Fisheries Yield at Landscape Scale in the Lower Mekong Basin in Thailand in 2022

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Contents

1. Introduction

1.1. Population and occupation

Thailand is located between the Gulf of Thailand in the east and Andaman Sea in the west. The country consists of 77 provinces and its total land area is about 513,115 km² with a total coastline of about 7,066 km and about 299,397 km^2 of exclusive economic zone. It has 22 river basins and 353 sub-basins (Table 1), and the two principal river systems are the Chao Phraya River and Mekong River (Figure 1). The total area of inland waters is approximately 3,750 km^2. In 2021, the country's population was 69.95 million and the GDP per capita was US$ 7,273.56 and the fisheries GDP was US$ 3,560 million (Thailand, 2019).

Thirty six percent of the land area of Thailand (188,962 km²) lies within the Lower Mekong Basin. The major sub-basins are the North Khong River Basin (17,435 km²); the Northeast Khong River Basin (47,162 km²); the Chi River Basin (49,274 km²); the Mun River Basin (70,943 km²); and a small portion of the Tonle Sap Basin, which is located on the eastern fringes of Chanthaburi and Sa Kaeo Provinces (4,148 km²). The Lower Mekong Basin in Thailand contains a variety of water bodies including floodplains, tributaries, canals, swamps, and reservoirs.

Table 1. Summary of surface area, population in 2021, and population density of the Lower Mekong Basin Thailand.

Surface area (km2)		Population (million)	
Whole country	Area in the LMB	Whole country	LMB population
513,115	188,962	69.95 (2021)	
		69.20 (2018)	
		61.04 (2005)*	
		60.62 (2000)**	22.53

Source: *Lymer et. Al. (2005); **Hortle (2007)

The inland fisheries sector is categorized into inland capture fisheries and freshwater aquaculture. Inland capture fisheries are carried out principally in rivers, lakes, swamps and reservoirs (Appendix 1.1). These fisheries have long been part of Thai culture and are an important source of animal protein for the rural people. Most fisherfolks in this sub-sector are small-scale. Only fishing in large impoundments is commercial in nature.

Participation in inland fisheries sector, data derived from the agricultural census in 2013 showed that about 4.1 percent of the total households, or 0.82 million households throughout Thailand, conducted fishing activities in various inland fisheries habitats (Figure 2). The highest participation in inland fishing activities is in the North (25 percent) and Northeast (61 percent) regions where people depend more on freshwater fisheries resources to meet their dietary needs. Of these SSF households, 94.4 percent fished for food consumption, whereas the remainder (5.6 percent) fished for trade. There are no systematic records of the total number of fishing boats employed in inland capture fisheries. This is mainly because most of the fishing boats are small-scale and are not obliged to register. Figure 3 presents the number of fishing households at district level in Thailand. The LMB covers 357 districts, 26 provinces and was home to about 644,903 fishers in 561,451 inland fishing households in 2013 (Appendix 1.2). Most of them (92 percent) are located in the northeast of Thailand and the rest are in the northern (7 percent).

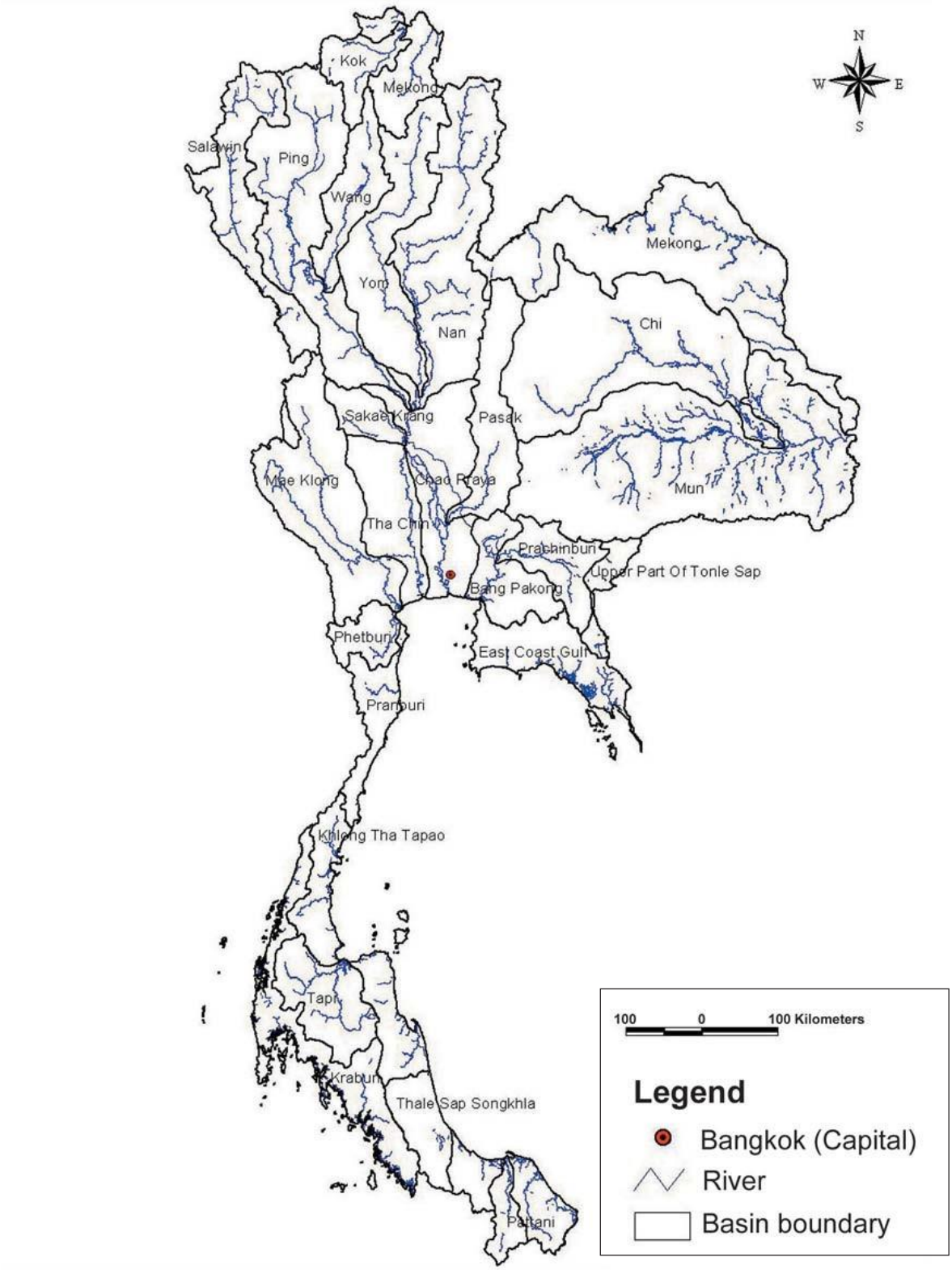
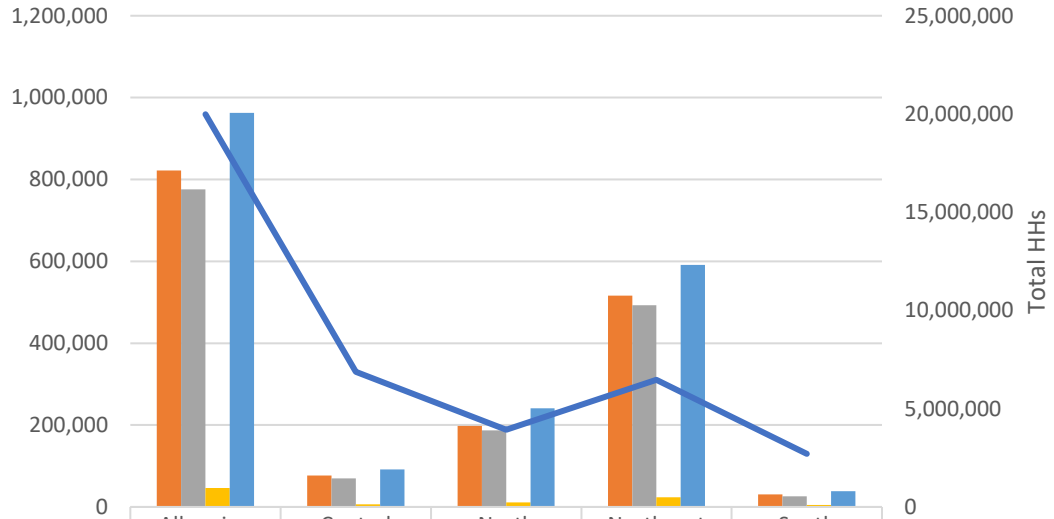


Figure 1. Map of 22 major river basins in Thailand.



	All region	Central	North	Northeast	South
Fishing HHs	821,753	76,446	198,291	516,276	30,740
SSF HHs	775,630	69,835	186,903	492,884	26,008
Commercial HHs	46,123	6,611	11,388	23,392	4,732
# fisher	962,404	91,409	241,094	591,469	38,432
Total HHs	19,985,900	6,876,300	3,931,500	6,473,800	2,704,300

Figure 2. Total households and inland fishing households in Thailand and by region.

1.1. Capture fisheries and aquaculture

Inland capture fishing activities in Thailand are carried out in natural and human-made water bodies of various types, from rivers and their tributaries to reservoirs and fishponds. Fish caught from inland habitats are multispecies and vary in abundance depending on the productive status of the water bodies (Pawaputanon, 2003). The main fishing gears are fish trap, gill net, long line, hand line, cast net, harpoon and landing net. Silver barb, Nile tilapia, striped snake-head fish, Jullien's mud carp, walking catfish and common climbing perch generally are the dominant species in various water bodies

In 2015, Thailand's total fishery production was placed at 2.4 million tonnes, with marine and inland capture fisheries contributing 1.5 million tonnes and aquaculture production contributing around 0.9 million tonnes. In 2021, total catch in marine and inland waters was, respectively, 1.3 and 0.1 million tonnes (Figure 4), the farming production of marine shrimp represented almost 40 percent of the total inland and marine culture production, slightly recovering (388,300 tonnes) after the substantially drop from over 600,000 tonnes in 2011-2012 due to a serious crop fail caused by the wide spread of the early mortality syndrome.

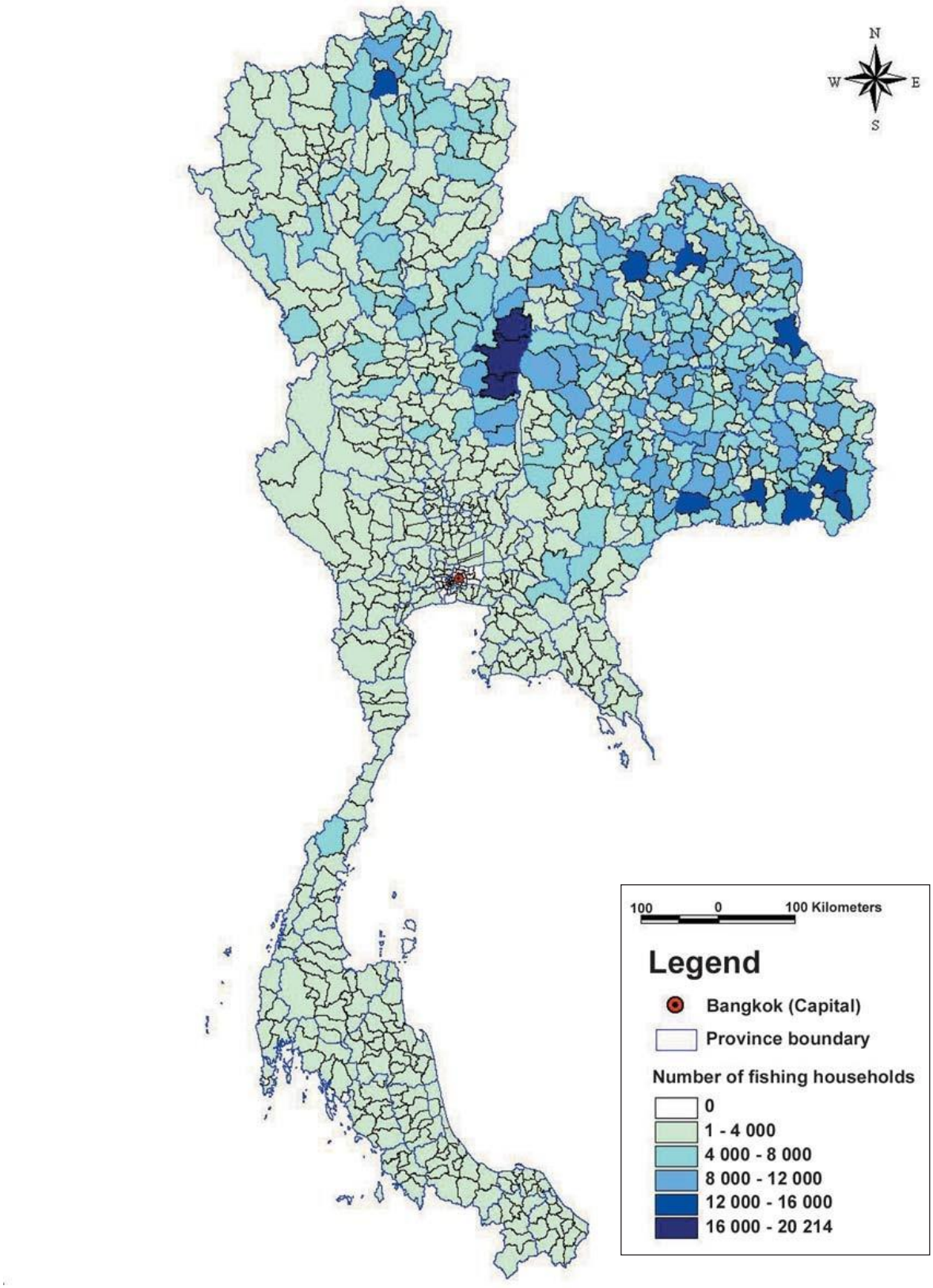
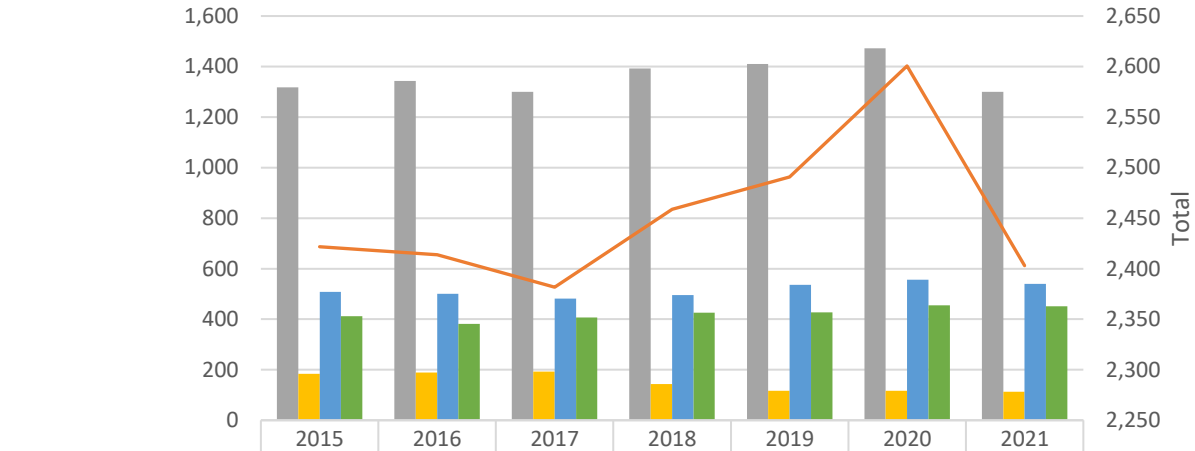


Figure 3. Distribution of fishing households in Thailand (Lymer et. al., 2005).

In 2015, inland capture fisheries produced 184,100 tonnes, although the overall production trend was decreasing in 2011-2021. The important species were Nile tilapia, walking catfish, common silver barb, and giant freshwater prawn. Freshwater aquaculture is carried out either as monoculture or polyculture, depending on the species cultured. Monoculture is not only common for raising carnivorous species such as the hybrid catfish and snakehead, but also for freshwater prawn, striped catfish, and sand goby. Polyculture is employed principally to raise herbivorous and filter-feeding species, such as tilapia, silver barb, common carp, Chinese carps, and mrigala.



	2015	2016	2017	2018	2019	2020	2021
Marine capture	1,317.20	1,343.30	1,300.40	1,392.90	1,410.70	1,472.40	1,299.50
Inland capture	184.1	188.9	192.6	143.9	116.5	116.8	112.6
Coastal culture	508.8	500.1	481.5	496.1	536.5	556.8	540.1
Freshwater culture	411.5	381.6	407.2	425.8	426.9	454.6	450.7
Total	2,421.60	2,413.90	2,381.70	2,458.70	2,490.60	2,600.60	2,402.90

Figure 4. Fisheries production (x1,000 tonnes) in quantity by sub-sectors, 2015 - 2021.

1.2. Food consumption

Inland capture fisheries are an important sector of many local economies in Thailand and are considered to be important in sustaining the livelihoods of many rural communities. They are also important sources of domestic fish consumption. The importance of the inland fisheries sector has been highlighted in providing food security and generating local income is frequently highlighted. The most recent national census in the agricultural sector throughout the country (2013) showed a high participation rate of Thai people in inland fisheries activities, with the main purpose of these fishing activities being for household consumption. Even though the figures for production and value in this sector are not high, it is still an important sector for local economies. Fisheries and aquaculture have a highly significant social, economic and nutritional role for the 69 million people of Thailand. Fish is one of the most significant sources of animal protein for most Thai people.

The main source of information about fish consumption in Thailand in 1995, the fish consumption was estimated at 27 kg/person/ year by the Department of Fisheries, with the central and northern regions importing fish from other provinces due to insufficient local supply (Baran et. Al., 2007). Prapertchob et al. (1989) reviewed the amount of freshwater fish consumption in northeastern Thailand as 21.3 kg/person/ year on average, with a variability between 13.3 kg/person/year in dry areas and 36.4 kg/ person/year in areas rich in water resources. Estimated annual per capita consumption of fish based on a field survey of consumers in 1998-1999 was an average of 28.8 kg which more than 90% was in the form of fresh fish. The highest per capita fish consumption by region was 33.8 kg in Northeast Thailand. Freshwater fish accounted for 70-90% of the total quantity of fish consumed in all regions. Fish ranked first among animal protein sources, followed by chicken, pork, and beef.

Hortle and Suntornratana (2008) shows median household consumption of 201 kg/household/year equates to about 41 kg/capita/year as a typical consumption, or about 32 kg/capita/year as actual consumption in 2000. The national average fish consumption per capita in 2001 was 33.5 kg according to the statistics of the Department of Fisheries (DOF) (ADB, 2005). This national average hides the large variation between communities with good access to fish and those without. The wide range in fish consumption also mirrors wide differences in income. Very low fish consumption levels of about 3-5 kg per capita occur in remote communities of Northern Thailand. However, these may not include fish obtained and consumed from outside the village.

Average annual per capita fish consumption was estimated at 27.2 kg in 2016. In 2019 the fish available for consumption was 29.50 kg/capita, higher than the consumption of the other three main animal protein commodities, namely: pork, beef, and chicken. In Thailand, the price of fish is generally low compared with the other sources of animal protein but the level of consumption varies among its people, because of the differences in household incomes, species preference, and geographic locations.

1.3. Survey sites in 2022

The study is for Thailand to update the estimates of fisheries yield by major habitat types (Appendix 1.3) by conducting ground-truth data collection in 3 survey sites (Table 2, Figure 5-6).

1) Benchalak District, Si Sa Ket Province:

   The topography is generally flat to lowland. The major water bodies is Huai Khayung, tributary of the Mun River. Most of the agricultural areas are rice fields, especially in-season rice. For the fisheries, it is only an additional activity in the agricultural areas where there is a water resource for cultivation. The most catch is for household consumption. Fishes that are sold within the area most of them imported from different areas.

2) Sirindhorn District, Ubon Ratchathani Province:

   It is located of the Sirindhorn Dam Reservoir (288 km^2) and the Chong Mek Permanent Border Checkpoint (Thai-Laos border trade channel). The major water bodies Mun River (tributary of the Mekong River) and Sirindhorn Reservoir are the important area for capture fisheries and cage culture.

3) Tha Uthen District, Nakhon Phanom Province:

   It is Confluence of Songkhram River and Mekong River. The Lower Songkhram River is a registered wetland of international importance or Ramsar Site and the important area for capture fisheries and cage culture

Table 2. Population in survey site

District	Area (km^2)	Habitats	Population	Male	Female	# HHs	Occupation (HHs)		
							Full time fisher	Part time fisher	Aquaculture
Benchalak	331.3	Rainfed zone Floodplain zone	35,975	18,155	17,820	8,536	-	-	226
Sirindhorn	759.9	Rainfed zone Floodplain zone Water bodies	55,125	27,906	27,019	19,710	-	898	382
Tha Uthen	468.8	Rainfed zone Floodplain zone	59,557	29,827	29,730	16,721	-	314	703

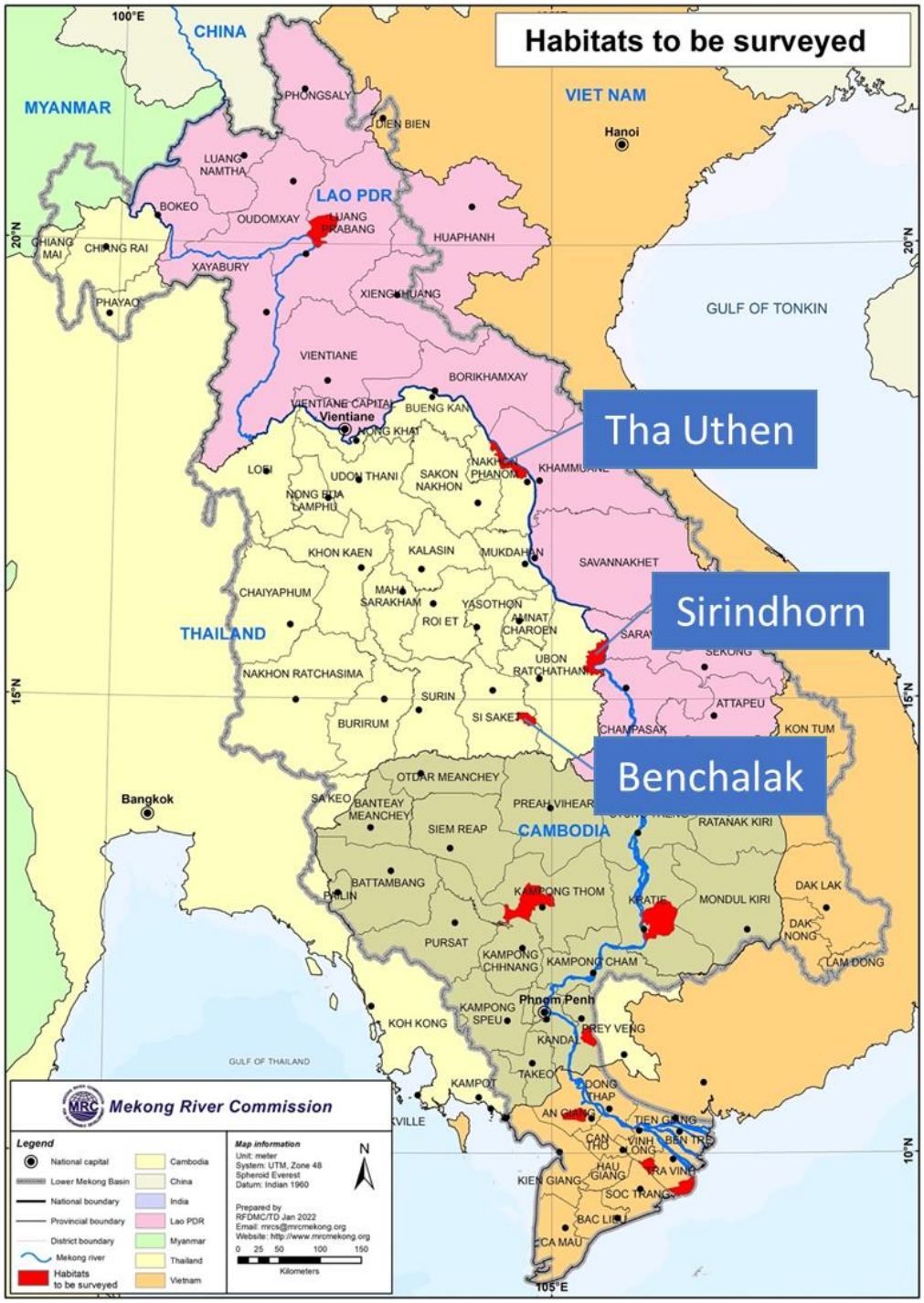


Figure 5. Location of survey site.

a) Benchalak District: Huay Khayung, Tributary of Mun River (Floodplain)

b) Sirindhorn District: Sirindhorn Dam Reservoir (Large water body)

c) Tha Uthen District: Confluence of Songkhram and Mekong River (Floodplain)

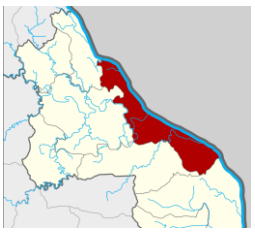


Figure 6. Major habitat in the survey site.

2. Methodology

The sample survey was carried out from June to July 2022. The survey teams first visited the village leaders and explained the objectives of the study and the interview schedule. This survey was carried out by interviewers using questionnaires, and comprised three separate surveys:

(1) Household/Fisher interviews;

The household/fisher surveys will be based on structured interviews to collect data on household/fisher's fishing gears, fish/ Other aquatic animals (OAAs) catch estimates by season and by habitat types, main species caught and consumption, and market prices of fish from the major types of fish habitats in the LMB.

At least total 180 households/fishers will be selected for interviewing spanning through 3 major habitat types. Households/fishers selection for the survey will be based on a random basic and those who are from different background and fish at as many different micro-habitats as possible. The survey team will try to balance 50% of participants who are full-time fishers and another 50% is part-time fishers. Gender balance should be considered when conducting the surveys.

(2) Provincial Fisheries Management Officer interviews;

A questionnaire for provincial fisheries management officers is based on semi-structure interviews to provide information on local perspectives about Import - Export - Aquaculture - Animal feeds related to capture fisheries in Thailand. A list of documents/ information being collected and collated at provincial level is outlined in Report Template.

(3) Focus Group discussions;

A focus group discussion will be organized at local/fisher communities of the same selected districts to validate the data and information collected from the household/fisher surveys and reflect on different perspectives that would not be recorded during the household/fisher interviews.

Each focus group discussion will include 6-10 people balancing men and women. Open ended questions used for group discussion with local/fisher communities are provided in open ended questions use for group discussion with HHs/Fishers. Participants for the group discussion are those who did not take part in the HH/fisher's interview. Gender balance should be considered when conducting the group discussion.

3. Results

3.1. Result of HH/fisher surveys

The total fisher interviews from the HHs survey were 183 respondents for all major habitats and Family member 2-12 people (Average=4.8) (Figure 7). For each fisher they have micro habitat and micro habitat for the fishing grounds except the fisher in Sirindhorn Dam Reservoir and rainfed zone is a major habitat for fishing (Table 3-4, Figure 8).

Figure 7. Household survey activity.

Table 3. Number of household and type of fishing gear from interviews

Macro Habitat	Micro Habitat	District	# HHs	Fishing gear		
Rainfed	Rainfed	Benchalak	31	Cast Net	Hook and line	Stationary gillnet
Rainfed	Rainfed	Sirindhorn	11	Cast Net	Stationary gillnet	Hook and line
Rainfed	Rainfed	Tha Uthen	1	Bamboo fish trap		
Rainfed	Floodplain	Benchalak	30	Cast Net	Hit gillnet	Hook and line
Rainfed	Small water bodies	Sirindhorn	11	Cast Net	Stationary gillnet	Hook and line
Rainfed	Small water bodies	Tha Uthen	29	Cast Net	Drifting gillnet	Bamboo fish trap
Floodplain	Rainfed	Tha Uthen	2	Hook and line	Spear	
Floodplain	Floodplain	Sirindhorn	19	Cast Net	Drifting gillnet	Bamboo fish trap
Floodplain	Floodplain	Tha Uthen	29	Drifting gillnet	Bamboo fish trap	Hit gillnet
Water bodies	Large water body	Sirindhorn	20	Attractant Basket	Guns	Long line bottom set
Total			183			

Figure 8. Rainfed zone is a major habitat for fishing.

The mean age of people in the households surveyed was 55 years, 61 percent were between 51-70 years old (Average female=46.5, male=54.8) and 6 percent are female (Table 4).

The most important subsistence activities were rice farming and capture fisheries, involved both in rice farming and fishing (71%) and 15 percent are fishing and rice farming (Table 5). 33 percent are fishers and 7.6 percent are fulltime or commercial fisher.

Table 4. Age and gender data from interviews.

Macro Habitat	Micro Habitat	Female				Male				Total
		≤30	31-50	51-70	≥70	≤30	31-50	51-70	≥70	
Rainfed	Rainfed			2			14	27		43
	Floodplain		2				12	14	2	30
	Water bodies		4	1		2	9	19	5	40
Floodplain	Rainfed						1	1		2
	Floodplain		2			1	12	30	3	48
Water bodies	Large water body						5	15		20
Total			8	3			3	53	106	183

Table 5. Occupation data from interviews.

Macro habitat	Micro habitat	District	Occupation last 5 years		Occupation last year	
Rainfed	Rainfed	Benchalak	Farmer		Farmer	
	Rainfed	Sirindhorn	Farmer		Farmer	
	Rainfed	Tha Uthen	fisher		fisher	Farmer
	Floodplain	Benchalak	Farmer		Farmer	
	Small water bodies	Sirindhorn	Farmer		Farmer	
	Small water bodies	Tha Uthen	Farmer	fisher	Farmer	fisher
Floodplain	Floodplain	Sirindhorn	fisher	Farmer	fisher	Farmer
		Tha Uthen	Farmer		Farmer	
Water bodies	Large water body	Sirindhorn	Farmer	fisher	Farmer	fisher

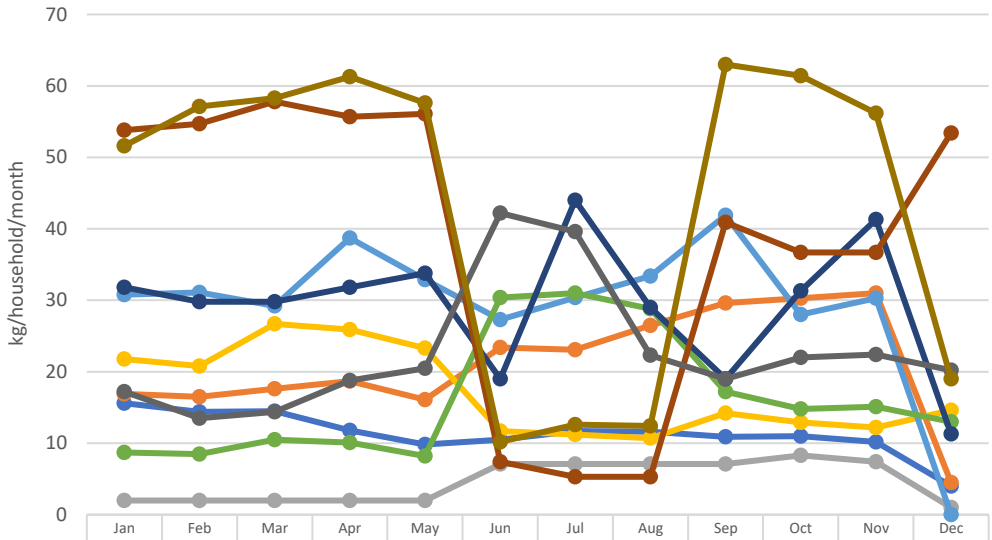
There were 16 kinds of fishing gear recorded, within 7 main categories. Several kinds of gear cast nets, stationary gillnets and hooks were widespread and found in most villages (Figure 9).

Figure 9. Main type of fishing gear in each habitat.

The fishing households were asked to estimate the number of trips they made each month; the habitats they visited, and their total annual catch in each habitat. There are three main periods: dry season, wet season and all year round, 73 percent they go to fishing all year round. Fishing is least frequent during the wet season (June to November).

A typical household fish catches (median) of the 183 fishing households about 203 kg/year or about 17 kg/month. The mean fish catch was estimated at 276.6 kg/household/year as a weighted mean for all households (Table 6).

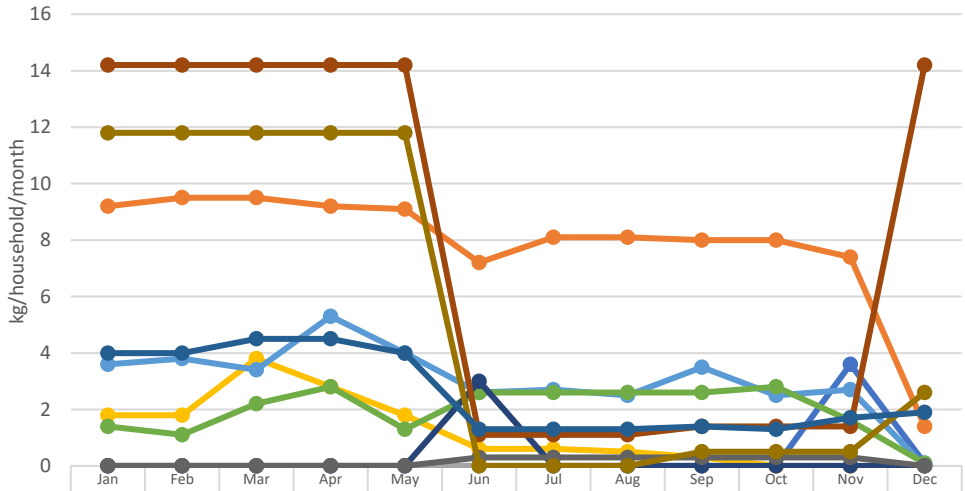
For the major habitat the largest total fish catch was in water bodies (Sirindhorn Reservoir) followed by floodplain and rainfed zone respectively 520.5, 347.6, 202.1 kg/household/year. 50 percent households reported catches of less than 200 kg/year; 115 households (63% of sample households) had an annual catch lower than the mean, and the highest annual catch was more than 7 times the mean catch. The 36 households with the highest catch (about 20% of the sample) caught about half of the total catch of all the households. There is a large variation in the fish catch from June to August in floodplain zone and large water body (Sirindhorn Reservoir) in Sirindhorn area (Figure. 10).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfed Benchalak	15.6	14.4	14.5	11.8	9.8	10.5	11.7	11.6	10.9	11	10.2	4
Rainfed Sirindhorn	16.9	16.5	17.6	18.7	16.1	23.4	23.1	26.5	29.6	30.3	31	4.5
Rainfed Tha Uthen	2	2	2	2	2	7.1	7.1	7.1	7.1	8.3	7.4	1
Floodplain Benchalak	21.8	20.8	26.7	25.9	23.3	11.7	11.2	10.7	14.2	12.9	12.2	14.6
Small water bodies Sirindhorn	30.8	31.1	29.2	38.7	32.9	27.3	30.4	33.4	41.9	28	30.3	0
Small water bodies Tha Uthen	8.7	8.5	10.5	10.1	8.2	30.4	31	28.8	17.2	14.8	15.1	13
Rainfed Tha Uthen	31.8	29.8	29.8	31.8	33.8	19	44	29	19	31.3	41.3	11.3
Floodplain Sirindhorn	53.8	54.7	57.8	55.7	56.1	7.4	5.3	5.3	40.9	36.7	36.7	53.4
Floodplain Tha Uthen	17.2	13.5	14.4	18.8	20.5	42.2	39.6	22.3	19	22	22.4	20.2
Large water body Sirindhorn	51.6	57.1	58.3	61.3	57.6	10.2	12.6	12.4	63	61.4	56.2	19

Figure 10. Total monthly fish catch for each habitat.

The mean Other aquatic animals (OAAs) catch was estimated at 30.8 kg/household/year as a weighted mean for all households (Table 7). The largest total OAAs catches were in large water body (Sirindhorn Reservoir) (62.7 kg/household/year) followed by floodplain and rainfed, respectively. Most habitat the OAAs catch in dry season more than in wet season and has a large variation liked monthly fish catch from June to August in floodplain zone and large water body (Sirindhorn Reservoir) in Sirindhorn area (Figure. 11).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfed Benchalak	0	0	0	0	0	0	0	0	0	0	3.6	0.1
Rainfed Sirindhorn	9.2	9.5	9.5	9.2	9.1	7.2	8.1	8.1	8	8	7.4	1.4
Rainfed Tha Uthen	0	0	0	0	0	0	0	0	0	0	0	0
Floodplain Benchalak	1.8	1.8	3.8	2.8	1.8	0.6	0.6	0.5	0.3	0	0	0
Small water bodies Sirindhorn	3.6	3.8	3.4	5.3	4	2.6	2.7	2.5	3.5	2.5	2.7	0
Small water bodies Tha Uthen	1.4	1.1	2.2	2.8	1.3	2.6	2.6	2.6	2.6	2.8	1.6	0.1
Rainfed Tha Uthen	0	0	0	0	0	3	0	0	0	0	0	0
Floodplain Sirindhorn	14.2	14.2	14.2	14.2	14.2	1.1	1.1	1.1	1.4	1.4	1.4	14.2
Floodplain Tha Uthen	0	0	0	0	0	0.3	0.3	0.3	0.3	0.3	0.3	0
Large water body Sirindhorn	11.8	11.8	11.8	11.8	11.8	0	0	0	0.5	0.5	0.5	2.6
Total	4	4	4.5	4.5	4	1.3	1.3	1.3	1.4	1.3	1.7	1.9

Figure 11. Total monthly OAAs catch for each habitat.

From the fish and OAAs catch, the mean annual total catch is 307.4 kg/household/year and for rainfed zone, floodplain zone and water bodies the total catch were 583.2, 384.1 and 224.7 kg/household/year, respectively. All total catch in dry season was more than 0.5 times total catch in wet season except in rainfed zone. The estimation of total catches compared to the past, it was found that in 2015 there was increasing trend from 2010 and after that almost tended to decline (Figure 12).

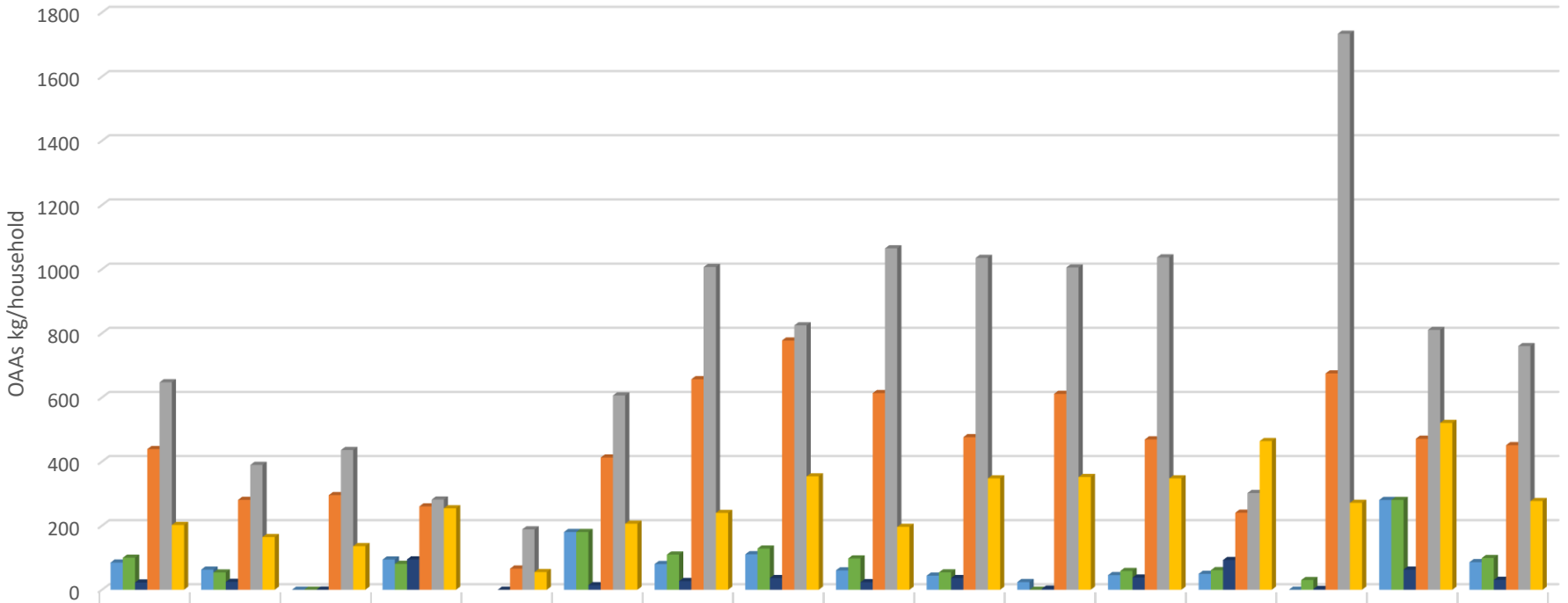
For household consumption, households were asked to estimate their weekly intake of foods within various categories in the wet and dry seasons. The results were summed by categories and by broader groupings for each household. Weight as actual consumption was estimated for fresh fish by multiplying FWAE (fresh whole animal equivalent weights) weights by 0.8 (80% of the fresh weight of fish was assumed to be eaten) and for OAAs by multiplying by 0.49 (49% of the weight of OAAs was assumed to be eaten) (Hortle, 2007). Figure 13 shows that reported household consumption as FWAEs averaged 65.5 kg/capita/year, of which about 65% capture fresh fish, 17.1% culture fish, and 4.1% was meat.

Table 6. Monthly fish catch (kg/household).

Habitat	Micro habitats	District	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Dry season	Wet season
Rainfed		Total	17.0	16.3	18.3	18.3	15.8	18.8	19.4	19.3	18.2	16.0	15.9	8.8	202.1	94.4	107.7
Rainfed	Rainfed	Total	15.6	14.6	15.0	13.3	11.2	13.7	14.5	15.4	15.6	15.9	15.5	4.1	164.4	73.9	90.5
Rainfed	Rainfed	Benchalak	15.6	14.4	14.5	11.8	9.8	10.5	11.7	11.6	10.9	11.0	10.2	4.0	136.1	70.2	65.9
Rainfed	Rainfed	Sirindhorn	16.9	16.5	17.6	18.7	16.1	23.4	23.1	26.5	29.6	30.3	31.0	4.5	254.2	90.2	164.1
Rainfed	Rainfed	Tha Uthen	2.0	2.0	2.0	2.0	2.0	7.1	7.1	7.1	7.1	8.3	7.4	1.0	55.1	11.0	44.1
Rainfed	Floodplain	Benchalak	21.8	20.8	26.7	25.9	23.3	11.7	11.2	10.7	14.2	12.9	12.2	14.6	206.0	133.0	73.0
Rainfed	Small water bodies	Total	14.8	14.7	15.7	17.9	15.0	29.6	30.8	30.0	24.0	18.4	19.3	9.4	239.5	87.5	152.1
Rainfed	Small water bodies	Sirindhorn	30.8	31.1	29.2	38.7	32.9	27.3	30.4	33.4	41.9	28.0	30.3	0.0	353.8	162.7	191.1
Rainfed	Small water bodies	Tha Uthen	8.7	8.5	10.5	10.1	8.2	30.4	31.0	28.8	17.2	14.8	15.1	13.0	196.2	58.9	137.3
Floodplain		Total	31.7	29.8	31.5	33.3	34.6	28.0	26.7	16.1	27.3	28.0	28.7	32.5	347.6	193.3	154.3
Floodplain	Rainfed	Tha Uthen	31.8	29.8	29.8	31.8	33.8	19.0	44.0	29.0	19.0	31.3	41.3	11.3	351.8	168.3	183.5
Floodplain	Floodplain	Total	31.7	29.8	31.6	33.4	34.6	28.4	26.0	15.5	27.7	27.9	28.2	33.4	347.4	194.4	153.0
Floodplain	Floodplain	Sirindhorn	53.8	54.7	57.8	55.7	56.1	7.4	5.3	5.3	40.9	36.7	36.7	53.4	463.8	331.5	132.3
Floodplain	Floodplain	Tha Uthen	17.2	13.5	14.4	18.8	20.5	42.2	39.6	22.3	19.0	22.0	22.4	20.2	271.2	104.6	166.6
Water bodies	Large water body	Sirindhorn	51.6	57.1	58.3	61.3	57.6	10.2	12.6	12.4	63.0	61.4	56.2	19.0	520.5	304.8	215.7
Total			24.8	24.4	26.3	27.1	25.5	20.4	20.7	17.7	25.6	24.2	23.8	16.4	276.6	144.4	132.2

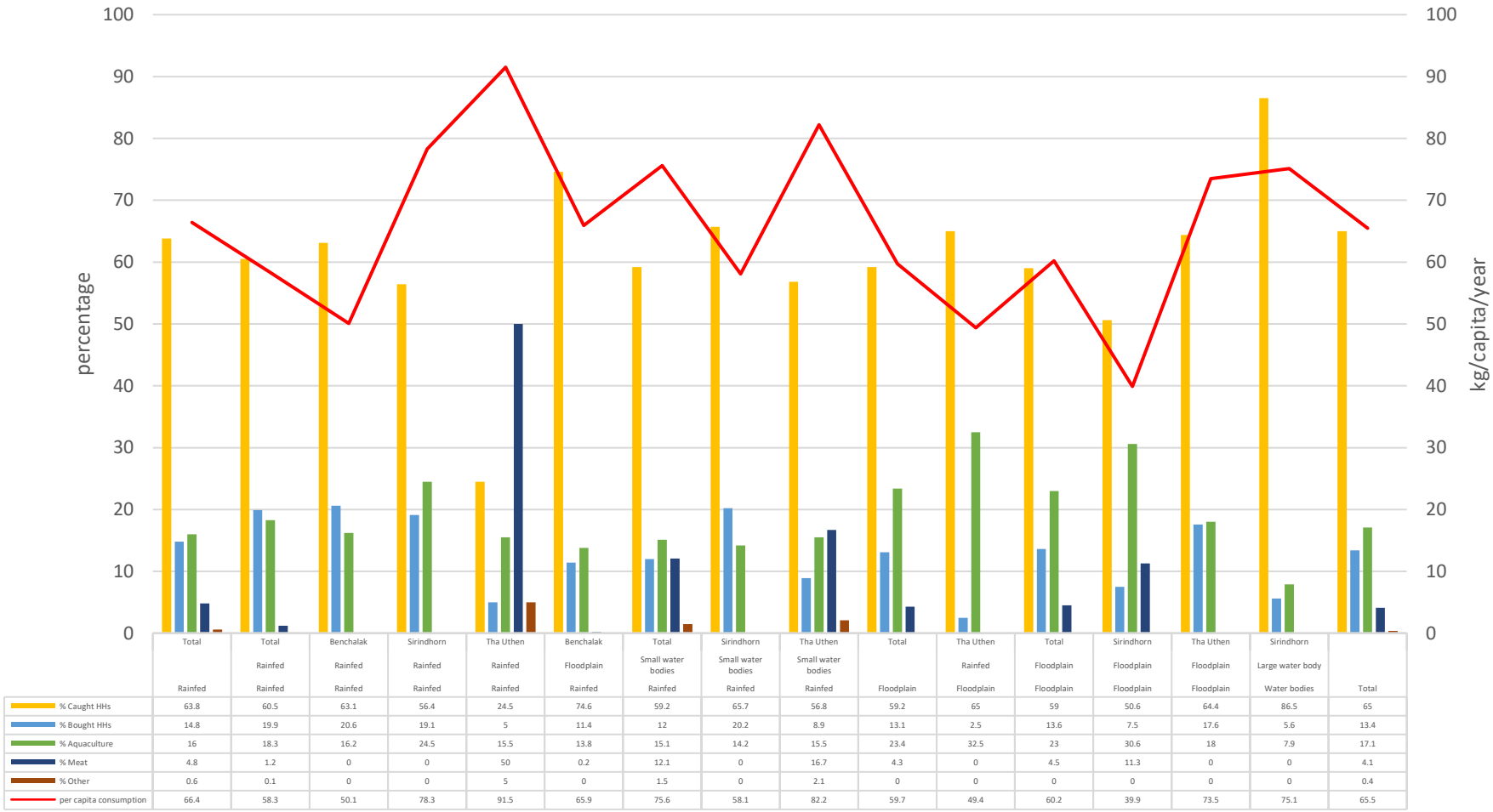
Table 7. Monthly Other aquatic animals (OAAs) catch (kg/household).

Habitat	Micro habitats	District	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Dry season	Wet season
Rainfed		Total	2.1	2.1	2.8	2.8	2.1	1.8	1.9	1.8	1.9	1.7	2.4	0.2	22.6	12.1	11.5
Rainfed	Rainfed	Total	2.3	2.4	2.4	2.3	2.3	1.8	2.1	2.1	2.1	2.1	4.5	0.4	24.4	12.3	14.7
Rainfed	Rainfed	Benchalak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.1	0.2	0.1	3.7
Rainfed	Rainfed	Sirindhorn	9.2	9.5	9.5	9.2	9.1	7.2	8.1	8.1	8.0	8.0	7.4	1.4	94.7	47.8	46.8
Rainfed	Rainfed	Tha Uthen	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rainfed	Floodplain	Benchalak	1.8	1.8	3.8	2.8	1.8	0.6	0.6	0.5	0.3	0.0	0.0	0.0	14.1	12.0	2.1
Rainfed	Small water bodies	Total	2.0	1.8	2.5	3.5	2.0	2.6	2.6	2.6	2.9	2.7	1.9	0.1	27.0	11.9	15.2
Rainfed	Small water bodies	Sirindhorn	3.6	3.8	3.4	5.3	4.0	2.6	2.7	2.5	3.5	2.5	2.7	0.0	36.4	20.0	16.4
Rainfed	Small water bodies	Tha Uthen	1.4	1.1	2.2	2.8	1.3	2.6	2.6	2.6	2.6	2.8	1.6	0.1	23.5	8.8	14.7
Floodplain		Total	5.4	5.4	5.4	5.4	5.4	0.7	0.6	0.6	0.7	0.7	0.7	5.4	36.5	32.3	4.2
Floodplain	Rainfed	Tha Uthen	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	3.0
Floodplain	Floodplain	Total	5.6	5.6	5.6	5.6	5.6	0.6	0.6	0.6	0.8	0.8	0.8	5.6	37.9	33.7	4.2
Floodplain	Floodplain	Sirindhorn	14.2	14.2	14.2	14.2	14.2	1.1	1.1	1.1	1.4	1.4	1.4	14.2	92.6	85.1	7.5
Floodplain	Floodplain	Tha Uthen	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.0	2.1	0.0	2.1
Water bodies	Large water body	Sirindhorn	11.8	11.8	11.8	11.8	11.8	0.0	0.0	0.0	0.5	0.5	0.5	2.6	62.7	61.3	1.4
Total			4.0	4.0	4.5	4.5	4.0	1.3	1.3	1.3	1.4	1.3	1.7	1.9	30.8	23.0	8.4



	Rainfed	Rainfed	Rainfed	Rainfed	Rainfed	Floodplain	Small water bodies	Small water bodies	Small water bodies		Rainfed	Floodplain	Floodplain	Floodplain	Large water body	
	Rainfed	Rainfed	Rainfed	Rainfed	Rainfed	Rainfed	Rainfed	Rainfed	Rainfed	Floodplain	Floodplain	Floodplain	Floodplain	Floodplain	Water bodies	Total
OAAS catch 2010	84.8	62.8	0	94.2		180	80	110.6	60.5	43.8	24	45.5	49.6	0	280	86
OAAS catch 2015	99.9	53.7	0	80.6		180	109.7	128.6	97.6	54	0	58.5	61.1	30	280	98.7
OAAS catch 2022	22.6	24.4	0.2	94.7	0	14.1	27	36.4	23.5	36.5	3	37.9	92.6	2.1	62.7	30.8
Fish catch 2010	438.9	280.5	295.1	260	65.9	412.7	657	777.7	613.6	476.1	611.2	469	240.1	675	471.2	450.9
Fish catch 2015	647.3	389.4	435.8	281.3	188.3	606.2	1,006.80	825	1,064.90	1,035.20	1,005.30	1,036.80	301.6	1,733.30	810.8	760.2
Fish catch 2022	202.1	164.4	136.1	254.2	55.1	206	239.5	353.8	196.2	347.6	351.8	347.4	463.8	271.2	520.5	276.6

Figure 12. Trending of fish and Other aquatic animals (OAAs) catch for last 12 years.



	Total Rainfed	Total Rainfed Rainfed	Benchalak Rainfed Rainfed	Sirindhorn Rainfed Rainfed	Tha Uthen Rainfed Rainfed	Benchalak Floodplain Rainfed	Total Small water bodies Rainfed	Sirindhorn Small water bodies Rainfed	Tha Uthen Small water bodies Rainfed	Total Floodplain	Tha Uthen Rainfed Floodplain	Total Floodplain Floodplain	Sirindhorn Floodplain Floodplain	Tha Uthen Floodplain Floodplain	Sirindhorn Large water body Water bodies	Total
% Caught HHs	63.8	60.5	63.1	56.4	24.5	74.6	59.2	65.7	56.8	59.2	65	59	50.6	64.4	86.5	65
% Bought HHs	14.8	19.9	20.6	19.1	5	11.4	12	20.2	8.9	13.1	2.5	13.6	7.5	17.6	5.6	13.4
% Aquaculture	16	18.3	16.2	24.5	15.5	13.8	15.1	14.2	15.5	23.4	32.5	23	30.6	18	7.9	17.1
% Meat	4.8	1.2	0	0	50	0.2	12.1	0	16.7	4.3	0	4.5	11.3	0	0	4.1
% Other	0.6	0.1	0	0	5	0	1.5	0	2.1	0	0	0	0	0	0	0.4
per capita consumption	66.4	58.3	50.1	78.3	91.5	65.9	75.6	58.1	82.2	59.7	49.4	60.2	39.9	73.5	75.1	65.5

Figure 13. Household consumptions (kg/capita/year).

3.2. Result of Fisheries management officer surveys

Data on utilizations of fish production from Fisheries Statistical Group, DOF shows the fish production in LMB Thailand at 67,873 tonnes from 457,558 fishing households, represents well over 58% of the national inland capture fisheries production (Table 8). Of this catch 84% sold in fresh fish or consumed and the others process in dry fish, smoked fish, salted fish and fermented fish etc.

Table 8. Utilizations of fish production in Lower Mekong Basin Thailand in 2020.

Province	Fish production	Utilization of fish production						
		Fresh fish	Dry fish	Smoked fish	Salted fish	Fermented fish	Pickled fish	Other
Chiang Mai	203.39	199.27	0.63	0.02	-	0.28	-	3.19
Chiang Rai	3,091.94	2,999.18	30.92	-	61.84	-	-	-
Phayao	1,862.84	1,806.95	55.89	-	-	-	-	-
Petchabun	80.27	76.25	2.41	1.61	-	-	-	-
Sa Kaeo	266.27	263.61	-	2.66	-	-	-	-
Chanthaburi	4.64	3.80	-	0.74	0.05	-	-	0.05
Loei	838.66	654.16	16.77	75.48	-	16.77	-	75.48
Chaiyaphum	957.71	900.24	47.89	9.58	-	-	-	-
Nong Khai	4,283.08	4,026.10	85.66	85.66	85.66	-	-	-
Bueng Kan	2,573.74	2,522.26	-	25.74	-	-	-	25.74
Nakhon Phanom	3,027.90	1,483.67	393.63	45.02	42.23	30.28	30.28	302.79
Mukdahan	1,478.19	1,478.19	-	-	-	-	-	-
Amnat Charoen	581.91	541.18	-	-	34.91	5.82	-	-
Ubon Ratchathani	5,245.31	4,248.69	157.36	14.72	62.27	157.36	-	104.91
Si Sa Ket	2,219.55	1,975.39	22.20	55.37	-	-	-	66.59
Surin	3,191.33	3,031.77	31.91	31.91	63.83	31.91	-	-
Buri Ram	2,190.96	1,621.30	219.10	43.82	219.10	87.64	-	-
Khon Kaen	3,868.17	2,166.17	773.63	580.23	54.73	193.41	-	-
Udon Thani	2,592.48	2,540.64	-	25.92	25.92	-	-	-
Nong Bua Lam Phu	2,883.25	2,075.94	461.32	-	45.99	-	-	-
Maha Sarakham	1,609.20	1,190.81	48.28	337.93	-	32.18	-	-
Kalasin	6,882.49	6,868.73	-	13.76	-	-	-	-
Roi Et	3,971.82	3,256.89	238.31	-	317.75	158.87	-	-
Yasothon	2,837.13	2,810.18	3.12	3.40	3.12	9.65	-	7.66
Sakon Nakhon	2,704.28	2,663.45	-	40.83	-	-	-	-
Nakhon Ratchasima	8,427.38	5,814.90	168.55	,432.65	421.37	505.64	-	84.27

Figure 14. The diversity of some fish production in the LMB Thailand (fermented fish and sun dried clupeia).

Data on Production of freshwater farm in LMB Thailand in 2020 shows Ubon Ratchathani Province has the most production at 20,875 tonnes (Table 9) from 10,810 farm (17,530 pond culture farm, 15 paddy field culture farms, 7 ditch culture farm and 858 cage culture farm). That has represented 3.3% of the national total freshwater aquaculture production (Table 10).

Table 9. Production of freshwater farm by province in LMB Thailand, 2020

Province	2010			2015			2020		
	# Farm	Area (ha)	Production (Tonnes)	# Farm	Area (ha)	Production (Tonnes)	# Farm	Area	Production (Tonnes)
Kalasin	9,677	3,183	3,870	10,298	3,437	3,949	11,606	2,848	8,554
Khon Kaen	41,015	11,528	18,798	24,772	3,737	11,593	23,952	3,238	6,411
Chanthaburi	613	183	280	627	163	169	273	62	79
Chaiyaphum	32,573	5,214	7,256	27,328	4,028	6,860	26,075	3,761	7,929
Nakhon Phanom	12,836	2,231	3,090	11,549	1,557	4,198	10,122	1,058	2,846
Nakhon Ratchasima	14,449	3,535	10,307	19,641	4,318	10,803	16,293	3,200	10,730
Bueng Kan	5,232	849	1,428	7,580	1,213	2,446	9,162	1,281	1,938
Buri Ram	11,764	1,200	1,889	11,229	1,359	2,127	17,139	1,831	2,155
Phayao	4,859	998	3,258	4,861	854	3,361	9,692	1,396	4,436
Maha Sarakham	9,455	2,794	4,485	13,727	2,121	5,601	16,010	2,484	2,874
Mukdahan	10,090	1,785	4,982	12,884	1,923	4,146	13,305	1,900	7,342
Yasothon	5,849	723	896	8,593	954	3,028	4,969	700	1,943
Roi Et	9,703	534	1,656	11,024	1,740	3,667	16,161	2,177	3,658
Si Sa Ket	9,857	938	1,454	9,858	938	1,653	6,561	564	789
Sakon Nakhon	7,477	1,354	1,590	8,647	1,519	2,109	11,474	1,837	3,137
Sa Kaeo	4,589	584	2,926	5,637	764	3,394	7,946	982	2,779
Surin	22,738	2,309	3,897	18,110	2,257	3,820	12,044	1,333	3,678
Nong Khai	6,945	2,123	3,996	6,945	2,123	5,818	9,070	1,966	10,666
Nong Bua Lam Phu	11,686	2,386	2,238	14,091	2,738	2,269	7,811	993	905
Amnat Charoen	6,135	758	1,852	9,572	1,062	1,654	9,915	947	1,358
Udon Thani	23,320	6,518	8,381	14,750	3,524	5,857	18,801	4,023	5,741
Ubon Ratchathani	9,220	919	7,788	14,524	1,609	7,401	18,410	2,019	20,875
Chiang Rai	17,844	4,599	24,557	17,643	4,461	14,468	15,503	3,043	6,552
Chiang Mai	9,217	1,010	3,673	7,291	812	3,821	7,485	931	4,202
Petchabun	6,375	1,619	3,213	9,655	2,430	4,836	9,962	2,460	7,424
Loei	15,305	2,645	6,003	15,384	2,695	2,519	16,048	1,373	3,055

Table 10. Production of freshwater aquaculture farms by type of cultures, 2020. (Tonnes)

Province	Total	Pond culture	Paddy field culture	Ditch culture	Cage culture
Nakhon Phanom	2,846	2,215	0	0	631
Si Sa Ket	789	724	2	0	63
Ubon Ratchathani	14875	5,592	3	1	9,279

3.3. Result of group discussion

The group discussion were 8 groups (51 people, 24 villages, 3 districts) for all major habitats and group member 5-8 people (Average=6.4). The mean age of people was 52.2 years and 11.8% are female (Figure 15).

The most important subsistence activities were rice farming, capture fisheries and employee. The estimation number of fisher in their villages for the full time are 70 fishers and the part time are 585 fishers (Table 11).

There were 22 kinds of fishing gear recorded, within 15 main categories. Several kinds of gear Stationary gillnet (37.2%), cast nets (25.1%), Drifting gillnet-at surface (14.8%) and fishing rod (8.2%) were widespread and found in most villages. Mainly fishing gear in rainfed zone are cast net in dry season and bag net in wet season, for floodplain and water bodies zone are stationary gillnet in both season (Table 12).

Figure 15. Group discussion activity.

Table 11. Number of discussion group member.

Habitats	District	Group member	Age	Number of Village	Occupation	# Full time fisher	#Part time fisher
Rainfed	Tha Uthen	6	41-57	6	Farmer, employee		50
Rainfed	Sirindhorn	6	35-59	1	Farmer, fisher	20	130
Rainfed	Benchalak	5	48-58	3	Farmer, employee	10	155
Floodplain	Tha Uthen	8	32-73	7	Rubber planting, farmer, employee		30
Floodplain	Sirindhorn	8	42-78	1	Farmer, fisher	10	20
Floodplain	Benchalak	6	26-68	4	Farmer		110
Water bodies (small reservoir)	Sirindhorn	6	47-60	1	Employee, fisher, farmer		50
Water bodies (large reservoir)	Sirindhorn	6	34-62	1	Fisher, employee, fish farmer	30	20

Table 12. Fishing gear in each habitat.

Habitats	District	Dry Season	Wet Season
Rainfed	Tha Uthen	Cast net, Scoop net (handle), Stationary gill net	Bag net in paddy, Lift-net on shore, Stationary gill net
Rainfed	Sirindhorn	Cast net, Scoop net (handle), Horizontal cylinder trap for Shrimp	Bag net in paddy, Pole hook, Stationary gill net
Rainfed	Benchalak	Cast net, Stationary gill net, Pole hook	Pole hook, Long Line, Stationary gill net
Floodplain	Tha Uthen	Stationary gill net, Horizontal slit trap	Stationary gill net, Horizontal slit trap
Floodplain	Sirindhorn	Stationary gill net, Long Line, Horizontal slit trap	Stationary gill net, Long Line, Pole hook
Floodplain	Benchalak	Cast net, Scoop net (handle), Stationary gill net	Bag net in paddy, Scoop net (handle), Pole hook
Water bodies (small reservoir)	Sirindhorn	Stationary gill net, Cast net, Drop door trap	Stationary gill net, Cast net, Pole hook
Water bodies (large reservoir)	Sirindhorn	Stationary gill net, Lift net (for Clupeia), Long Line	Stationary gill net, Lift net (for Clupeia), Long Line

The group discussions were asked to estimate their total monthly and annual catch in each habitat. For the major habitat the largest annual fish catch was 2,475.0 kg/household in water bodies (Sirindhorn Reservoir) and the month catch most in October (Table 13). In rainfed zone they can catches more than floodplain zone. For the utilization of fish production usually sell or consume in fresh fish and process to fermented fish (Table 14). The OAAs annual catch has the highest in small waterbodies was 253.8 kg/household (Table 15) and most of the catch can be caught in the rainy season than in the dry season. For the utilization of OAAs production usually process to fermented OAAs (Table 16).

The annual fish catch in rainfed zone is highest at 4,015 kg/household and the dominance species is walking catfish, snakehead and climbing perch. The dominance fish species in large reservoir is redtail barb, yellow mystus, clupeia, sand goby and Nile tilapia (Table 17).

For household consumption, the highest in floodplain zone was 10.4 kg/household/week, in large reservoir they consume a few and the least at rainfed zone was kg/household/week (Table 18).

Table 13. Fish catch in each habitat (kg/household).

Habitats	District	Monthly catch	Annual catch	Most month	Least month
Rainfed	Tha Uthen	11.5	100.8	June	December
Rainfed	Sirindhorn	88.6	313.5	September	December
Rainfed	Benchalak	7.9	28.6	October	May
Floodplain	Tha Uthen	3.3	12.6	February	July
Floodplain	Sirindhorn	6.3	24.7	September	April
Floodplain	Benchalak	8.3	30.5	September	May
Water bodies (small reservoir)	Sirindhorn	31.9	124.7	September	July
Water bodies (large reservoir)	Sirindhorn	699.0	2,475.0	October	May

Table 14. Annual fish utilization (kg/household).

Habitats	District	Fresh fish	Ferment fish	Dried/salted fish	Smoked fish	Pickled Fish	fish sauce
Rainfed	Tha Uthen	36.0	104.0	12.0			
Rainfed	Sirindhorn	96.0	156.0	12.0			
Rainfed	Benchalak	19.2	21.9				
Floodplain	Tha Uthen	260.0					
Floodplain	Sirindhorn	416.0	156.0	52.0			
Floodplain	Benchalak	182.5	50.0			3.6	2.0
Water bodies (small reservoir)	Sirindhorn	30.0	29.2				
Water bodies (large reservoir)	Sirindhorn	840.0	260.0	960.0		182.5	

Table 15. OAAs catch in each habitat (kg/household).

Habitats	District	Monthly catch	Annual catch	Most month	Least month
Rainfed	Tha Uthen	9.3	35.8	October	January
Rainfed	Sirindhorn	18.9	22.7	September	January
Rainfed	Benchalak	6.8	24.8	October	April
Floodplain	Tha Uthen	1.3	4.1	April	May
Floodplain	Sirindhorn	8.6	34.7	August	March
Floodplain	Benchalak	14.6	51.3	April	May
Water bodies (small reservoir)	Sirindhorn	72.5	253.8	August	March
Water bodies (large reservoir)	Sirindhorn	51.3	167.5	April	August

Table 16. Annual OAAs utilization (kg/household).

Habitats	District	Fresh OAAs	Ferment OAAs	Dried/salted OAAs	Smoked OAAs
Rainfed	Tha Uthen				
Rainfed	Sirindhorn	52.00	520.00	52.00	52.00
Rainfed	Benchalak	7.30	102.20	1.83	
Floodplain	Tha Uthen		106.00		
Floodplain	Sirindhorn	104.00			
Floodplain	Benchalak	21.90	255.50	21.90	
Water bodies (small reservoir)	Sirindhorn	2.0	3.0		2.0
Water bodies (large reservoir)	Sirindhorn	1.5			

Table 17. Annual fish catch (kg) by fish dominance species in each habitat.

Code name	Fish species name	Rainfed			Floodplain			Water bodies	
		Benchalak	Sirindhorn	Tha Uthen	Benchalak	Sirindhorn	Tha Uthen	Large reservoir	Small reservoir
3	*Chitala ornata*	1	-	-	-	-	-	-	-
5	*Notopterus notopterus*	2	-	-	-	-	-	-	15
26	*Amblyrhynchichthys truncatus*	-	-	730	-	-	-	-	-
29	*Cyclocheilichthys enoplos*	-	-	-	-	15	-	-	-
32	*Discherodontus ashmeadi*	-	-	-	-	-	-	365	-
33	*Mystacoleucus marginatus*	-	-	-	-	-	-	60	-
34	*Puntioplites proctozystron*	-	-	730	-	-	60	60	-
35	*Puntioplites falcifer*	-	-	-	-	6	-	-	-
38	*Barbonymus schwanenfeldii*	-	-	-	-	-	-	60	-
39	*Barbonymus gonionotus*	-	2	-	73	-	-	-	4
40	*Barbonymus altus*	-	-	-	-	-	84	-	-
50	*Hampala dispar*	-	2	-	-	-	-	-	-
51	*Hampala macrolepidota*	-	-	-	-	-	-	36	-
56	*Labeo rohita*	-	-	-	-	-	-	-	64
58	*Labeo chrysophekadion*	-	-	-	-	54.75	48	-	-
63	*Henicorhynchus siamensis*	15	-	-	-	-	-	-	-
66	*Osteochilus vittatus*	-	-	730	7.3	3.6	60	-	-
71	*Osteochilus waandersii*	-	-	-	-	24	-	-	-
87	*Hemibagrus wyckioides*	3	-	-	-	91.25	-	72	-
107	*Pangasius larnaudii*	-	-	-	-	252	-	-	-
113	*Laides longibarbis*	-	-	-	-	3.6	-	-	-
116	*Clarias batrachus*	14	32	730	43.8	-	-	-	30
120	*Monopterus albus*	-	5	-	10.9	-	-	-	8
122	*Pristolepis fasciata*	-	-	-	-	-	-	-	21
123	*Anabas testudineus*	44	48	365	47.5	-	-	-	2
124	*Trichogaster pectoralis*	5	-	-	-	-	-	-	-
128	*Channa striata*	37	16	730	14.6	-	-	-	57
131	*Oxyeleotris marmorata*	-	-	-	-	-	-	219	4
133	*Datnioides undecimradiatus*	-	-	-	-	12	-	-	-
137	*Oreochromis niloticus*	-	-	-	-	-	-	365	-
143	*Clupeichthys aesarnensis*	-	22	-	36.5	-	-	600	-
173	*Mystus mysticetus*	-	-	-	3.7	60.5	-	-	-
1139	*Cyclocheilichthys apogon*	-	2	-	-	-	-	-	-
1178	*Puntius brevis*	-	3	-	-	-	-	-	52
1330	*Hemibagrus filamentus*	-	-	-	8.7	24	-	183	-
1658	*Trichogaster microlepis*	-	55	-	-	-	-	-	-
1782	*Mystus marginatus*	6	-	-	-	-	-	-	-
	Total	127	187	4,015	246	546.7	252	2,020	257

Table 18. Weekly fish and OAAs consumption.

Habitats	District	fish and OAAs consumed	% Caught by the HH	% Bought by the HH	% Aquaculture
Rainfed	Tha Uthen	8.3	62.1	3.8	34.2
	Sirindhorn	1.7	39.0	9.5	51.5
	Benchalak	5.0	36.0	4.5	59.5
Floodplain	Tha Uthen	10.4	55.6	10.0	34.4
	Sirindhorn	2.6	59.0	15.0	26.0
	Benchalak	2.9	53.8	29.7	16.6
Water bodies	Sirindhorn (small reservoir)	3.3	52.0	8.0	40.0
	Sirindhorn (large reservoir)	2.1	56.3	20.3	23.4

4. Conclusions and Recommendations

The estimate of fish yield for the LMB Thailand based on these household survey and group discussion data show the result as follows:

The sample includes 183 households in total (33% are fishing households and 7% are professional fisher); households comprised between 2 and 12 people, with an average of 4.8 people/ household. The major habitat is rainfed zone, most important activities for subsistence were rice farming and capture fisheries. The mean annual fish catch per household is 276.6 kg/household/year for all habitat. This catch equates to 65.5 kg/capita, as there are on average 4.8 people in each household.

Hence we recommend that before the field survey should be clear and understand for the purpose of questionnaire and essential to carry the experience staff to conduct the discussion group due to the fisher don' t like to share information about high efficiency or illegal fishing gear that their own for fishing and in discussion group may be get impact to overestimate information from more data sharing of experience or professional fisher and result from discussion is useful to recheck and validate the household survey data again.

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6. Appendix

Appendix 1.1: Habitats important for inland capture fisheries production.

Region	Major freshwater resources
Central	The Central region occupies most of the area of the Chao Phraya Basin. Almost all of the mountainous part of northern Thailand is drained to the Chao Phraya River through the Ping, Wang, Yom and Nan Rivers. The low-lying floodplain and delta of the Chao Phraya River in the Central Plain generate a huge number of freshwater fish.
	Apart from the Chao Phraya River and its large lowland floodplain and delta area, large dams and reservoirs, including natural swamps in the Central Plain, are other important freshwater fisheries utilized by the rural people in this region.
North	The four river basins of Ping, Wang, Yom and Nan in the north, the Salween River basin in the northwest and the Mekong River in the northeast are all important river systems with abundant fish. Large dams, reservoirs and human-made water bodies in all provinces generate fish production.
Northeast	The Mekong main stream along the border between Thailand and Lao PDR and large tributaries of the Mekong are other important resources. Many of the Mekong tributaries are dammed and many weirs are found along the river and streams for fishing purposes.
South	Fisheries resources are more limited on peninsular Thailand. Important inland fisheries habitats are small river basins and large freshwater lakes and a few large dams.

Appendix 1.2: Distribution of Inland fishing households in LMB Thailand.

Region	Province	District	Total inland fishing HHS	# Fisher	SSF HHs	Commercial HHs
Eastern	Chanthaburi	2	69	73	65	4
	Sa Kaeo	4	6,015	7,505	5,915	100
Northeast	Nakhon Ratchasima	32	29,850	35,635	28,420	1,430
	Buri Ram	23	20,610	23,593	19,470	1,140
	Surin	17	34,812	38,432	32,692	2,120
	Sri Sa Ket	22	29,005	33,208	28,321	684
	Ubon Ratchathani	25	46,303	54,861	44,039	2,264
	Yasothon	9	24,440	27,277	23,536	904
	Chaiyaphum	16	32,549	37,697	31,264	1,285
	Amnat Charoen	7	13,784	15,299	13,390	394
	Bueng Kan	8	20,623	23,111	19,696	927
	Nong Bua Lam Phu	6	17,901	20,279	17,168	733
	Khon Kaen	26	33,817	38,441	32,091	1,726
	Udon Thani	20	29,039	33,809	27,808	1,231
	Loei	14	13,448	15,458	13,037	411
	Nong Khai	9	12,149	13,686	11,445	704
	Maha Sarakham	13	10,897	12,134	10,537	360
	Roi Et	20	22,605	25,325	21,595	1,010
	Kalasin	18	29,931	32,993	27,845	2,086
	Sakon Nakhon	18	43,867	51,435	42,052	1,815
	Nakhon Phanom	12	36,943	41,700	35,267	1,676
	Mukdahan	7	13,703	17,096	13,211	492
North	Chiang Mai	3	2,284	2,706	2,195	89
	Phayao	7	9,946	11,336	9,448	498
	Chiang Rai	18	26,125	30,994	25,207	918
	Petchabun	1	736	820	734	2
Total	Total	357	561,451	644,903	536,448	25,003

Appendix 1.3: Major habitat definition.

Habitat	Definition
Rainfed zone	Fields and associated habitats include land outside the flood zone that is classed mainly as rice fields. Based on comparison with Google Earth images, about one third of this class includes other habitats which are not separately delineated such as small swamps, water bodies, wetland crops and others. Most of this zone was formerly covered by forest which was cleared prior to being modified for rice farming, so most of this zone includes new (human- constructed) aquatic habitats.
Floodplain zone	Large river includes all land within the major flood. This zone includes most major rivers and floodplains, including their permanent water bodies and recession rice fields as well as some former floodplains.
Permanent water bodies	Outside the major flood and Rainfed zones mainly comprise large reservoirs/man-made lakes which have capacity to store water for irrigation or hydropower or turning large water body from lotic to lentic environment. The rivers in this zone could be further categorised as being upstream of and connected to reservoirs or connected to the major flood zone.

Appendix 1.4: Household consumptions (kg/capita/year).

Habitat	Micro habitats	District	per capita consumption	% Caught HHs	% Bought HHs	% Aquaculture	% Meat	% Other
Rainfed	Rainfed	Benchalak	50.1	63.1	20.6	16.2	-	-
		Sirindhorn	78.3	56.4	19.1	24.5	-	-
		Tha Uthen	91.5	24.5	5.0	15.5	50.0	5.0
	Floodplain	Benchalak	65.9	74.6	11.4	13.8	0.2	-
	Small water bodies	Sirindhorn	58.1	65.7	20.2	14.2	-	-
		Tha Uthen	82.2	56.8	8.9	15.5	16.7	2.1
Floodplain	Rainfed	Tha Uthen	49.4	65.0	2.5	32.5	0.0	-
		Sirindhorn	39.9	50.6	7.5	30.6	11.3	-
		Tha Uthen	73.5	64.4	17.6	18.0	-	-
Water bodies	Large water body	Sirindhorn	75.1	86.5	5.6	7.9	-	-
	Total		65.5	65.0	13.4	17.1	4.1	0.4

Appendix 2. Google drive link to the photos taken during the surveys.

https://drive.google.com/drive/folders/1C8jrT9TafM7iR702rsGrsb9zxIZ9bdrs?usp=sharing