM 2012). Cambodians consumed an average of 143 kg rice/person/year (NIS 2014). This allows for a surplus of rice to exchange for some household income. These diverse livelihood activities may contribute to improved fishery management, as it could divert some efforts to alternative appropriate occupations and relieve the pressure on natural resources (Marschke and Berkes 2005). Tietze (2016) suggested that alternative livelihood opportunities are a priority for improving fisheries conservation and management (Tietze 2016). In the case of the two communities, the savings group provides some fund for livelihood activities and fishery management. In addition, it is important to have effective fishery-management measures.

Although the income of the two rural communities did not depend fully on fishing, members of the community fisheries were likely to focus on fisheries. Almost all community members were members of community fisheries, more than any other social associations. Effective fishery comanagement requires the involvement and active participation of local community members (Marschke and Berkes 2005, Barakagira and Wit 2017). It is essential to obtain the involvement of the direct users of fishery resources. The community members found it important to manage the fishery resources in their communities to maintain their livelihoods. Community fishers are legally expected to participate in fishery conservation and management and are concerned about the decline of fish stocks. These community fishers

could report the historical status of fishery resources in their communities. Their observation of fish-catch decline confirmed the report by Marschke and Berkes (2005) (Marschke and Berkes 2005). The decline in fish abundance and size was addressed in 2002 by Zalinge et al. (2002) (Van Zalinge et al. 2002). The 2006 Cambodian fishery law provides community fishery members with rights and the responsibility to manage fishery resources in their designated fishing grounds [9,32]. Community fisheries are expected to develop their own fishery management plan (Hortle et al. 2004). Community fisheries are responsible for developing, managing, conserving, and utilizing fishery resources in their designated area in a sustainable manner [9,32]. The community fishers are required to protect the fish habitat and ecosystem, participate in the monitoring and the control of fishery resources, and prevent destructive activities [9,32].

3.4.2. Savings Groups and Loans

Savings groups and microcredit options were implemented in the two community fisheries. The establishment and implementation of savings groups were facilitated and supported by the provincial fishery cantonment and nongovernmental organizations (Sreyphrea et al. 2016). The concern of the community fishers about taking loans may be related to their debt. The incurrence of debt may be connected with agriculture and other business activities, but not fisheries (Mousset et al. 2016). A rural fishing-dependent household in the Tonle Sap region had an average debt of US\$372 (Mousset et al. 2016), which was one third of their national GDP per capita of US\$1269.9. Community fishers receive loans for their family's needs and for buying rice seeds, pesticides and fuel for farming, livestock production, education, healthcare, and to pay other debts (Kurien 2017) (OXFAM 2018). Savings in community fisheries are different from agricultural savings because part of the interest earned from the loans is used for fisheries management and the

conservation of community fisheries. The savings group is a useful activity in community fisheries (Kurien 2017).

The experiences of a savings group in Bantoat Bos Village, Cambodia showed that, with the help of a savings group, a poor community member who was not in the habit of saving money could do it and gain access to a loan (OXFAM 2018). The loan relieved financial difficulty and could be used to generate more income from raising livestock and growing vegetables (OXFAM 2018). The current savings implemented in those communities by the Sustainable Community International program was small. However, it was appreciated by the community fishers, as it was easy to access without collateral. A study in Pakistan showed that although microcredit was small, it had a positive effect on poverty reduction (Latif et al. 2011). This community savings fund could help relieve the stress of paying off other debts. The savings group also provides an incentive for strengthening local community fisheries and solidarity. A study on the sustainability of the Elephant Marsh Fisheries in Malawi suggested that a strong local institution has a strong effect on the sustainability of fisheries management (Kosamu 2014).

According to the Cambodian sub-decree on community fisheries, the budget needed for community fisheries to implement their action plans permits the communities to seek technical and financial support from charities, government, nongovernmental organizations, international organizations, and other legal sources [9]. The communities can also collect contributions from their community members as a membership fee [9]. Engaging in fishery ecolabeling could be an opportunity to access additional sustainable sources of funding for implementing community fisheries' action plans. The savings group must be sustained so that it can sustain the community fisheries fund.

Funding from the savings group is part of a solution to relieve budget shortages in community fisheries. However, this study found some concerns among community

households about the savings operation. These concerns were about the rights of community members to access the savings and their distribution. Consultation meetings should be conducted with members of savings groups to gather their opinions and collect further details about the current internal rules and regulations of savings groups. Any implementation procedures should be agreed to by all members. Archer (2012) reported the recommendations of the Community Development Fund that the funds should be managed in a way that the community members play an active role, and therefore, adapt to the system (Archer 2012).

In this regard, a study of savings groups in Cambodian agricultural production in 2012 by OXFAM (OXFAM 2012) suggested that, to ensure good operation and sustainability of the savings group, the implementation arrangement and procedure should consider the following:

- Group size: some savings groups failed because there were too few group members. A larger number of group members were found to accumulate larger funds and could more quickly fulfill the demand for giving loans. However, the most suitable size for the group is 15–25 members (Ledgerwood and Rasmussen 2011).
- Lending to nonmembers: past experiences of lending to nongroup members gave both a good advantage and high risk. However, it depended on the decision of the group members and the availability of money.
- Rules and procedure: holding regular meetings and more participation in meetings showed a stronger organization. The rules and regulations, such as to have regular meetings and to return loans and deposit money in a timely manner, were implemented to reinforce the activities of the savings group. However, in some cases, punishment would cause tension within the group. Meetings are essential to keep members well-informed, improve communication among members, and to understand the importance of savings for the community.

- Committee or leadership of savings group: Trust and belief is very important in the savings group. The savings and loans must have accurate records and accountability. This is to build trust and belief. It is essential that the leader or committee is good at conflict resolution and has financial or book-keeping skills. Females were found to be good recorders and good leaders of saving groups (Kurien 2017). Capacity building should be conducted to enhance accounting and book-keeping.
- Available funds: the savings should make funds available, which can be mobilized among group members.

Funding from a savings group is financial capital for reinvesting in livelihood activities such as fishing, farming, livestock, and small businesses. The fishers and farmers joined a network or association to work together as community fisheries and savings groups. They joined such networks or associations to maintain the sustainability of their natural assets. Livelihood was defined by Scoones (1998) (Scoones 1998) as consisting of the capabilities, assets, and activities required for a means of living. Scoones (1998) added that livelihood strategies can be implemented depending on the basic material and social, tangible, and intangible assets that people possessed (Scoones 1998). Fishery resources, farmland, and cropland are the assets these communities own and use for their livelihood.

3.5. Conclusions

The characteristics of the two community fisheries, Peam Popech and Phlong, were relevant factors for the successful implementation of community-fisheries management and livelihood development. The community fisheries members did not fully depend on fishing; however, it was a very important source of food and income for the rural households. Part of the income from fishing was invested in other economic activities. Facing the problem of fish

decline, this study suggests that fishery management shall be further strengthened to maintain sustainable fishery resources for the communities.

The findings from this study suggested that the implementation arrangement and procedure should be reviewed and strengthened to encourage the active participation of savings group members. The procedure should reflect the opinion and perceptions of the savings group members and incorporate experiences from elsewhere. A shortage of funds is an obstacle to livelihood activities and community-fisheries management. The part of the savings fund is used for sustainable fisheries management. Funding from a savings group may help relieve the stress of financial shortages in community fisheries. Loans from these savings were used by the community fisheries members to invest in diverse livelihood activities to generate more family income. The government should have a national financial policy to facilitate community fishers in investing in their fishery-related activities. The lessons learnt from these community fisheries will be beneficial to other communities elsewhere.

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Chapter 4: Freshwater Fisheries of Cambodia: the Bagnet (Dai) fishery in the Tonle Sap River

4.1 Introduction

The Tonle Sap River connects Cambodia's Great Lake and the Mekong River (Fig.1). It joins the Mekong in Phnom Penh, where the Mekong splits into two branches, the Mekong proper and the Bassac. A remarkable hydrological phenomenon takes place during the annual flooding of the Mekong River: when pushed by the enormous quantities of water transported down the Mekong, the Tonle Sap River changes direction and flows upstream to the Great Lake for about 3 months, until the floods subside and the river resumes its normal course.

The bagnet or dai fishery is located in the lower part of the Tonle Sap River 4-30 km north of Phnom Penh. It is one of the large-scale inland water fisheries of Cambodia. According to official 1995 fishery statistics of the Department of Fisheries (DoF), the dai fishery has in recent years contributed 10-20% to the total annual inland fish production of 65,000-75,000 t. However, fishery data in general are limited and unreliable, as estimates are often based on outdated methodologies (FAO, 1994). Therefore, a new approach is required on a country-wide scale. To facilitate the design of a new data collection scheme, preliminary low frequency data collection has been carried out. The dai fisheries were sampled from December 1994 through February 1995. Results and a new sampling design are presented here.

4.2 Hydrological and biological Aspects

The reversal of the Tonle Sap River flow normally takes place in July and, as a result, water depth increases greatly. The average water level in the Great Lake is about 1 m in April and increases to over 9 m during the peak of the floods (Mekong Secretariat 1993). The surface areas of the lake and the river expand three to five times in size, covering the belt of flood forests, degraded forests and wetlands surrounding the lake and river.

Fish migrating upstream invade these inundated areas for feeding and reproduction. Biological productivity is at peak in this period. In September/October, a second flow reversal occurs and the Tonle Sap River starts flowing once more from the Great Lake to the Mekong River. As the water level decreases, fish migrate back to the lake and river. First the dai fisheries start operating, followed by other large-scale fisheries using filtering devices, such as barrier traps, lake fences and traps (lob nor).

The hydrological cycle is mirrored in the biological cycle. Many species tend to spawn around the onset of the floods and their fry enter the food-rich wetlands with the floodwaters. Other species use the flooded plains and forests for reproduction and also as nurseries. Most productive among these are the so-called opportunists – small, fast-growing and prolific species that feed low in the food chain. Large numbers migrate back to the river when floods recede from October through February. Migration usually peaks in December and January, especially in a time-window from 6-1 d before full moon, when the river seems packed solid with fish. At that time, we observed catch rates of up to 38 t per dai unit in 24 h, compared to a few hundred kilograms per day during the rest of the month. The catch was found to contain mainly opportunists, but species of “white” fish (larger migratory fish) were also present.

Collection of water level data (daily gauge height readings) from stations along the Tonle Sap River has been irregular. Kampong Chhnang data go back to 1924, but there are many omissions. A declining trend in flood levels is apparent from 1957 (Figure 4.2). However, the Mekong Secretariat (1993) suggests that the position of the measuring gauges has changed in this period and thus, that the lower levels after 1957 are not directly comparable. Local sources confirm that for an unknown period until 1994, water levels in Kampong Chhnang were measured using the steps of a staircase leading to the river. In 1994, new gauges were established and the flood level recorded in October 1994 was indeed in the pre-1957 range of fluctuations. Apart from these deviations, Fig. 2 shows that water levels vary from year to year within a range of 2 m. The extent of the inundated area clearly varies with the level and duration of the floods, but reliable data on area coverage do not exist. The Mekong Secretariat (1993) has shown that there is a strong correlation between the volume of water entering the Tonle Sap (and thereby the Great Lake) and the magnitude of the Mekong flood. Thus, a decrease in the average level of the Mekong flood (e.g., through the cumulative effect of dams) would lead to less water reaching the lake and less area being inundated, which would have a negative effect on fish production.

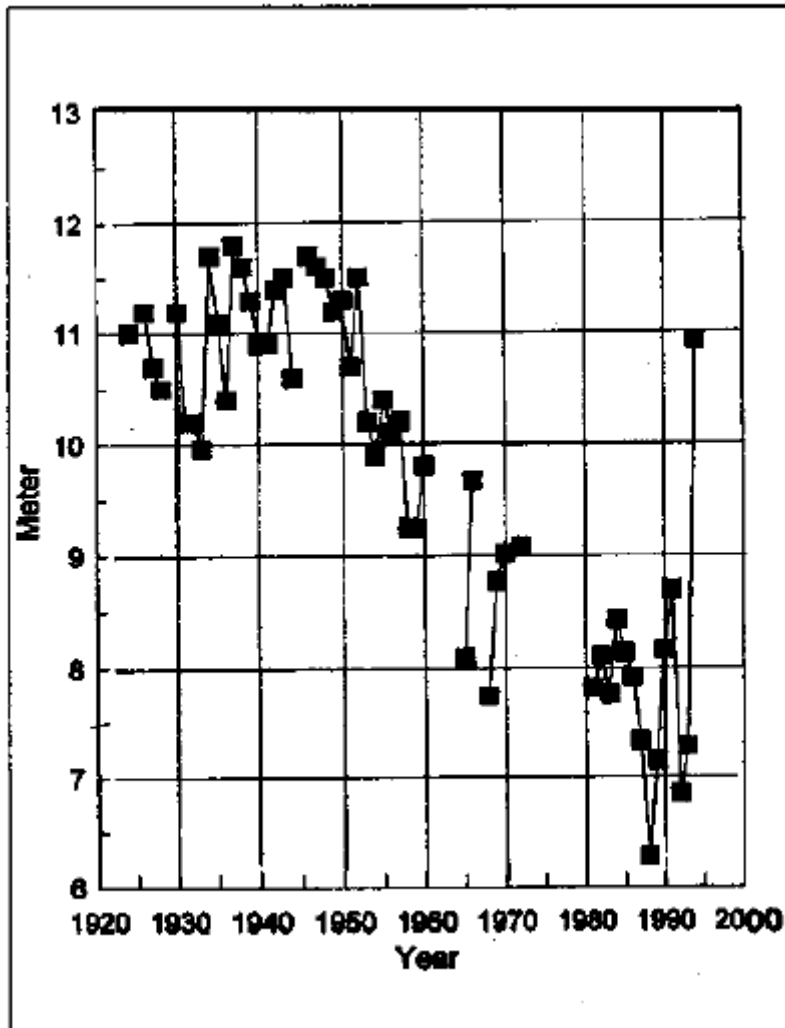


Figure. 4.2. October water levels of the Tonle Sap River in Kampong Chhnang from 1924 to 1994. (courtesy Mekon Secretariat and Kampong Chhnang Hydrology Station)

4.3 Bagnet or Dai Gear and Operation

Dai untis are operated singly but are joined with three to eight others in rows across the river, which sometimes form large barrages that leave just enough space for navigation (Figure 4.3.) Altogether there were 73 dais in 15 rows operating during the 1994-95 fishing season. This number was reduced to 63 in the new season.



Figure 4.3 Bagnet fisheries in Tonle Sap River, Cambodia

Two bamboo rafts about 25 m apart are linked together by bamboo poles and held stationary by anchors in the river. A sampan is placed between them, ensuring stability to the whole structure (Figure 4.4). A cone-shaped net is placed in the water between the two rafts by ropes. Its mouth diameter is 25 m and the net is 120 m long. Mesh size is 15 cm at the entrance and 1 cm at the bag. When catches are low, an open-weave basket made of bamboo and rattan is attached to the last part of the bag. Another raft with platform and sampan is situated downstream at the level of the bag, which can be winched onto the wooden platform where the catch is deposited for sorting.

The dai is kept open by the force of the water current and with the help of anchors and two vertical bamboo poles fixed to the rafts. Fish moving down-stream with the receding floodwater enter the net. When migration of fish is at its peak, the bag is emptied every 15-20

minutes day and night and may hold up to 500 kg of fish per lift. But on days when few fish are migrating, the frequency of lifting is much less.

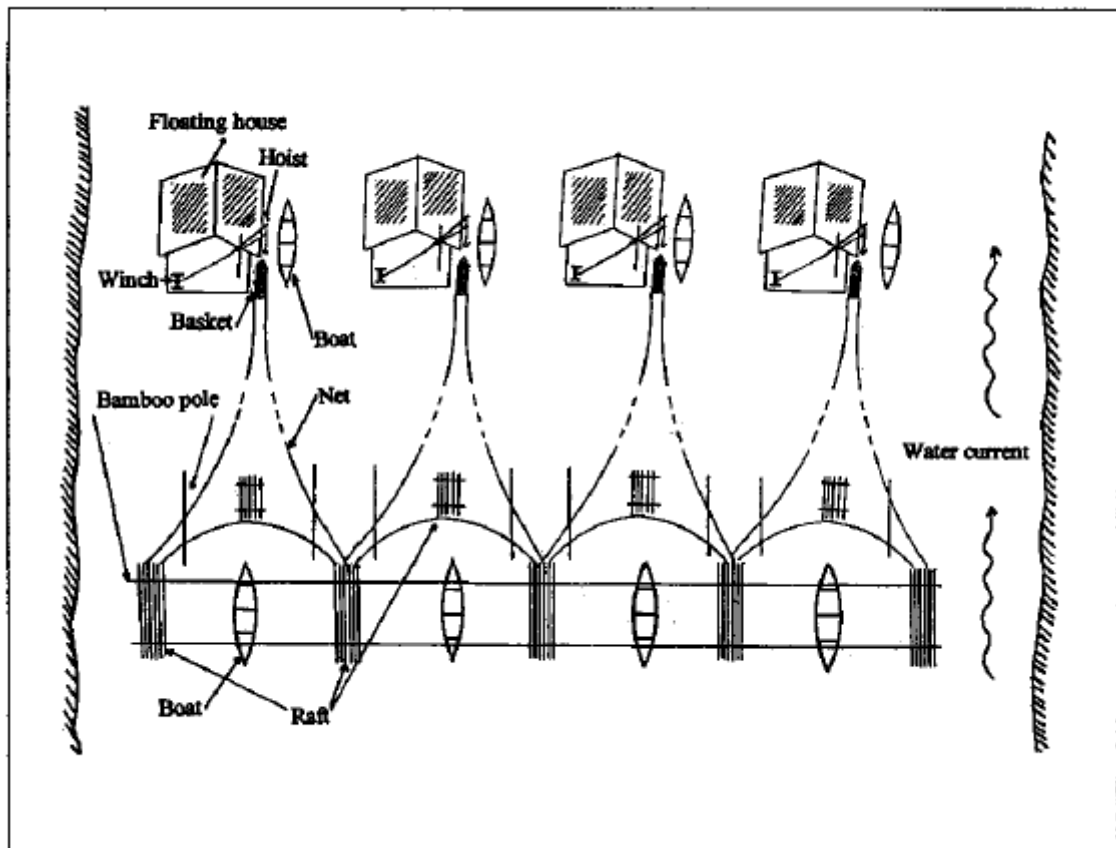


Figure. 4.4. Diagram of row of four dai units in the Tonle Sap River, Cambodia.

4.4 Auction System and Fish Handling Practices

Under Cambodian fishery law, a bagnet or dai unit is classified as a fishing lot. Fishing lots are concessions auctioned by the government to the highest bidder for exclusive exploitation over a 2-year period. It is one of the government's instruments for extracting a resource rent from fisheries.

The auction is overseen by a committee consisting of the director of the central fishery department, the governor of the province and the provincial finance director. Prior to the bidding, interested parties must deposit an amount equal to one third of their initial

written offer, which has to exceed the published minimum price fixed by the government. The auction take place in three stages. The duration of each stage is determined by the burning of a short candle which usually takes 3-5 minutes. Those who increase their bid during the first two stages may proceed to the “last candle” when the right to operate the lot for two years goes to the highest bidder. Dai ownership is divided among ethnic lines as follows: 46% Khmer, 50% Cham (Muslim) and 4% Vietnamese.

In the 1995 auction, dai units varied in price from US\$200 to over US\$5000 for one year, reflecting differences in profitability. Despite a bumper catch in 1994-95, the average price (US\$1,921) was 4% less than in 1993, and 10 dai lots were not auctioned, due to lack of bidders.

Usually, fresh fish are sold on the riverbank near the dai unit to traders who take them mainly to Phnom Penh city markets. More valuable fish (usually the bigger fish) are often kept alive in cages below working platform of the dai. Quantities vary from 6 to 20 t, but fishers complain that numbers are decreasing. These fish are sold from March through September, when fish prices are higher than in the main fishing season and comprise such species as: Pruol, Krom, Po, Chhkok, Chhpin and Pra (see Table 1). Fresh fish consumption is important among people living close to fish production area and markets, but in rural areas far from natural water bodies or markets, processed fish is more important. At the height of the season, when fish catches are very large, most are processed into fish paste (prahoc), fermented fish (phaok), sweet fish (mam), smoked fish and fish sauce. Surplus fish are dried for pig feed or fertilizer. Species used for fish paste, etc. are the small fish like riel, sluk russey, kros, linh, kaek, kralang and kanh chruk (see Table 1).

Since the government prohibited the export of this kind of fish to Vietnam in 1990 (Touch, 1993), apparently a surplus has been created, leading to lower prices (down to \$0.02 kg⁻¹) and a decrease in the number of dais.

4.5. Sampling Method and Results

All dai units in Phnom Penh and Kandal (73 dais in 15 rows) were divided into three minor strata (rows 1-5, 6-10 and 11-15). Sampling was conducted randomly with an average frequency of 2 days per month. Stratification in time was also applied: a peak period of 4-6 days before full moon and a low period consisting of the rest of the month. Catch per lift was estimated, as well as the number of lifts per 24 hrs. The total catch of a lift was sampled for species composition at low periods, while subsampling was necessary at peak periods. Length frequency samples of selected species were also taken.

ARTFISH, computer software for the estimate catch by species of the 73 dai units in December 1994, January and February 1995. The overall catch was estimated to be 18,410 t. The breakdown by species and months is given in Table 1.

Differences in day and night catches per lift apparently are insignificant. However, the number of lifts at night can be less than during the day, and thus should be accurately assessed on sampling days, as variations in effort have a greater impact in the catch estimation process than variations in the catch itself.

Table 4.1. Estimated catch by species of the 1994-95 bagnet/dai fisheries ranked in order of importance. For comparison of the species abundance in 1962-63 (in%) and 1938-39 (relative abundance) is presented¹.

Species ²	Khmer name	Estimated catch (t)				% of Total catch	1962-63 % catch	1938-39 rel.Abundance
		Dec. 94	Jan. 95	Feb. 95	Total			
<i>Henicorhynchus spp.</i>	Riel	55	6,834	5,543	12,432	67.52	25.4	++++++
<i>Paralabuca typus</i>	Sluk russey	31	1,562	866	2,460	13.36	0.3	+++++
<i>Dangila spp./Osteochilus hasselti</i>	Khmong veng/Kros	42	543	394	979	5.32	-	+++++
<i>Thynnichthys thynnoides</i>	Linh	3	479	33	515	2.80	14.9	+++++
<i>Morulus chrysophekadion</i>	Kaek	17	420	34	471	2.56	2.0	++++
<i>Cirrhinus microlepis</i>	Pruol/Kralang	4	143	251	398	2.16	18.6	++++
<i>Botia spp.</i>	Kanh chruk	4	171	94	270	1.47	0.2	+
<i>Cyclocheilichthys enoplos</i>	Chhkok	38	70	84	192	1.04	1.7	+++
<i>Clupeoides/Clupeichthys spp.</i>	Bandaulampou	1	11	77	88	0.48	1.6	+
<i>Micronema apogon</i>	Kes	1	82		83	0.45	0.3	++
<i>Pang. siamensis/spp.</i>	Chhweat	1	55		56	0.31	1.5	+++++
<i>Pangasius concophilus</i>	Pra ke	3	30		33	0.18	0.0	++
<i>Amblyrhynchichthys truncates</i>	Kambot chramos	10	16	4	30	0.16	0.7	+
<i>Osteochilus melanopleura</i>	Krom	18	7		26	0.14	3.2	++++
<i>Pang. hypophthalmus/spp.</i>	Pra	5	17		22	0.12	0.4	++
<i>Mystus nemurus</i>	Chhlang	0		11	12	0.06	0.0	++

<i>Pangasius larnaudiei</i>	Po	10			10	0.06	0.4	++
<i>Barbodes altus</i>	Kahe	1	9		10	0.06	7.5	++++
<i>Puntioplites protozysron</i>	Chrakeng	5	1		6	0.03	3.2	+++
<i>Macrochirichthys macrochirus</i>	Dang Kteng	5			5	0.03	0.1	+++++
<i>Cosmochilus harmandi</i>	Kampoulbai	4			4	0.02	0.7	+
<i>Parambassis wolffi</i>	Kantrang preng	1	3		3	0.02	2.6	++++
<i>Belodontichthys dinema</i>	Khlang hai	3			3	0.02	0.5	++++
<i>Coilia spp.</i>	Chanluonh mean		2		2	0.01	2.8	+
<i>Barbodes gonionotus</i>	Chhpin	1			1	0.01	0.7	+
<i>Osteochilus schlegeli</i>	Lolok sor	1			1	0.01	-	+
<i>Probarbus jullieni</i>	Trasork	1			1	0.00	0.0	+
<i>Tenualosa thibaudeaui</i>	Kbork	1			1	0.00	7.7	++++
<i>Systemus orphoides</i>	Ampil tum	0			0	0.00	1.0	+
<i>Cyclocheilichthys apogon/spp.</i>	Sraka kdam	0			0	0.00	0.0	+++
<i>Leptobarbus hoevenii</i>	Pralung	0			0	0.00	0.7	+++
<i>Other species</i>		13	245	37	295	1.60	1.3	
<i>Total</i>		279	10,701	7,429	18,410	100.00	100.00	

¹Data adapted from Fily and d'Aubenton (1965) and Chevey and Le Poulain (1940)

²Scientific nomenclature follows Rainboth (in press).

4.6. Discussions

Catches of individual dai units were found to vary greatly within rows and between rows. This was also reported by Fily and d'Aubenton (1965) who suggested a link between high catches and optimum water current velocities. Although reliable catch data of individual dai units are available, it is believed that the price for which a dai is auctioned reflects its perceived productivity. In the future therefore, dai units will have to be stratified (for random sampling) into two strata: those with an auctioned price above and below the Riel equivalent of US\$3000. Stratification by group of rows, as applied in 1994-95, will not be continued.

Fish catches at the peak period are extremely high and sampling must be more intensive than at the low period, as the level of the monthly catch is determined in this short interval. Therefore, the stratification in time (peak period/low period) will have to be maintained in future sampling programs.

It appears from Table 4.2 that our estimates are much higher than those provided by the DoF, but close to the estimated catch for the peak year of 1985-86 recorded by Nguyen and Nguyen (1991). According to the dai operators, catches in 1994-95 were higher than experienced for many years. This was attributed to higher water levels than usual. DoF statistics show that the 1994-95 catch was among the highest with 1985-86 and 1990-91. Mr. Ian Baird (pers. comm.) reported from southern Laos (Khone Falls area) the presence of much larger numbers of small migratory fish species (especially juvenile *Cirrhinus microlepis*, Kralang) in the catches during January and February 1995, a phenomenon that had not occurred for several years. Apparently, only in years of high productivity do these species migrate in significant numbers farther up river, suggesting a density-related effect.

For comparison, the species composition for 1962-63 (Fily and d'Aubenton 1965) and for 1938-39 (Chevey and Le Poulain 1940) is also shown in Table 4.1. It appears that the share of the small prolific opportunistic species is much higher than suggested by Fily and d'Aubenton's data. Probably this is largely due to under-estimation of this group by Fily and d'Aubenton, because of their relatively low value and predominant use for fish paste or fertilizer. Species, such as *Dangila spp./ Osteochilus hasselti* (Khong veng/Kros) and *Paralaubuca typus* (sluk russey) forming, respectively, 5.3% and 13.4% of the present catches, were respectively, not or hardly (0.3%) reported in 1962-63. It is unlikely, however, that they were absent from the catches in those days given their high abundance in 1938-39. The Mekong Secretariat (1992) also commented on these discrepancies in the Fily and d'Aubenton (1965) data. It is interesting to note the absence of *Catloparpio siamensis* (kolreang/giant barb) and *Puntioplites bulu* (kanchrea) from the present catches, while in 1938-39 and 1962-63, specimens were still seen regularly. Also *Leptobarbus hoeveni* (pralung/mad barb) *Barbodes altus* (Kahe) and the endemic *Tenualosa thibaudeaui* (kbork/Mekong River shad) have become scarce, when compared to 1962-63 and 1938-39. Robert (1993) attributes the decline of shad at the Khone Falls to increases in fishing effort.

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Chapter 5: General Discussion and Conclusions

5.1. General Discussion

This study on tools to promote community sustainable community fisheries management in Southeast Asia has given evidences to provide incentive tools to promote community fisheries to participate in sustainable fisheries management and livelihood development in Southeast Asian countries. The study on fishery ecolabel may provide the opportunity to get price premium directly to community fishers for local fisheries management. The study on saving group provide understanding of the characteristics of community fisheries and saving group to enhance sustainable fisheries management and livelihood development of the community fisheries. The study on fisheries data and information gathering of bagnet fisheries in Tonle Sap, Cambodia suggest a new confident and reliable scientific fisheries data and information collection and analysis scheme to be implemented in community fisheries. These incentive tools are useful and suitable for and support to community fisheries or community-based fishery management (CBFM) in Southeast Asian countries in the current situation that CBFM were established in all ASEAN countries.

The fishery legislation gave a support for an establishment of local fishery organization, a fishery ecolabel by local community fishers with the support of relevant institutions such as local authority, NGOs and research institutions. This gives a participatory and capacity support to community fisheries to promote decentralization policy of fishery management authority to local community fisheries in Southeast Asia in the situation that their capacity is still weak (De Graaf et al. 2011). This policy support offer opportunity to community fisheries to take responsibilities to control their own development and management through community-based co-management (Tietze, 2016). The fishery ecolabel may be an opportunity for providing price premium as an

incentive for sustainable community fisheries management. Incentive is a necessary condition for successful fishery management (Uchida 2017). This fishery certification gives the opportunity to expand local fish market system to global standard that enable the community fishers utilize wide ranges of species and such wide range of market also reflect the value of fish species in the ecosystem. The Southeast Asian countries have an intention to move toward autonomous community-based fisheries management. The financial and technical support from national government would be gradually reduced when community fisheries could successfully implement their community-based management. The existing ASEAN fishery legislation provides direction to gather scientific fishery data and information and use the available scientific information in fishery management to achievement these future objectives. To move forward to achieve these future purposes of autonomous community-based fishery management, community fishers would be necessarily be properly educated. Part of the capacity building is the data and information gathering by the community fisheries.

The data collection and analysis system which was experimentally studied, shall be integrated and implemented in the community fisheries action plan. The scientific fishery data and information collection scheme of the bagnet fishery in Tonle Sap River, Cambodia which was developed, provide the reliable data and information collection system for monitoring status and trend of fisheries. This method of the data collection and analysis shall be adopted as a model of a regular scheme for monitoring the status and trend of a fishery. In Cambodia, the agreement between community fisheries and Cambodian Fisheries Administration gives an obligation to community fishers to observe and control fishing effort and status of fisheries (MAFF 2007). Berghöfer et al. (2007) mentioned that by assigning the tasks and responsibility, it

will motivate and enhance flexibility of the participants in sharing their thoughts. Data collection and analysis is costly and time-consuming, need an extent of cooperation from fishers (De Graaf et al. 2011). Data and information collection implemented with participation of local community fishers within co-management scheme can be a cheaper way (De Graaf et al. 2011). The participation of community fishers in data and information collection will enable their understanding of the historical status and trend of their own fishery resources in decision-making process toward sustainable fisheries management. This is important that they utilize the knowledge in decision-making process for their community fisheries in planning and implementing their community fisheries management action plan. Data and information collection from small-scale fisheries so far are generally not well-covered so far (De Graaf et al. 2011). It is suggested that data and information collection system should be improved and the priority is given to small-scale fisheries (De Graaf et al. 2011). States and relevant stakeholders should enable small-scale fishing communities through capacity building support to participate in data collection and research and utilize the information in fishery management consideration (FAO, 2015). When the community fishers understand the crisis, it triggers their participation and enlarge broader stakeholders (Berghöfer et al. 2007). Previous study on community fisheries co-management indicated that particular involvement of local community can enable equitable and sustainable management of local fisheries resources (Gum 2000). The management action plan of Cambodian community fisheries is tasked by the Cambodian government which consists of fishery management and conservation activities, combating illegal activities, habitat protection, and data and information about fishing effort and fishery resources in the community fishing ground. These tasks and responsibilities were given by an agreement between the Royal Government of Cambodia and community fisheries (RGC 2005). Part of the plan, the community

fisheries are obliged to monitor fishing effort and status of fisheries resource in the community fishing ground (MAFF, 2007). The engagement of community fishers in the data collection and analysis allow the local community to manage their own resources and fish habitat. The past experiences of such engagement of the community demonstrate the effectiveness of community-based management.

Previous studies showed that participation of local stakeholders to decision-making process had positive effects for the conservation of local resources. This study reinforces this knowledge. In addition, this study found that influences from outside of ASEAN could be a tool to promote sustainable fisheries in the local community when local community people share the views and objectives of the tool. To do so, providing scientific information is essential. Based on the past experiences, the participation of stakeholders and community fishers in gathering data and information at their local community would enhance their understanding of the status and trend of their local fisheries. This is important basis for establishing rules and regulation (the legal framework and working mechanism) in their specific local fisheries. It is a powerful tool to encourage local community fishers engaged in managing their own fisheries resources. They realize that they are the owners of the fisheries resources and their future linked to the future of the resources. In addition, understanding of the characteristics of community fisheries would provide further input to community fisheries management.

Understanding the characteristics of community fisheries and savings group is important attributes for considering to provide incentives for community fisheries management. The savings group is to mobilize fund within and outside the community fisheries to generate fund for fishery management and family economic investment. The perception of the community

households about the savings group was generally good. At the same time, some changes in the perception toward the saving group were identified and they were influenced by the characteristics of community fisheries and other factors such as education, income, and livelihood activities. This is important for implication of these incentive tools for community fisheries in the present policy of the ASEAN countries moving toward decentralization fishery policy. All southeast Asian countries has established community-based fisheries management. SEAFDEC the arm fisheries technical support to ASEAN has integrated the aspect on improving data and information collection by autonomous community fisheries under the training of trainers. Regional synthesis of fishery data and information collection systems in the Southeast Asian region, and information requirements for sound policy-development, better decision-making and responsible fisheries management. The directions, considerations and immediate actions for the improvement of fishery statistics require regional reflection of monitoring systems focusing on obtaining information on status and trends of capture fisheries to support development and implementation of sound and sustainable policies and management, both main objectives of CCRF and Status and Trend of Fisheries (STF), the more appropriate indicators are fish catch, CPUE, species composition and fishing effort (FAO/SEAFDEC 2005). It is essential that local community fishers, not only engage in fishing operation, but also resource conservation and management. The management by local community fishers has lower cost and more flexible. The local community is proud to be part of the management scheme. However, the government need to monitor co-management activities and provide capacity building as necessary. Provide capacity building is very important for community fisheries.

ASEAN secretariat and SEAFDEC provides critical support in capacity building and technical assistance to ASEAN fisheries management. ASEAN secretariat and SEAFDEC give

the arm support to ASEAN countries. ASEAN countries have become as one to undergoing harmonisation policy in ASEAN by developing a regional strategy, marketing, standards and market practices based on international best practices (ASEAN 2015). The tool of ecolabel fisheries would provide the contribution to this economic integration of ASEAN countries through harmonization of fisheries activities in the ASEAN regions. In this context, with the significant contribution from inland and coastal small-scale fisheries for countries in the Southeast Asian region, and emphasized the need for appropriate management measures in order to effectively control the utilization of resources in sustainable manner and mitigate possible conflicts that may arise from resources utilization. The countries in the region have been exploring management approaches to ensure sustainability of fishery, while the “ASEAN-SEAFDEC Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020” adopted in 2011 also aim to enhance the contribution from fisheries to food security and the well-being of people in the region. It was further noted that community-based fisheries management has been promoted by several countries as one of the appropriate management approaches to ensure sustainability of fisheries; however, this requires support from their national government. With the high percentage of fully-exploited fishery resources and many resources are already overfished, it is necessarily required for more effective conservation and management measures, and ratification/implementation of international fisheries instrument including combating Illegal, Unreported and unregulated (IUU) fishing in order to maintain the level of capture fisheries production. The characteristics of fisheries in the Southeast Asian region with large areas of archipelagic waters and disputed maritime boundaries, resulting in limited intervention by international organizations in the management of fishery resources. There are extremely large numbers of small-scale fisheries targeting multi-

species of fishes, making management models existing in other regions not applicable for the region. The collection of fishery statistics also faced problems where large portion of statistics could not be reported at species level, resulting in insufficient information for stock assessment and effective management of the resources. The challenges for small-scale fisheries in the region, including in the application of ecosystem approach to fisheries management, application of precautionary principle, inclusive of stakeholders in fisheries management, dealing with social and equity aspects of resource users and impact of allocation of access to fishery resources, etc. This emphasizes the necessity for managing people's fishing activities, rather than focusing solely on the biological aspects of the species and ecosystem dynamics. The fisheries management schemes, which could be categorized into three types, namely: 1) Input Control, e.g. licensing, effort control, restriction on size/number of vessels, restriction on number of gears; 2) Technical Measures, e.g. time and area of closures, gear restriction, size/sex selectivity; and 3) Output Control, e.g. Total Allowable Catch (TAC). It was noted that some of the tools such as TAC might not be applicable for small-scale and multi-species fisheries of Southeast Asia. Therefore, it is necessary for the community participate in such required data and information and implement at their local community. The experiences from Japan shows the two different management practices, which are top-down approach and bottom-up approach (for coastal and small-scale fisheries). The latter of which delegates territorial use rights to fishing communities. The application of bottom-up approach is very effective for Japanese coastal fisheries, as the conservation cost and the benefits incurred are shared by the same stakeholder group, while fishers need to pay attention not only on fish stocks but also on habitats. Important roles of government in this system was also emphasized, particularly in controlling new entry of

fishers through limiting fishing licenses, encouraging fishing organizations to work closely with communities, and ensuring sustainable use of resources.

SEAFDEC so far gave support activities to Member Countries in facilitation of implementation community-based management. This is the contribution to the implementation of the “Resolution and Plan of Action on Sustainable Fisheries for Food Security for ASEAN Region Towards 2020” adopted by the ASEAN-SEAFDEC Ministers and Senior Officials in 2011, particularly on those that relevant to the decentralization of management authority including co-management and rights-based fisheries (SEAFDEC 2011). In these regards, so far SEAFDEC provided the training of the trainers (ToT) to Cambodia, Lao PDR, Myanmar, Philippines, and Vietnam, aiming to enhance the capacity of fisheries officers and trainers of these countries on fisheries management approaches, co-management, so that these trainers could further conduct mobile on-site trainings (MOT) in their respective countries to community fishers. In addition to other topics on management, there was a training on fishery data and information collection and analysis. The aspect of data and information gathering developed in the bagnet fishery was simplified and applied to a number of SEAFDEC training courses, particularly data and information on fish catch, fish species, number of boats, gears, number of fishing days. Some community fisheries in ASEAN countries have started implementation of such fisheries data and information with participation of local fishers or so-called local fishers’ knowledge in fisheries management. Some publications had been made so far from these community fisheries participations.

Such incentive tools suggested by this study, are suitable for and support to community fisheries or community-based fishery management (CBFM) in Southeast Asian countries in the current situation that CBFM were established in all ASEAN countries with status as follow:

Brunei Darussalam

The fishery resources of Brunei Darussalam are in the declining state. Management measures were undertaken through resources protection and promotion of responsible fishing and small-scale fisheries in Zone-1 including fishing zonation, moratorium on issuance of fishing licenses for all bottom trawl fisheries, and mesh size regulation, habitat conservation/enrichment program, prohibition of destructive fishing practices. The measures resulted in positive impacts in increase public awareness on fisheries management. Brunei viewed that community-based management could be effective tools to support more effective fisheries management.

Cambodia

Co-management is arranged between the Cambodian government and local community fishers in Cambodia. Fisheries reform was implemented in Cambodia starting from 2000, where the government decided to abolish 56% of fishing lot concession equivalent to 538,522 ha for local people, and encouraged establishment of Community Fisheries (CFi). With the good experiences and progress of community fisheries implementation, in 2012 further reform was carried out, and the remaining fishing lots (412,534 ha) were also abolished with over 75% transferred for local people use, and the remaining kept for conservation. Relevant legal framework of Cambodia included: Law on Fisheries (RGC 2007), Sub-decree on CFi management (RGC 2005), and Ministerial Prakas on community fisheries guideline (MAFF 2007). Steps for establishment of CFi, structure, and activities undertaken by CFi were also defined. Up to present, 516 CFis have been established throughout the countries (477 CFi are in

the freshwater region and 39 CFi in the coastal region). Nevertheless, the promotion of CFi also faced challenges as CFi still depend on the external supports, the lack of budget and resources for implement of CFi activities; lack of incentive for and capacity of CFi committee, etc.

Indonesia

Indonesia have large number (2.4 million) of small-scale fisheries involvement. Management regimes in Indonesia was Top Down approach (1965-1999). However, from 1998, based on the Reform Order, the Bottom Up approach was applied in fisheries management. The legal framework at national and region/local levels for Community-based Fishery Management (CBRM) in Indonesia were also presented. There are models of CBRM in Indonesia in Sasi, Panglima Laot, Awig-awig and Mangku Laut.

“Awig-awig”, which is an agreement within community (customary law) to ensure harmony and mitigate conflicts in the society. “Awig-awig” has also been used for management of fisheries in the communities. However, with the establishment of the Constitution, “Awig-awig” slightly disappear, but still applied in some region, e.g. in Lombok. Regulation under “Awig-awig” is a combination of various measures, e.g. zoning, type of technology restriction, collection of fine, etc. Experience was also shared on CBRM in Rawa Pening, which is very successful. Nevertheless, there are also difficulties included, low education and awareness of fishers, low scientific consideration, lack of law enforcement, CBRM can only applied in simple community where activities are not extensive, mostly vulnerable to external changes.

Lao PDR

Lao PDR faced a lot of pressure and need for appropriate management for inland fisheries, which are mainly based on inflow water from the Mekong River. The majority of Lao's population relies on the availability of aquatic resources for their food security and livelihood; and there are five categories of inland water bodies in Lao PDR, which are: 1/. Mekong River and its tributaries; 2/. Reservoirs; 3/. Natural ponds – being promoted as community pond; 4/. Wet season rice field; and 5/. Areas for aquaculture. The Fisheries Law of Lao PDR was developed in 2009 (Lao PDR 2009), with Articles that provide framework for community-based management, namely: Article 4 on the ownership of fish and other aquatic fauna; Article 5 on State policies on fisheries; Article 6 on basic principles of fisheries; Article 48 on Fishermen's associations; Article 50 on Establishment of Fisheries Management Committees (FMCs) in Water Bodies; Article 51 on Structure of Fisheries Management Committees in Water Bodies; Article 53 on Village Fisheries Regulation; and Article 54 on Content of the Regulations (Lao PDR 2009).

Malaysia

Tagal system was initiated by the Department of Fisheries (DoF) Sabah to promote co-management since 2000, aiming to enhance awareness and cooperation among stakeholders and the DoF in resources protection and conservation in order to sustain catch and income for river fishers and other stakeholders. Legislation/laws that are used to empower local community to implement the CBRM under the Tagal System include: 1) The Sabah Natives Courts (Native Customary Laws) of 1995 (Sabah 1995), and Sabah Inland Fisheries & Aquaculture Enactment

of 2003 (Sabah 2003). Basic rules for CBRM and Tagal System and basic criteria for starting of CBRM in a village, as well as the roles of local community and the DoF Sabah in CBRM were established.

In 2004, the DoF Sabah introduced “Zoning of the Tagal Sites” in order to make Tagal System more successful and sustainable. The DoF also provided assistance to communities, for instance through provision of fishing equipment, infrastructures for tourism activities, patrolling boats, fish fingerlings for restocking (focusing on species with high price), training/study visit to successful Tagal sites, etc. At present, there are 510 tagal sites for river CBRM and 20 sites for coastal CBRM, and the successful Tagal systems have been promoted for eco- and agro-tourism in order to generate more income to local communities. The difficulties faced in the implementation of the Tagal system, e.g. some people that may not agree with the implementation, and insufficient funding support from government.

Myanmar

The marine fisheries of Myanmar are defined to comprise inshore and offshore fisheries, with the annual production of 1.37 million MT (in 2011-2012). Important fishing gears are trawls, and purse seines, etc. Fisheries management measures undertaken for marine fisheries include gear restriction; prohibition of certain fishing activities in particular seasons/areas; and restriction of fishing, and management of some threatened species. Inland fisheries cover lakes, rivers and reservoirs. 3,490 of 3,722 leasable fisheries support the livelihood of fishing communities. Fish restocking programs undertaken in collaboration with communities to

enhance production from culture-based fisheries. Myanmar face particularly the inadequate capacity to strengthen the MCS functions along the coastal areas, inadequate of knowledge, ineffective implementation of existing management measures and law enforcement, and limited capacity and awareness within the community fishers.

Philippines

The legal framework for fisheries of the country are the 1987 Philippine Constitution; Philippine Environment Policy; Philippine Environmental Code; Local Government Code 191; Pertinent Provision of RA 7160; Philippine Fisheries Code 1998; and RA 7586, The National Integrated Protected Areas System (NIPAS) Act of 1992. There are also some programs/projects/activities in support to fisheries coastal communities and resources management. There is a need to improve fisheries through the provision of funds for fisheries development; establishment of guidelines on resettlement issues concerning displaced fisherfolks; enhancing stakeholders responsibility, roles of the Local Governmental Units (LGUs), DA-PFDA, People's Organization, NGOs and other relevant organizations.

Thailand

Fisheries plays crucial roles for national incomes and livelihood. The DoF therefore attempts to use “input control” to manage fisheries. However, the long coastlines result in limited MCS activities. The alternative tools such as CBRM is being introduced. Some legal framework of Thailand, i.e. the Constitution B.E. 2540, Fisheries Act B.E. 2490, 8th National Economic and Social Development Plan, 11th National Economic and Social Development Plan, Master Plan

for Marine Fisheries Management of Thailand which enhances the roles and responsibility of community in resources conservation and management.

Fisheries community organization in Thailand involve wide range of activities such as establishment of fisheries community organization, implementation of activities under fisheries community organization such as resources management, conservation and rehabilitation, as well as promoting alternative and/or supplementary livelihood. The roles of government is to undertake MCS and law enforcement in coastal and inland areas of Thailand, and promote fisheries community participating in CBRM. However, the community still requires support and assistance from government, particularly as seed money at the beginning of the project as well as for capacity building activities. DoF Thailand has a new Fisheries Bill (2012) which state the need for DoF to encourage participation of community fisheries management. Thailand also needs to strengthen fisheries community organization through various means. The capacity building of human resources from various sectors (government and non-governmental sectors) is necessary for enhancing the promotion of CBRM in Thailand. DoF consider establishing mechanism to promote CBRM through enhanced participation of multi-stakeholder participation. In addition, the Thailand also consider upgrading data/information system to monitor the impacts from the implementation of CBRM in pilot sites.

Vietnam

Community-based Resources Management was established in Coastal and Inland Fisheries in Vietnam. There are limitations in fisheries management to control exploitation

activities. Therefore, co-management was introduced. The relevant laws and regulations for facilitating co-management and right to fishing in the country were defined. There are cases of application of co-management in Vietnam in Tam Hai Commune, Nui Thanh District, Quang Nam Province; Buon Triet Commune, Lak District, Dak Lak Province; and Cu Lao Cham Marine Protected Area. It is suggested that it is necessary to improve policies and legal framework and human resource capacity to support effective implementation of co-management in the future.

The application of fishery data and information gathering in community fisheries would provide sustainable data and information collection and more impact on fisheries management. The case in Cambodia, with the participation of community fishers in data and information collection, the Cambodian Governments and community fishers can better understand status of fisheries based on fisheries data from community fisheries in a particular location for implication to fisheries management (Ishikawa et al. 2017). Before the reform of fisheries in 2000, the large-scale fisheries or fishing lot fisheries had the obligation to provide statistical fish catch record in a logbook to the government. But now there is almost no large-scale fisheries in the country, community fisheries occupy almost all the entire fishing grounds. Therefore, the cooperation, participation and networking with community fishers are the necessity for future sustainable data and information gatherings (Ishikawa et al. 2017). The data and information gathering at the community level should be a minimum requirement (Ishikawa et al. 2017). The experiences of the participation of community fishers in Thailand and Lao PDR provide local fisheries information gave the most effective cost and shows the sense of belonging and responsibility and its important implication to formulate local fisheries rules and regulations for local fisheries management (Baird 2001, Suasi et al. 2017).

However, the application of fishery data and information gathering in community fisheries face risks and challenges. This is due to limited capacity, low education and poverty of local community fishers. Some community fishers can not read and write. Recording fishery statistics is a new task for the community fishers. The community fishers have to spend their time for daily livelihood need. The community fisheries have suffered from shortage of fund for the operation of their community fisheries action plan. There is a need to provide incentive to the selected community fishers to do fishery statistical record. They need fishery data and information training, continuous coaching, guidance and monitoring of the fishery record. There are large number of community fishers in Southeast Asian countries. The SEAFDEC training program had been conducted so far, covered limited number of participants from fisheries sector and community fishers.

5.2. General Conclusion

The study is proved to provide incentive tools to promote participation of community fisheries in sustainable fisheries resource management and improve livelihood development. The fishery legislation of ASEAN countries has fulfilled most of the GSSI requirement for community fisheries to establish fishery ecolabel. Fishery ecolabel may be an opportunity for providing incentives for sustainable community fisheries management. Understanding the characteristics of community fisheries and savings group is important attributes for considering to provide incentives for community fisheries management. The savings group is to mobilize fund within and outside the community fisheries to generate fund for fishery management and

family economic investment. In addition, the new data and information collection and analysis design scheme gives a confident and reliable information of fishery resource status. This method provides an essential tool for community fisheries which shall be adopted as a model of a regular scheme for monitoring the status and trend of a fishery in community fisheries. Previous studies showed that participation of local stakeholders to decision-making process had positive effects for the conservation of local resources. This study reinforces this knowledge. In addition, this study found that influences from outside of ASEAN could be a tool to promote sustainable fisheries in the local community when local community people share the views and objectives of the tool. To do so, providing scientific information is essential. ASEAN secretariat provides critical support in capacity building and technical assistance to ASEAN fisheries management. These results of the study provide useful tools for ASEAN secretariat and SEAFDEC researchers, fishery managers, administrators and other stakeholders to uptake for considering community fishery management option.

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Appendix

Questionnaire For The Interview Peam Popech and Phlong Community Fisheries, Kampong Chhnang Province, Cambodia

Part 1: Characteristics of Community Fisheries

Community Name: _____

1.3. Sex: Male Female

1.4. Age:

- Under 15 36-45 66-75
 15-25 46-55 76-85
 26-35 56-65 86 and above

1.5. What is the highest level of education that you have completed?

- No formal education University Degree
 Secondary School Graduate Degree
 High School

1.6. How much does fishing contribute to your monthly income during the dry season?

None	0-30%	30-70%	More than 70%
1	2	3	4

1.7. How much does fishing contribute to your monthly income during the wet season?

None	0-30%	30-70%	More than 70%
1	2	3	4

1.8 List all income generating activities, besides fishing, which you take part in during the wet season:

- Rice farming
- Construction
- Fishing gear making
- Crops
- Fish trade
- Animal husbandry
- Factory
- Fish processing
- Other: _____

1.9 List all income generating activities, besides fishing, which you take part in during the dry season:

- Rice farming
- Construction
- Fishing gear making
- Crops
- Fish trade
- Animal husbandry
- Factory
- Fish processing
- Other: _____

1.12. How many days a week do you eat the fish you catch during the dry season?

None	Less than 3 days a week	3-5 days a week	Every Day
1	2	3	4

1.13. How many days a week do you eat the fish you catch during the wet season?

None	Less than 3 days a week	3-5 days a week	Every Day
1	2	3	4

1.14. Which of the following do you own?

- Rice Fields (If so _____ hectares)
- Crop Fields (If so _____ hectares)
- Boat
- Fishing Gear (specify gear)
- Livestock (specify livestock)
- House

Part 2. Status of Fishery Resources and Management

2.1. According to your experience, compared to ten years ago, the abundance of black fish has:

Significantly decreased	Slightly decreased	No change	Slightly increased	Significantly increased
1	2	3	4	5

2.2. According to your experience, compared to ten years ago, the abundance of white fish has:

Significantly decreased	Slightly decreased	No change	Slightly increased	Significantly increased
1	2	3	4	5

2.3. According to your experience, compared to ten years ago, the average size of white fish has:

Significantly decreased	Slightly decreased	No change	Slightly increased	Significantly increased
1	2	3	4	5

2.4. According to your experience, compared to ten years ago, the average size of black fish has:

Significantly decreased	Slightly decreased	No change	Slightly increased	Significantly increased
1	2	3	4	5

2.5. List any community or social groups you are a member of:

- Community Fishery
- Savings Group
- Women’s Group
- Water management community
- Others: _____

Part 3. Financial Status

Select the answer that best describes how much you agree with the described feelings:

Strongly	Slightly	No	Slightly	Strongly
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	Agree	Agree	Opinion	Disagree	Disagree
3.1. I am concerned about accessibility to loans.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.2. Loans should be available to all community members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.3 For the community as a whole to benefit, not everybody can have equal access to loans.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.4 The appropriate distribution of loans should be prioritized.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Select the answer that best describes how much you agree with the described feelings:

	Strongly Agree	Slightly Agree	No Opinion	Slightly Disagree	Strongly Disagree
3.5 This community has a strong savings group leader.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>