



AquaFish CRSP Project

USAID Grant No.: EPP-A-00-06-00012-00

"Development of Alternatives to the Use of Freshwater Low Value Fish for Aquaculture in the Lower Mekong Basin of Cambodia and Vietnam: Implications for Livelihoods, Production and Markets"

Investigation 5 (07FSV01UC) - Phase 1

Maximizing the utilization of low value or small size fish for human consumption through appropriate value added product development

Final Technical Report

Research topic 2: MARKET CHANNEL AND TRADE OF SMALL-SIZED FISH PASTE IN CAMBODIA'S MEKONG RIVER BASIN

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December, 2009

Abstract

Fermented small-sized fish paste is considered as the main food or food ingredient for Cambodians, especially for the poor. However, according to So et al. (2005) and some other researchers, small-sized fish are either used for human consumption or used as direct feed for fish and livestock. Thus, the study was conducted under four main objectives – (1) to find out market channels and trade of fermented fish paste; (2) to explore opportunities for market and trade; (3) to identify problems and other issues related to the trade; and (4) to analyze economic efficiency of stakeholders. Phnom Penh city, Kandal, Kampong Chhnang, Battambang, and Siem Reap provinces were selected as the study areas. The total sample size was 150. Collected data was analyzed in SPSS 12 and Microsoft Excel.

The study revealed that fermented small-sized fish paste is marketed and traded differently. Regarding the total volume of annual production, three main sources should be considered. The total production of fermented fish paste in year 2008 was 6,659 tons. Kampong Chhnang province bears the largest amount. Total amount processed and traded by all stakeholders, except wholesalers, continuously increased from 2000 to 2008, so did its price. Most stakeholders are satisfied with and plan to maintain their current business. Most consumers are satisfied with the product bought from markets. The increasing price of the fermented fish paste will make consumption decrease by 50% of the total amount of fermented fish paste that they consume daily. Most middlemen and exporters have met buying problems, while most wholesalers and retailers confront selling problems. Marketing and trading fermented fish paste is profitable.

This study has very important implications for developing sustainable local and international markets and trade, and for supporting value-added product development.

1. Introduction

Fish has played an important role in ensuring food security in Cambodia. Most protein that Cambodian people receive comes from fish. Besides the protein the fish provide, fish itself also provide income for fishermen, middlemen, processors and other involved stakeholders.

Not only fresh fish alone, but processed fish products are also crucial to the Cambodian people due to the fact that it contributes to food availability, especially in the period when there is a shortage of fresh fish supply. Because of long shelf life, processed fish products can be kept and eaten year round. Moreover, these products are presented and traded in all markets in Cambodia and even in some other countries.

Fish paste is one of the processed fish products which is preferable and kept for use in all houses. There are two kinds of fish paste – boneless and bony fish paste – which have been bought and used by different classes of people. Some boneless fish paste is processed from small-sized fish species, but it is sold at a higher price compared to that of bony fish paste. Normally, bony fish paste, which is mostly processed from small-sized fish, has been mostly consumed by the poor who have limited income. Small-sized fish paste is processed for not only for household consumption by the poor but for selling to other processors. Before the year 2005, small-sized fish was not broadly processed into small-sized fish paste or other processed products since it was used as feed for snakehead and hybrid catfish culture. Small-sized fish represents from 60% to 100% of the total feed used by aquaculture farmers. However, since the government of Cambodia put a ban on snakehead farming in May, 2005, most of small-sized fish is now processed into small-sized fish paste or other products for human consumption. This ban helps to protect small-sized fish diversity from being used as direct feed, which is an unsustainable way of feeding for fish culture. Moreover, this change can be a good strategy to increase food security for people, especially for the poor as they will have more access to small-sized fish paste availability. Another thing, this change does provides more opportunity for stakeholders who get involved in small-sized fish paste trade such as processors, middlemen, exporters, wholesalers and retailers to earn more income for the family.

The small-sized fish paste market in Cambodia is so far not well documented nor are any other relevant documents or statistics available. For this reason, this topic about Fermented Small-Sized Fish Paste Market Channel and Trade in Cambodia has been proposed. This research is supported by US Agency for International Development (USAID) under Aquaculture and Fisheries Collaborative Research Support Program (AquaFish CRSP).

The overall objective of the study is to ascertain market channels and trade of fermented small-sized fish paste in Cambodia. This study will contribute to finding information about fermented small-sized fish paste markets and trade and to examine ways to improve fermented small-sized fish paste market and trade in the country, particularly to benefit all fermented small-sized fish paste stakeholders. Thus, in order to achieve the overall objective, there are four main specific study objectives:

1. To find out market channel and trade of fermented small-sized fish paste
2. To explore opportunities for fermented small-sized fish paste market and trade
3. To identify problems and other issues related to fermented small-sized fish paste trading; and
4. To analyze economic efficiency of wholesalers, exporters, middlemen, and retailers of fermented small-sized fish paste.

2. Methods and materials

2.1 Study site selection

This study is undertaken in one city - Phnom Penh, along Bassac River; and in four provinces - Kandal province, along Mekong-Bassac River; and Kampong Chhnang, Battambang and Siem

Reap provinces, along Tonle Sap River - in Cambodia. Specific sites in which the research is conducted within each province are chosen based on characteristics of selected sample (See figure 1).

Figure 1

2.2 Sample justification and sampling method and size description

Because there are many kinds of stakeholders who are engaged in fermented small-sized fish paste processing, trading and consuming, samples for the research are selected and categorized into six types based on their trading and consumption of fermented small-sized fish paste. These are: processors, middlemen, exporters, wholesalers, retailers, and end consumers. The numbers of respondents for each kind of sample was purposively selected for interview according to the limitation of time, budget and availability of respondent. As determined, five processors, five middlemen, five exporters/wholesalers, five retailers and ten consumers from every selected studied location were chosen to be interviewed. Hence, there are thirty samples from each studied location which were interviewed. Multiplied with 5 study areas, the number of samples for the research totals 150 respondents (see table 4 below description).

2.3 Methods for Data collection

2.3.1 Secondary data collection

Secondary data documentation of relevant issues is done to get better understanding about fermented small-sized fish and fermented small-sized fish paste condition, particularly in Cambodia from some technical papers, journals, books, other publications, and other reports from each district of target study area related to background information on the study areas. Those documents were obtained from related relevant institutions such as: Inland Fisheries Research and Development Institute of Fisheries Administration, Department of Agro-industries, Department of Fisheries (Ministry of Agriculture Forestry and Fisheries), Ministry of Industry Mines and Energy, books, journal, Ministry of Commerce, and each district hall of target area for the study.

2.3.2 Primary data collection

The primary data were collected through the following:

a) Questionnaire survey

The semi-structured questionnaires were designed to collect primary data from relevant stakeholders identified. A pre-test of questionnaires was conducted in the first week of actual field work to verify variables in the questionnaires were appropriate to the study sites. Some modifications were made after the pilot survey (see appendix 1).

b) Interview of fish processors and traders

The interview with each selected sample is structurally conducted. Semi-structured interview is used with the relevant respondents selected. Interviews with processors, middlemen and exporters in the study areas from each selected province are chosen based on availability of fermented small-sized fish paste processing as well as trading activities (see table 1).

Table 1

Furthermore, in this study, only processors who produce fermented small-sized fish paste for commercial purposes were selected for interviews. For wholesalers and retailers, interviews were done in markets. Specific markets from each studied city and province are selected in accordance with fermented small-sized fish paste selling characteristics whether or not fermented small-sized fish paste tends to be all that is sold, or if it is either sold wholesale or retailed (see table 2 below description).

Table 2

In addition, interviewed consumers were purposively selected in the city and each province depending on the places where fermented small-sized fish paste users are living (see table 3 below description).

Table 3

Table 4

c) Observations

Additionally, observation on fermented small-sized fish paste processing and trading activities was also done both at interview and trading places. The purpose of the observation was to see and monitor characteristic features of producers/households, trade status of the market workers, fresh fish, types of machines, place of fermented, and fish paste product.

2.4 Statistical analysis

All collected data are encoded for use in Statistical Package for Social and Science (SPSS) version 12. Most of the data collected, especially for objectives 1, 2 and 3, are descriptive statistics in which only frequency and mean is analyzed in SPSS 12. Moreover, a custom table is also used in the program to show the trend of fermented small-sized fish paste production as well as trading by years in city and provinces. For the last objective, which is about economic efficiency, the data is analyzed in Microsoft Excel. Thus, some formulas are needed in order to achieve this last objective:

- Total Cost = Variable Cost + Fixed Cost \Leftrightarrow (TC = VC + FC)
- Total Revenue = Quantity * Price/unit \Leftrightarrow (TR = Q * P)
- Net Income = Total Revenue – Total Cost \Leftrightarrow (NI = TR – TC)
- Economic Efficiency = Total Revenue/Total Cost \Leftrightarrow (EE = TR/TC)

3. Results

3.1 Major stakeholders involved in market channels and trade of fermented small sized fish past

There are many stakeholders who are involved in fermented small-sized fish paste trading. The trading activity normally happens from processing sites to markets. Before fermented small-sized fish paste can reach the end consumers, it passes through many stakeholders, such as processors, middlemen, exporters, wholesalers, and retailers. Those stakeholders are detailed as follows:

3.1.1 Processors

Processors refers to someone who buys fresh and whole small-sized fish, beheaded small-sized fish, or salted small-sized fish in order to process it further into semi-final fermented small-sized fish paste or (final) fermented small-sized fish paste through stocking or adding some more salt before it can be sold to markets. According to the field survey, fermented small-sized fish paste production in Phnom Penh, Kandal, Kampong Chhnang, Battambang, and Siem Reap provinces has increased from 2000 until 2008 (see figure 2). Among the five provinces, Kampong Chhnang province has the most potential of fermented small-sized fish paste processing, followed by Kandal, Battambang, Phnom Penh city, and Siem Reap provinces, respectively. The total amount of fermented small-sized fish paste production in each province seems to fluctuate from year to year. Total amount of fermented small-sized fish paste production in 2000 to 2001 is 35 tons in Phnom Penh, 278 tons in Kandal province; 665 tons in Kampong Chhnang; 95.7 tons in Battambang; and 51 tons in Siem Reap. In 2007 to 2008, this production increased to 101.5 tons in Phnom Penh; 220.84 tons in Kandal province; 810 tons in Kampong Chhnang province; 247 tons in Battambang province; and 69.5 tons in Siem Reap province. Table 5 shows about 19 fish species are used to make fish paste by processors in the study areas. Among these small-sized fish species,

Trey Riel, Kompleanh, Chanteas Phloulk, and Sleik Russey are more present than other species for fermented small-sized fish paste. Trey Riel represents around 75.53% of all small-sized fish species, following by Kompleanh (5.4144%), Chanteas Phloulk (4.8979%), and then Sleik Russey (4.5878%), respectively. Figure 3 shows that 63.83% of the total amount of (semi-final and final) fermented small-sized fish paste are sold to middlemen, following by 14.26% to wholesalers; 12.94% to retailers; 6.56% to exporters/exporting companies; 2.35% to provincial markets (markets in other provinces); and around 0.06% are sold to consumers.

Figure 2

Table 5

3.1.2 Middlemen

Middlemen are stakeholders who buy fresh small-sized fish or salted small-sized fish from fishermen, salted small-sized fish from processors, or (final) fermented small-sized fish paste from processors in order to hold for a few months or for immediate sale to exporters, wholesalers, retailers, and sometimes village middlemen. Based on field observation, middlemen in Phnom Penh city and Kandal province sell out their products when it already becomes (final) fermented small-sized fish paste. But in Kampong Chhnang (1st middlemen), Battambang, and Siem Reap provinces, middlemen sell out their products when they are still salted small-sized fish.

Figure 3

According to the study, around 1,292 tons of salted small-sized fish and fermented small-sized fish paste were bought by middlemen in the five study areas in 2007 - 2008. Approximately 58.82% of total amount of salted small-sized fish and fermented small-sized fish paste were bought from fishermen from the river, 0.39% from exporting companies, 30.42% from processors, 6.97% from 1st middlemen (in Kampong Chhnang province), and 3.4% from fishing lots in the river (see figure 4 below description).

Figure 4

Figure 5 shows that 65.14% of the total amount fish paste is sold to exporters (in the case of middlemen in Battambang and Siem Reap provinces), followed by 16.76% sold to retailers; 12.14% sold to wholesalers; 3.89% sold to middlemen who are in other provinces; 1.40% sold to 2nd processors (in the case of Battambang province); and 0.67% sold to consumers (in the case of Phnom Penh middlemen who retail their products directly to consumers in markets in Phnom Penh).

Figure 5

3.1.3 Exporter/exporting companies

Exporters refer to groups of people or companies who buy fresh and whole small-sized fish from fishermen, beheaded small-sized fish, and salted small-sized fish from middlemen in order to continuously process into (final) fermented small-sized fish paste, or not process (but at least add some salt to salted/small-sized fish) and then sell it out to wholesalers, retailers, middlemen, or village middlemen, and especially export to neighboring countries. Based on field observation, the exporting companies are located in Battambang and Siem Reap provinces. These companies were founded in 2002 and 2005. As shown in Figure 6, exporters in Battambang province bought 3,300 tons of fermented small-sized fish paste in 2005-2006. This amount gradually increased to 3,323 tons in 2007-2008. Exporters in Siem Reap province bought 800 tons of fermented small-sized fish paste from 2001 to 2007. This number slightly increased to 816 tons in 2007-2008.

Figure 6

Figure 7 shows about major stakeholders that exporters sold their products to and those stakeholders are middlemen, wholesalers, and processors. 88.74% of the total amounts of fermented small-sized fish paste from exporters are sold to middlemen, following by 9.32% to wholesalers, and 1.94% to processors (in Battambang province). In addition, every year probably 76.66% of total amount of (semi-final) fermented small-sized fish paste are exported to Thailand markets. Besides exporting to Thailand, exporters also sell about 20.92% of the fermented small-sized fish paste to provincial markets such as markets in Battambang, Takeo, Kampong Thom, Banteay Mean Chey, Kandal, Kampong Cham, Prey Veng, and Siem Reap provinces. Moreover, around 2.42% of the fermented small-sized fish paste is sold to Phnom Penh markets as well (see figure 8).

Figure 7

Figure 8

3.1.4 Wholesalers

Wholesalers refer to stakeholders who buy salted small-sized fish for holding or (final) fermented small-sized fish paste from processors, middlemen, or exporters in large amount for wholesaling to wholesalers, retailers, or consumers/end users. About 598 tons of salted small-sized fish and fermented small-sized fish paste were traded by wholesalers in 2007-2008. Approximately 73.5% of the total amount of salted small-sized fish and fermented small-sized fish paste were bought from middlemen, while only 26.5% was bought from processors. Thus, middlemen play an important role in providing salted small-sized fish and fermented small-sized fish paste to wholesalers in the market. Figure 9 shows that 33.97% of the total amount of fish paste is sold to wholesalers in markets either in the same province or in other provinces, followed by 23.45% to provincial retailers, 22.30% to consumers in the country, 15.40% to middlemen (village middlemen from other provinces), 4.85% to Phnom Penh retailers, and 0.03% to consumers living abroad (Cambodian) who come to visit Cambodia sometimes.

Figure 9

3.1.5 Retailers

Retailers are stakeholders who buy salted small-sized fish for holding or fermented small-sized fish paste from processors, middlemen, exporters, or wholesalers for retailing to consumers. Figure 10 shows 20.48% of retailers bought salted small-sized fish and fermented small-sized fish paste from wholesalers, 43.13% from processors, and 36.39% from middlemen. Therefore processors play a primary role in supplying of fish paste for retailers than for other stakeholders, while those stakeholders supply less fish paste for retailers. The major supply sources of fish paste for retailers are Phnom Penh, Kandal, Kampong Chhnang, Kampong Cham, Battambang, and Siem Reap provinces (Figure 11). Approximately 29.60% of retailers bought salted small-sized fish and fermented small-sized fish paste from Phnom Penh city, followed by 21.55% bought salted small-sized fish and fermented small-sized fish paste from Siem Reap province; 16.98% from Battambang province; 15.97% from Kampong Chhnang province; 7.98% from Kandal province; and 7.92% from Kampong Cham province.

Figure 10

Figure 11

3.1.6 Consumers

Consumers are end users and buy fermented small-sized fish paste mostly from retailers for daily cooking or household consumption.

3.2 Market flow chart of fermented small sized fish paste

The market and trade system of small sized fish paste in Cambodia is different from one province to another province. In other words, it would be complicated and hard to understand if they were

combined together. The market system must be examined at the individual site level. Market flow charts of fermented small-sized fish paste in each study area are detailed as following:

3.2.1 Market flow chart of fermented small sized fish paste in Phnom Penh

Figure 12 shows that processors in Phnom Penh play important roles in supplying fermented small-sized fish paste to many stakeholders. First, fermented small-sized fish paste is bought from processors by middlemen in Phnom Penh, Svay Reang, Prey Veng, Takeo, Kampong Speu, and Kandal provinces. Besides being sold to middlemen, some fermented small-sized fish paste is also sold to wholesalers and retailers in Phnom Penh markets and some retailers in other provinces such as Kampong Thom, Svay Reang, Kampong Speu, Prey Veng, and Takeo province. Sometimes, it is also sold to wholesalers in provinces like Svay Reang and Prey Veng province. Besides processors in Phnom Penh, who are the main suppliers, there are three more sources that are also relevant in fermented small-sized fish paste business in Phnom Penh. They are processors in Kandal and Kampong Chhnang provinces, and an exporter/exporting company (Marchar Steung Sangkae Company) in Battambang province. Some fermented small-sized fish paste is bought by wholesalers in Phnom Penh markets and middlemen in Phnom Penh from processors in Kandal province. Moreover, some fermented small-sized fish paste is bought from exporters and processors in Kampong Chhnang province by middlemen in Phnom Penh. Middlemen in Kampong Cham province annually provide fermented small-sized fish paste to wholesalers and retailer in Phnom Penh markets. Middlemen in Phnom Penh buy fermented small-sized fish paste for stocking and selling year round. No matter when fermented small-sized fish paste is needed by purchasers, it is sold. After buying fermented small-sized fish paste from processors in Phnom Penh, Kandal, and Kampong Chhnang province, and an exporting company, they continue to sell this fermented small-sized fish paste to retailers in Phnom Penh markets, to consumers in Phnom Penh (retailing in markets by themselves), and to wholesalers and retailers in some provinces such as Pursat, Kampong Chhnang, Kampong Thom, Prey Veng, and Svay Reang provinces. Wholesalers in Phnom Penh, after buying fermented small-sized fish paste from middlemen in Kampong Cham, processors in Phnom Penh, and in Kandal province, continue to sell fermented small-sized fish paste to retailers in Phnom Penh markets, to consumers either living in Phnom Penh or abroad, and to provincial sellers in Kampong Speu, Preah Vihear, Rotanakiri, Mondulkiri, Kampot, Takeo, Prey Veng, Kratie, and Kampong Cham provinces. Additionally, middlemen in Kandal province also sell fermented small-sized fish paste to retailers in Phnom Penh markets as well.

Figure 12

3.2.2 Market flow chart of fermented small sized fish paste in Kandal

There is only one processor in Kandal province who supplies fermented small-sized fish paste in Kandal province (see figure 13). After being processed, fermented small-sized fish paste is sold to many stakeholders such as wholesalers in Phnom Penh and Kandal markets, sellers in Kampong Speu markets, and consumers in Svay Reang (processors from Svay Reang province), Kampong Speu (sometimes when the price of fermented small-sized fish paste is high), Prey Veng, and Kandal provinces. In addition, fermented small-sized fish paste is also bought from processors by middlemen in Phnom Penh, Kandal, Kampong Cham, Prey Veng, Takeo, and Kampong Speu provinces. Sometimes when the price of fermented small-sized fish paste is high, middlemen in Kandal province sell their products to sellers in Phnom Penh. Usually they sell fermented small-sized fish paste to retailers in Prey Veng, Koh Kong, Kampong Cham, and Kandal province, and to wholesalers in Kandal province. Besides receiving fermented small-sized fish paste from middlemen in Kandal province, retailers in Kandal province also buy fermented small-sized fish paste from wholesalers in Phnom Penh markets and in markets in Kandal province, and from middlemen in Phnom Penh. For wholesalers in markets in Kandal province, besides buying fermented small-sized fish paste directly from processors, they also buy fermented small-sized fish paste from middlemen. After that, they sell this product to retailers in Takeo and Siem Reap provinces, and to consumers in Phnom Penh, Takeo, and Kandal provinces.

Figure 13

3.2.3 Market flow chart of fermented small sized fish paste in Kampong Chhnang

In Kampong Chhnang province, besides processors who are the main supplier of fermented small-sized fish paste in the province, 1st middlemen (living in Tonle Sap) in Kampong Chhnang, Pursat, and Battambang provinces also contribute some amount of fermented small-sized fish paste to the business in the province. Figure 14 shows that fermented small-sized fish paste from the processors is then sold to wholesalers in Phnom Penh, middlemen in Kampong Cham, Poipet, Kampong Chhnang (2nd middlemen), Battambang (2nd middlemen), Svay Reang, Pursat, Kampong Speu, Koh Kong, and Kampong Thom provinces. This fermented small-sized fish paste is also sold to provincial wholesalers and retailers in Svay Reang, Battambang, and Kampong Chhnang provinces. Besides meeting the domestic demand, fermented small-sized fish paste is exported to Vietnam by Vietnamese processors and to Thailand by Cambodian processors. For wholesalers in Kampong Chhnang province, they do not only receive fermented small-sized fish paste from processors but also from 1st middlemen living in Tonle Sap of Kampong Chhnang province. They have to continuously process this fermented small-sized fish paste into final fermented small-sized fish paste and stock it for selling. Then they sell this fermented small-sized fish paste to local consumers and to sellers in Kampong Speu province. Second middlemen in Kampong Chhnang do not only get fermented small-sized fish paste from processors, but they also buy fermented small-sized fish paste from 1st middlemen in Kampong Chhnang, Pursat, and Battambang provinces. After that, they supply this fermented small-sized fish paste to middlemen in Kampong Cham, Poipet, Battambang (2nd middlemen), Phnom Penh, and Prey Veng province. Moreover, they also sell this fermented small-sized fish paste to sellers in Battambang and Kampong Speu provinces.

Figure 14

3.2.4 Market flow chart of fermented small sized fish paste in Battambang

In Battambang province, all fresh small-sized fish species and salted small-sized fish which are used to process fermented small-sized fish paste are all from fishing lots, fishermen, and middlemen living in the Tonle Sap of Battambang province. Figure 15 show that all of these small-sized fish species and salted small-sized fish go to 1st middlemen in Battambang province. Sometimes if small-sized fish are not yet beheaded or salted, then it will be beheaded and then salted. After that, these salted small-sized fish (semi-final fermented small-sized fish paste) will be sold to fermented small-sized fish paste processors (2nd processors: the one who buy salted small-sized fish or semi-final fermented small-sized fish paste in order to process more into final fermented small-sized fish paste), exporting companies, wholesalers, and retailers in Battambang province. After fermented small-sized fish paste is processed and stocked by 2nd processors, these fermented small-sized fish paste are sold to middlemen in Phnom Penh, Pursat, Banteay Meanchey, Battambang (2nd middlemen), Pailen, and Takeo provinces. Moreover, these fermented small-sized fish paste are also sold to local wholesalers, local retailers, and wholesalers in Siem Reap province before it can reach to consumers. Wholesalers in Battambang province also play a role as suppliers of fermented small-sized fish paste to retailers and 2nd middlemen in Battambang province, and middlemen in Pailen province. Some salted small-sized fish are also purchased from 1st processors (this refers to someone who buys fresh small-sized fish by beheading and salting small-sized fish one time) in Battambang province by retailers in Battambang province. Exporting companies in Battambang province, besides buying salted small-sized fish from 1st middlemen in Battambang, they also buy salted small-sized fish from 1st middlemen in Kampong Chhnang province. Then, these salted small-sized fish (after putting 2 to 3 times more of salt) and fermented small-sized fish paste are sold to 2nd processors, and to some middlemen in Phnom Penh, Takeo, Kandal, Kampong Cham, and Prey Veng markets. In addition, they also sell these salted small-sized fish and fermented small-sized fish paste to wholesalers in Takeo, Kampong Thom, and Banteay Meanchey provinces. More importantly, the salted small-sized fish are annually exported to Thai markets through these two exporting companies.

Figure 15

3.2.5 Market flow chart of fermented small sized fish paste in Seam Riep

Most of the salted small-sized fish and fermented small-sized fish paste in Siem Reap province are supplied by 1st middlemen in Battambang province who buy either fresh small-sized fish or salted small-sized fish from fishermen in Pursat and Battambang provinces. Figure 16 show that these 1st middlemen sell their products to retailers, wholesalers and an exporting company in Siem Reap province. Moreover, there are also 1st middlemen in Pursat province who sell salted small-sized fish to this exporting company. Then this company exports salted small-sized fish to Thailand, and sell fermented small-sized fish paste to some sellers in Siem Reap markets. For wholesalers in Siem Reap markets, besides buying salted small-sized fish from 1st middlemen, they also buy fermented small-sized fish paste from middlemen in Siem Reap province. After that, they sell it to retailers in Siem Reap, and wholesalers in Takeo province. Usually fermented small-sized fish paste which is processed by processors in Siem Reap province are only sold to Phnom Penh and Siem Reap markets. In order to sell fermented small-sized fish paste year round, retailers in Siem Reap province have to buy either salted small-sized fish or fermented small-sized fish paste from many sources such as from 1st processors and 1st middlemen in Battambang province, and processors, middlemen and wholesalers in Siem Reap province.

Figure 16

3.3 Problems encountered in market and trade of fermented small sized fish paste

There are several problems affecting the market and trade of fermented small sized fish paste in Cambodia. These problems are: 1) Factors Affecting Fermented Small-Sized Fish Pastes Price; 2) Price Determination; 3) Accessibility of Price Information of Fermented Small-Sized Fish Paste, 4) Marketing Problems for Processors, 5) Problems in Fermented Small-Sized Fish Paste Marketing and Trading; 6) Formal-Fee Payment on the Trade; and 7) Informal-Fee Payment on the Trade.

3.4 Economic efficiency analysis of all stakeholders

3.4.1 Middlemen in Phnom Penh, Kandal, and Kampong Chhnang Province

As shown in Table 6 and Table 7, total variable costs of middlemen in Phnom Penh, Kandal, and Kampong Chhnang province for fermented small-sized fish paste business per year is 240,426,823 Riel (or 60,106.70 USD) and total fixed costs is 1,370,344 Riel (or 342.59 USD). Thus, the total costs are 241,601,404 Riel (or 60,400.35 USD).

Table 6

Table 7

Table 8 shows that total revenue of middlemen in Phnom Penh, Kandal and Kampong Chhnang province per year is 258,771,429 Riel (or 64,692.86 USD). With data on total costs and total revenues, economic efficiency of middlemen in the business can be analyzed. Economic Efficiency is formulated by dividing Total Revenue by Total Cost or $EE = TR/TC$. Thus, economic efficiency of middlemen in Phnom Penh, Kandal and Kampong Chhnang province is 1.131. Their net income per year is 17,170,024.762 Riel (or 4,292.50 USD). This means that 1 Riel of their money invested in fermented small-sized fish paste business, will return 1.131 Riel. They can earn money or receive net profit about 0.131 Riel for every 1 Riel invested in the business.

Table 8

3.4.2 Middlemen in Battambang and Siem Reap Provinces

As shown in Table 9 and Table 10, in Battambang and Siem Reap province, total variable cost of fermented small-sized fish paste for middlemen per year is 163,064,021 Riel (or 40,766 USD) and total fixed cost per year is 1,872,875 Riel (or 468.22 USD). Thus, their total cost for the business per year is 164,936,896 Riel (or 41,234.22 USD).

Table 9
Table 10

Table 11 shows that total revenue of middlemen from selling fermented small-sized fish paste per year is 175,712,500 Riel (or 43,928.12 USD). The economic efficiency of these middlemen is 1.052 and their net income per year is 10,775,603.75 Riel (or 2,693.90 USD). This means that if they invest 1 Riel in the fermented small-sized fish paste business, they will receive 1.052 Riel, and so net income from 1 Riel invested in the business is 0.052 Riel.

Table 11

3.4.3 Exporters in Battambang and Siem Reap province

As shown in Table 12 and Table 13, total variable cost of exporters or exporting companies in running the business per year is 2,764,808,600 Riel (or 691,202.15 USD) and their total fixed cost per year is 23,202,889 Riel (or 5,800.72 USD). Thus, their total cost per year is 2,788,011,489 Riel (or 697,002.87 USD).

Table 12
Table 13

Table 14 shows that total revenue from trading fermented small-sized fish paste per year for exporters or exporting companies is 3,686,633,333 Riel (or 921,658.333 USD). Their net income per year is 898,621,844.444 Riel (or 224,655.461 USD) and their economic efficiency is 1.327. This means that exporters/exporting companies receive 1.327 Riel from each 1 Riel they invest in the business. Thus, they get net income of 0.327 Riel from 1 Riel they invest in the fermented small-sized fish paste business.

Table 14

3.4.4 Wholesalers in Phnom Penh

Table 15 and 16 shows that variable cost of fermented small-sized fish paste wholesalers per year in Phnom Penh is 404,054,666 Riel (or 101,013.66 USD); and their fixed cost per year is 411,933 Riel (or 102.98 USD), so their total cost per year is 404,466,599 Riel (or 101,116.65 USD).

Table 15
Table 16

Table 17 shows that total revenue of wholesalers in selling fermented small-sized fish paste per year is 457,250,000 Riel (or 114,312.50 USD). Their net income per year is 52,783,401.17 Riel (or 13,195.85 USD) and their economic efficiency in the business is 1.092. This means if each wholesaler in Phnom Penh invests 1 Riel in the business, they receive 1.092 Riel. Thus, they get 0.092 Riel from every 1 Riel they spend in the business.

Table 17

3.4.5 Wholesalers in Kandal, Kampong Chhnang, Battambang, and Siem Reap

As shown in Tables 18 and 19, the total variable cost per year is 130,386,855 Riel (or 32,596.71 USD) and the total fixed cost per year is 245,650 Riel (or 61.41 USD). Hence, the total cost per year is 130,632,505 Riel (or 32,658.12 USD).

Table 18 and 19

Table 20 shows that total revenue from selling fermented small-sized fish paste per year is 174,651,491 Riel (or 43,662.87 USD). Therefore, their economic efficiency is 1.348 and their net income per year is 44,018,985.91 Riel (or 11,004.75 USD). It means that each 1 Riel invested in the business by wholesalers, 1.348 Riel will be received. Thus, 0.348 Riel of net income will be gotten from every 1 Riel spent in the business.

Table 20

3.4.6 Retailers in Phnom Penh City, Kandal, and Siem Reap Provinces

Table 21 and 22 shows that variable cost per year is 20,963,830 Riel (or 5,240.96 USD) and fixed cost per year is 73,876 Riel (or 18.47 USD). Their total cost in the business per year is 21,037,706 Riel (or 5,259.43 USD).

Table 21

Table 22

Table 23 shows that total revenue of the retailers from selling fermented small-sized fish paste per year is 24,691,579 Riel (or 6,172.89 USD). Their net income per year is 3,653,872.544 Riel (or 913.47 USD). The economic efficiency is 1.084. It simply means that for each 1 Riel of capital spent in the business, 1.084 Riel will be received from the business. Consequently, retailers get 0.084 Riel from 1 Riel they invest in the business.

Table 23

3.4.7 Retailers in Kampong Chhnang and Battambang Provinces

As shown in Table 24 and Table 25, variable cost of retailers per year is 29,643,117 Riel (or 7,410.78 USD) and fixed cost per year is 24,280 Riel (or 6.07 USD). Thus, total cost per year is 29,667,397 Riel (or 7,416.85 USD).

Table 24

Table 25

Table 26 shows that total revenue of retailers from selling fermented small-sized fish paste per year is 33,643,333 Riel (or 8,410.83 USD). Their net income per year is 3,975,936 Riel (or 993.98 USD). The economic efficiency is 1.193. Again, it means that if those retailers invest 1 Riel in the business, they will get 1.193 Riel in return. Thus, they will receive net income around 0.193 Riel from 1 Riel they spend in the business.

Table 26

4. Discussions

Fish paste is one of the most preferable preserved and processed fish products for rural markets, and is a basic foodstuff for almost all ethnic Khmer. Although there is dwindling catch of large species of fish, accompanied with the increased demand of fresh large fish species, family-scale preservation and processing of fermented small-sized fish paste remains an important livelihood (Touch, 2001). The fisheries commodity produced by traditional processing technology normally supplies fish product to the Cambodian people, including those who are living within the country as well as outside the country (Nao et al., 2001). Traditional processing absorbs high volume of small (inland) trash and (marine) fish and is processed for human and animal consumption. According to Touch (1993), Ahmed et al. (1996), and other socio-economic surveys, the total volume of fish paste produced every year by subsistence fishers is estimated at 15,000 to 20,000 tons. Moreover, based on department of fisheries estimates (2001), the total amount of fish paste (both fermented small-sized fish paste and fermented big-sized fish paste) processed by commercial scale processors in Cambodia in 2000 was around 12,681 tons, of which 7,187 tons (56.68%) were

domestically consumed and 5,494 tons (43.32%) were exported abroad. However, according to Nao et al. (2001), the actual amount of fish paste exported was much higher than the mentioned figures as there were unreported trading that happened at the border of Cambodia-Thailand or Cambodia-Vietnam. Given the evidence for this issue, Nao et al. (2001) stated that: "Fishery products have been exported to Thailand, collected from Battambang, Siem Reap, and Kampong Chhnang provinces and to Vietnam, from Kampong Cham, Kandal, Takeo, and Prey Veng provinces and Phnom Penh capital city without reporting." Furthermore, Touch (2001) stated that in 2000, the total amount of fish paste produced by family-scale processors were from 17,500 to 25,000 tons, and by commercial-scale processors were 7,187 tons (as mentioned above). With the price of \$0.50 or 2,000 Riel per kilogram, the total value of fish paste from family-scale processing in 2000 was from \$8,750,000 to \$12,500,000 and from commercial-scale processing was \$2,700,000 (negligible from subsistence fishers). Moreover, semi-final/unfinished fish paste (Mum in Khmer) processed by commercial-scale processors in 2000 was about 5,000 tons and could earn from \$1,000,000 to \$1,250,000. Touch (2001) illustrated the fluctuation of the total amount of fish paste processed only by commercial-scale processors from 1991 to 2000. In 1991, the total volume of fish paste processed by this scale was only 4,900 tons. In 1992, this volume decreased to 3,220 tons and continued to decline to about 3,200 tons. This number went up to 4,060 tons in 1994, and to 5,350 tons in 1995. However, it went down again in 1996 to 3,480 tons, and then went up again to 4,210 tons in 1997, and went on to 4,720 tons in 1998. This number declined to around 4,300 tons before it reached the peak of 7,187 in 2000. Within these ten years, 1993 was the only year that fish paste was least processed, while 2000 was the year that fish paste was the most processed. Furthermore, the amount of semi-final/unfinished fish paste (Mum in Khmer) also varied by year during these ten years. In 1991, total volume of semi-final fish paste was 5,500 tons. In 1992, it steadily increased to 10,500 tons, nearly double of the total amount in 1991. However, this number had a slight decrease to only 10,000 tons in 1993. Since then it continued to decline to 9,500 tons in 1994; 8,000 tons in 1995; 7,500 tons in 1996; 7,000 tons in 1997; 6,000 tons in 1998; 6,000 tons in 1999; and 5,000 tons in 2000. Hence, during this period, 1992 was the year that semi-final fish paste was processed in the largest amount, whereas 2000 was the year that it was processed in the smallest amount.

As considered, the marketing and trading system of fermented small-sized fish paste is, to some extent, similar to marketing and trading system of fish of which distribution channels – supply chain, is the most complicated component (Touch 2001). From this market channel, many transactions take place before fish products reach end consumers or export markets. Within the trade, middlemen are vital and the trade could not exist without these entrepreneurial individuals and enterprises. Trade is about business, and business is about risk. When middlemen take possession of fish products along the supply chain, they assume important risk for a highly perishable product, risk that the fisher does not want to take. Middlemen, which in this case refer to collectors, wholesalers, distributors, retailers, exporters, lenders, state enterprise, processors, and caterers, provide temporary sources of capital, allow the trade to flourish in a capitalist system (Touch, 2001).

Freshwater fish marketing problems are believed to be similar to problems of fish processed products marketing, especially for fish paste marketing. Thus, according to Le and Nguyen (1997) in research about marketing freshwater table fish in the central area of the Mekong river delta, which was done in Vietnam, revealed several problems affecting the marketing of brackish fish products. The problems were grouped into four categories such as buying, selling, processing, and exporting problems. The most important buying problems were: lack of capital, high level of taxes, bad design or arrangement in the market, and the quality and quantity of fish supplied. Besides these main problems, there are: competitive pressure, fluctuation of price, not good sanitation, fish sold very slow, small space, sellers' behaviors, and lack of facilities which are the least problems. When the products were sold, the problems were: high transport costs, long transport distance, hard work/sanitation, survival rate/quantity/quality, lack of capital, bad design/arrangement in the market, bad road condition, high transport taxes, storage of facilities, and lack of labor. The processing problems were: facilities/techniques, quantity/quality of fish, sanitation, and

electricity/water. The exporting problems were: competitive pressure, intensive/control policies, lack of capital, low price of fish, quantity of fish supplied, and high tax level.

Besides all of these problems, Nao et al. (2001) mentioned major exporting problems of fisheries and fishery products which were being encountered by Department of Fisheries of Cambodia. First of all, it is issues for issuance of quarantine and health certificate for fish and fishery products, which are related to laboratory resources, human resources, laws and regulations, and financial resources. Second problem is the lack of national strategies, law and legislation, and policy frameworks, which are relevant to aquatic animal health and fish and fishery products quarantine responsibility, and aquatic animal health and fisheries and fishery products quarantine legislation and regulation. Third, it is about institutional requirements. Last but not least, it is about resource requirements.

Analysis of the cost of production of 7,187 tons of fish paste produced in 2000 indicates that fresh small-sized fish were sold to processors very cheaply at 100 Riel to 200 Riel per kilogram with salt at 500 Riel per kilogram and labor input at 100 Riel to 200 Riel per kilogram of fresh fish to be processed (Touch, 2001). The price of bony fish paste was about 1,500 Riel and 5,000 Riel for boneless fish paste (although in small quantity). Consequently, the total value of commercial fish paste production can be estimated as 10,800 millions Riel. Since the total cost of production, including cost of fresh fish, salt, labor and depreciation, is between 4,380 and 6,590 millions Riel, the value-added of fish paste processing was 7,000 to 10,000 millions Riel, excluding facilitating costs (Touch, 2001). According to the result of this study, small-sized fish species which are chosen for fermented small-sized fish paste processing vary by place and province. The average buying price of fresh fish is 1,497.474 Riel per kilogram (processors). The price fluctuates based on season and its availability. This study also reveals that both fermented small-sized fish paste and salted small-sized fish (or semi-final fermented small-sized fish paste), which is already called fermented small-sized fish paste in some provinces, are being traded by stakeholders. The total amount of fermented small-sized fish paste produced in 2007-2008 is estimated to be 6,659.466 tons, regardless of weight loss (from salted small-sized fish to fermented small-sized fish paste). Within this amount, around 3,341.466 tons (50.18%) are domestically consumed (negligible of outside consumers), 3,268 tons (49.07%) are exported to Thailand by exporting companies, and 50 tons (0.75%) to Vietnam by Vietnamese processors. However, the exact number reflecting the whole country may be higher since some provinces were not selected for the study; only some were selected and available stakeholders were interviewed; and the real number is not truly presented by the interviewees. Concerning the use of fermented small-sized fish paste for daily cooking, on average, around 0.27 kilogram of fermented small-sized fish paste is consumed by each family per week. The number can be conveyed per day which is about 0.03857 kilogram (38.57 grams) per day and 12.96 kilograms per year. Consumers use fermented small-sized fish paste four weeks per month and twelve months per year in their cooking. Most of them (56%) do not care about small-sized fish species contained in the fermented small-sized fish paste they bought from markets. Processing and marketing problems of fermented small-sized fish paste stakeholders are also shown in the result of this study. These problems can be listed by the types of stakeholder, such as processors, middlemen, exporters, wholesalers, and retailers. First, processing and marketing problems to which processors are confronted include: no processing skills/techniques, lack of/no enough capital, shortage of small-sized fish, increasing price of other inputs, borrowing/cheating by buyers, no many buyers, substitution of other products, no exportation, no knowing about suitable time to buy small-sized fish, difficulty in finding laborers, hard to find exact price, bad smell and hard work, and informal-fee payment. Second, middlemen might face marketing problems in loading/transporting, borrowing/cheating by buyers, auctioning in buying sites, negotiating price with processors, price instability, and informal-fee payment. Third, marketing problems of exporters are: loading, borrowing money by buyers, and exporting stability in the future. Fourth, marketing problems of wholesalers are: unconscious buying not good quality, borrowing by buyers, quality degradation, and no many buyers. Last, marketing problems of retailers are: increasing price, unconsciously buying not good fermented small-sized fish paste, price degradation, buyers' perception on chemical substance application and borrowing/cheating by buyers. With the average

buying price of fresh small-sized fish, which is 1,497.474 Riel per kilogram (processors), and the average selling price of fermented small-sized fish paste, which is about 6,789.28 Riel per kilogram (retailers), the added value and marketing of fermented small-sized fish paste per kilogram is approximately 5,291.80 Riel, regardless of input cost, weight loss, depreciation cost, and interest expense. In order to produce one kilogram of fermented small-sized fish paste, exporters need to spend an average of about 1,933.79 Riel; middlemen have to spend 2,738.16 Riel; wholesalers need to spend 3,890.87 Riel; and retailers have to spend 3,593.52 Riel. In average, around 3,039.08 Riel is spent on a kilogram of fermented small-sized fish paste by each stakeholder. Hence, throughout the marketing of fermented small-sized fish paste (from exporters to retailers), around 12,156.34 Riel is spent on one kilogram of fermented small-sized fish paste. In regard to the cost for fermented small-sized fish paste processors, total expenses on producing and marketing per kilogram of fermented small-sized fish paste is even higher. If all costs, variable or fixed costs, and weight loss are included, it can be found that exporters/exporting companies can get an average net profit of 623.29 Riel per kilogram of fermented small-sized fish paste; middlemen can get 190.16 Riel; wholesalers can get 714.60 Riel; and retailers can get 572.64 Riel. On average, each stakeholder can receive about 525.18 Riel of net profit from a kilogram of fermented small-sized fish paste. Thus, throughout the marketing transaction (from exporters to retailers) around 2,100.71 Riel of net profit is added to one kilogram of fermented small-sized fish paste. If the value added to fermented small-sized fish paste by processors is included, the net profit should be higher.

5. Conclusions

In conclusion, fermented small-sized fish paste market and trade in Cambodia is undertaken through many steps and types of stakeholders who play multiple roles in marketing before it can reach the end consumers. Moreover, it tends to be more complicated due to the fact that not only final fermented small-sized fish paste is marketed and traded, but also salted small-sized fish or semi-final fermented small-sized fish paste, which is called fermented small-sized fish paste by people in some provinces. According to the results of this study, the total amount of fermented small-sized fish paste production and trade by each stakeholder is increasing from year to year (except wholesalers) although the total amount of small-sized fish catch is declining. However, the price of fermented small-sized fish paste is gradually increasing and varies by season. Although most stakeholders are satisfied with the business, they do not augment the amount of fermented small-sized fish paste they buy and sell from year to year. This can reflect that the demand for fermented small-sized fish paste might be remaining stable. Since most stakeholders plan to maintain their current business, and consumers buying behavior either in the past, present and future remains unchanged, it can not be ensured that the market will stay the same. Furthermore, most of the stakeholders attempt to maintain their current business because they have no enough sufficient capital, get less and less profit, have no broad distribution channel, have no capability in running the business, get older and older, lack labor force, and especially lack small-sized fish. Most of the people are poor, and as the study reveals, most consumers use fermented small-sized fish paste for their daily cooking and they prefer fermented small-sized fish paste bought from markets. Nevertheless, although a high percentage of consumers can accept the increasing price of fermented small-sized fish paste, the use habits of consumers will be negatively changed because around half of them will turn to use other substitute products if the price still keeps on increasing. The shortage of small-sized fish species leading to the increasing price of small-sized fish, salted small-sized fish, and fermented small-sized fish paste is not the only problem encountered by all stakeholders in the market and trade. It also includes the price of other inputs, capital, loyalty (in running the business), and transportation. Furthermore, most of them think that informal-fee payment does not affect their business, while only exporters think it does. This can be interpreted as only the ones who pass across more on this payment realize how strongly it affects the business. Additionally, most processors, exporters and middlemen have buying difficulties, whereas most of wholesalers and retailers have selling problems. All stakeholders face difficulty in getting price information because it is neither told nor truly told. Another thing, price information of fermented small-sized fish paste is not broadly made known in the markets. Hence, they can be cheated. From the study it can be seen that amongst all kinds of stakeholders, only wholesalers, who buy salted small-sized fish for continuous processing, stocking, and then selling, receive the highest economic

efficiency in the business, followed by exporters. But the difference is only a little bit. Nonetheless, by looking to the annual net income, only exporters earn the best net profit. Thus, it can be assumed that those who tend to expand or invest more in the business will earn better profit than those who do not. According to the results of this study, and in order to improve and strengthen the market and trade of fermented small-sized fish paste in Cambodia, it is necessary for government, other related institutions and beneficiaries to do the following:

- 1). Although the government put a ban on catfish and snakehead, culture which is critical for sustainable development of small-sized fish species, the aquatic resources should be well managed and all illegal fishing using inappropriate fishing gears, overfishing, or any activities which are done to harm all these resources in any image should be prohibited to make sure that they, especially small-sized fish species, are still sustainable and available for peoples consumption, and for fermented small-sized fish paste processing and trading. This can not be done by the government alone. It needs to be incorporated with NGOs or other authorized and functional organizations.
- 2). The real status of weight loss of fresh small-sized fish, when becoming salted small-sized fish or (final) fermented small-sized fish paste traded from one stakeholder to another stakeholder and from one step to another step in the trade, should be clearly ascertained.
- 3). Accessibility to reliable price information of fermented small-sized fish paste for each step of trading should be collected and confirmed by all types of stakeholders.
- 4). Specific formal-fee and informal-fee payment of all kinds of stakeholders on fermented small-sized fish paste trade should be clearly and broadly identified to identify the impact of these payments on the business. If possible, informal-fee payment should be restricted to eliminate inappropriate cost which may happen during business operation.
- 5). Transportation in the river, mainly from landing sites to selling places, should be improved and developed.
- 6). Many financial organizations or credit systems, either supported by governments or private sectors, should be established to offer loans with low interest rate to processors and other fermented small-sized fish paste stakeholders who have no or limited capital for the fermented small-sized fish paste business.
- 7). Proper processing technique or skill should be delivered to not only fermented small-sized fish paste processors, but exporters, middlemen, wholesalers, and retailers by any means in order to make them realize how to process good quality fermented small-sized fish paste and maintain good quality during different steps of the trade. Furthermore, hygiene, food safety, and quality control to meet national and international standards should be improved in order to increase the opportunity for domestic and export trade.
- 8). For middlemen, in order to maximize net profit, they should buy fresh small-sized fish or salted small-sized fish to continuously process into (final) fermented small-sized fish paste and stock for selling for the whole year, especially when small-sized fish is not available. For wholesalers and retailers, they should also buy salted small-sized fish to continuously process into (final) fermented small-sized fish paste and stock for selling year round, rather than directly purchasing (final) fermented small-sized fish paste for selling.
- 9). Salted small-sized fish which is transported to neighboring countries should be safely packaged in order that the selling price can be increased. Added value for (final) fermented small-sized fish paste should be promoted to be exported to neighboring countries to earn more income.

- 10). Real statistics of fermented small-sized fish paste production from each processing site and fermented small-sized fish paste export to neighboring countries should be truly reported to the Department of Fisheries in order that a national development plan for fermented small-sized fish paste production and trade can be made or any remedial action on fermented small-sized fish paste can be taken.
- 11). Law enforcement on fermented small-sized fish paste trade should be well and strictly practiced by all fermented small-sized fish paste stakeholders (processors to middlemen/wholesalers), and by fishery and other authorized officers, so that no corruption occurs.
- 12). Illegal labor migration for work to other countries should be banned so that unforeseen risk during the work cannot happen and the local labor force can be increased. In order to meet demand for labor force in particular provinces, the needed for labor should be made known to all so that it is possible to obtain enough laborers and the risk and illegal migration to other countries can be avoided.
- 13). Identify the true and clear role of fermented small-sized fish paste stakeholders in the fermented small-sized fish paste market and trade.
- 14). Other research studies on different locations/provinces should be undertaken in order to reflect information about the fermented small-sized fish paste market and trade in Cambodia and to verify the difference between what has been found in this study and the new research.
- 15). The price of fermented small-sized fish paste in markets should be broadcast or made known to stakeholders by different media outlets.

Acknowledgements

This study was funded by AquaFish CRSP. We thank the Cambodia's Fisheries Administration and Fisheries Administration Cantonments of Phnom Penh, Prey Veng, Kandal, Kampong Chnang, Battambang and Siem Reap for field support and collaboration. We thank colleagues, field researchers and graduate and under graduate students of Inland Fisheries Research and Development Institute (IFReDI) in Phnom Penh.

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