

## Interviews

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7. Village informant, Wealth Rank Group 3. Kadan Village, Chumphone District. 05/03/02
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12. Village informant, Fisher and rice farmer, village committee member. Phone Muang Village, Chumphone District. 15/03/02
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45. Fingerling Farmer H, Km 4 Village, Chumphone District. May 2002
46. Senior advisor, Network of Aquaculture Centres in Asia and the Pacific. Bangkok, 22/01/03
47. Senior advisor,, Coordinator, Support to Regional Aquatic Resources Management. Bangkok 21/01/03
48. Project Officer, Asian Institute of Technology Aqua-Outreach Programme. 03/10/02
49. Senior advisor, Swedish International Development Agency. Phnom Penh 13/02/03
50. Senior advisor, Aquaculture and Inland Fisheries, Regional Office for Asia and the Pacific Food and Agriculture Organisation. 20/01/03
51. Coordinator, Sustainable Agriculture Forum, Vientiane. 23/01/03
52. Coordinator, Mennonite Central Committee, Vientiane. 26/02/03

53. Senior advisor, World Conservation Society, Vientiane. 27/01/03
54. Officer, OXFAM Belgium. 27/02/03
55. Advisor, Programme Officer, The United Nations World Food Programme, Lao PDR. 31/01/03
56. Coordinator-Laos, Norwegian Church Aid. 31/01/03
57. Senior advisor,, Quaker Services Lao. 03/02/03
58. Programme Officer, ZOA, Vientiane. 03/01/03
59. Programme Officer, Church World Service. 03/02/03
60. Senior advisor, The World Conservation Union, Vientiane. 06/02/03
61. Senior advisor, Freshwater Coordinator, Lao Project Office, World Wildlife Fund for Nature, Savannakhet. 20/03/03
62. Senior advisor, Interview on activities of Cooperazione e Sviluppo. Phnom Penh 14/02/03
63. Senior advisor, Coopération Internationale pour le Developpment et la Solidarite. Vientiane 07/02/03
64. Project officer, CARE Australia. Vientiane. 29/01/03
65. Senior advisor,, Project Manager, Action Nord Sud, Savannakhet Province. Savannakhet 14/07/02
66. Senior advisor, National Director, World Vision Lao PDR. Vientiane 26/01/02
67. Senior advisor, Community Aid Abroad, Vientiane. 07/02/03
68. Senior advisor, FAO Lao National Office. Vientiane. 08/03/03
69. Senior advisor, United Nations Drug Control Programme
70. Officer, Living Aquatic Resources Research Centre. 06/02/03
71. Senior officer Livestock and Fisheries Section, Savannakhet Provincial Livestock and Fisheries Office. 21/02/03
72. Senior officer, Head of Livestock and Fisheries Section, District Livestock and Fisheries Office Outhomphone 22/02/03
73. Senior officer, District Livestock and Fisheries Office Chumphone. 22/02/03
74. Senior officer, District Livestock and Fisheries Office Khantabouli. 23/02/03

## Appendix A

### *GIS Secondary data sources and metadata*

GIS data layers were supplied by a number of organisations in Lao PDR. Meta-data details are summarised in Appendix table 1.

**Appendix table 1 Data layer information**

<b>Data Layer</b>	<b>Date</b>	<b>Scale</b>	<b>Source</b>
Digital terrain model	2001	1:50000	WSCP, MRC
Lao village census	2000	1:100000	MRC and NSO
Landuse	1997	1:100000	NAFRI
Soil Type	2001	1:100000	NAFRI
Land suitability	2001	1:100000	NAFRI
Provinces	2001	1:200000	WHO
Districts	2001	1:200000	WHO
Rivers	2000	1:50000	NAFRI
Irrigated area	2002	1:100000	MAF
Wetland classifications	2001		WSCP, MRC
Irrigation projects		1:100000	MAF
Reservoirs		1:100000	MAF
Irrigation projects		1:100000	MAF
Roads	2002	1:100000	WHO

Note: WSCP – Watershed Classification Project, MRC – Mekong River Commission, NSO – National Statistics Office, NAFRI – National Agriculture and Forestry Research Institute, WHO – World Health Organisation, MAF – Ministry of Agriculture and Forestry

All data layers were transformed into WGS 1984 (UTM zone 48 north) using ArcGIS. Two different transformations were made. The first was from the Russian projection Pulkovo 1942 (Gauss Kruger zone 18) and second was from Indian 1954 (UTM zone 48 north). The second transformation required an assigned transformation using error parameters (x: 217, y:823 z:299) using the Molodensky algorithm packaged with ArcToolbox.

## The extent of natural aquatic resources

Appendix table 2. Basic statistics on studydistricts.

Feature	Statistic	Chumphone	Outhomphone	Khantabouli
General	District area (ha)	103629	105449	63828
	Population	84383	49475	72361
	Households	13426	7659	11902
	Population density	0.81	0.47	1.13
Reservoir area	ha	2201	0	284
	% district area	2		0
Irrigated area	ha	10191	0	1138
	% district area	10	0	2
Wetland area	ha	49961	18463	13278
	% district area	48	18	21
Length of rivers	Km	1362	1231	516
Irrigation projects	number	57	8	12
	Type			
	Diesel pump	5		
	Electric pump	29		7
	Irrigated waterway	5	7	3
	Pump (undefined)	4		
	Irrigated waterway (undefined)	14	1	2
Rice production	Floodplain wet rice	34649	15067	13278
	People per area of rice	2.44	3.28	5.45
	Households per area of rice	0.39	0.51	0.90
	People per irrigated area	8.28	0.00	63.59
	% villages marketing at least one crop <sup>†</sup>	84	93	78
	% villages always self sufficient in rice <sup>†</sup>	42	7	27
	% villages never self sufficient in rice <sup>†</sup>	24	59	37
	% of landless households	8	18	59
Accessibility	Ave. travel time to district centre, minutes (Dry season) <sup>†</sup>	134	55	31
	Ave. travel time to district centre, minutes (Wet season) <sup>†</sup>	167	64	38
	% village with no road access <sup>†</sup>	17	1	4
	% villages with all year round road access <sup>†</sup>	57.5	68	87
	% villages with no transport services <sup>†</sup>	26	5	6
	% villages with dry seasonal only transport services	25.5	27	5
	Average travel time to first market <sup>†</sup>	87	40	31
	Average travel time to first market	145	78	27

<sup>†</sup> Information from IRAP (1999; 1999; 1999)

**Appendix table 3. Wetland Area and Type in each of the study districts**

Wetland Classification	Chumphone		Khantabouli		Outhomphone	
	Area (ha)	% Area	Area (ha)	% Area	Area (ha)	% Area
District Area	1036288.0		638281.9		1054494.0	
Permanent freshwater lake	23711.5	2.29	0	-	0	-
Permanent swamp	108781.7	10.50	0	-	0	-
Floodplain wet rice	346486.2	33.4	132780.9	20.8	150668.1	14.3
Unclassified wetland type	20631.0	2.0	-	-	-	-
Seasonally flooded trees, shrubs	0	-	0	-	33961.3	3.22
Total	499610.4	48.2	132780.9	20.9	184629.4	17.5

Note: Figures are calculated from map layers provided by NAFRI and MRC wetland classification project

**Appendix table 4. Landuse area in each of the districts**

Landuse	Chumphone		Khantabouli		Outhomphone	
	Area (ha)	% Area	Area (ha)	% Area	Area (ha)	% Area
Agriculture land	442598.6	42.7	133732.8	21.2	288212.7	27.3
Cropping mosaic, cropping area < 3 %	21005.7	2.0	44630.7	7.1	75907.7	7.2
Cropping mosaic, cropping area > 3 %	2371.9	0.2	3999.7	0.6	1803.2	0.2
Forested Land	455960.1	44.0	384772.9	61.1	687500.7	65.2
Water	29001.4	2.8	26989.9	4.3		
Wetland	83482.0	8.1				
Urban or built-cover area	1885.1	0.2	35935.6	5.7	965.6	0.1
Grassland					121.1	0.01
Total Area	1036304.8	100	630061.6	100	1054511.1	100
District Area	1036288		638281.9		1054494	
Unclassified	16.8		-8220.3		17.1	

Note: Figures are calculated from map layers provided by NAFRI

## Pond survey analysis results

Appendix table 5 Top ten frequent species mixes combinations in each district

District	Rank	Species mixes <sup>†</sup>	Frequency	%
<b>Outhomphone</b>	1	CC,SB,TL	217	13.55
	2	PK,PDW,WCO	86	5.37
	3	CC,SB,MG,TL	84	5.25
	4	No stocking	74	4.62
	5	CC,SB	65	4.06
	6	CC,SB,TL,KL	59	3.69
	7	CC,TL	59	3.69
	8	CC,BH,SB,TL	52	3.25
	9	CC,SB,MG	49	3.06
	10	SB,TL	48	3.00
<b>Khantabouli</b>	1	CC,SB,MG,TL	99	25.85
	2	CC,BH,SB,TL	24	6.27
	3	CC,SB,TL	23	6.01
	4	CC,MG,TL	21	5.48
	5	SB,TL,PK	21	5.48
	6	No stocking	19	4.96
	7	CC,BH,TL	15	3.92
	8	CC,BH,SB,TL,PK,PDW,WCO	14	3.66
	9	SB,TL	13	3.39
	10	CC,TL	9	2.35
<b>Chumphone</b>	1	PK,PDW,WCO	40	10.99
	2	PK,PDW	32	8.79
	3	SB,KL	19	5.22
	4	CC,SB,TL	17	4.67
	5	CC,TL	15	4.12
	6	TL	13	3.57
	7	No stocking	12	3.30
	8	CC,SB	9	2.47
	9	TL,PK,PDW	7	1.90
	10	CC,SB,MG,TL,KL,PK,PDW	6	1.60
10	KL	6	1.6	
10	SB	6	1.6	
10	SB,KL,PK,PDW,WCO	6	1.6	

<sup>†</sup> In total there are 230 different species mixes across all three districts.

CC – Common carp (*C. carpio*), SB – Silver Barb (*P. goniotus*), MG – Mrigal (*C. mrigala*), TL – Tilapia (*T. nilotica*), PK – Hybrid walking catfish (*C. batrachus*), BH – Big Head Carp (*A. nobilis*), KL – Silver Carp (*H. molitrix*), PDW – Walking Catfish (*C. macrocephalus*), PK – Snakehead (*Channa spp.*), ACO – Other culture species, WCO – Other native species

## **Investment Index**

**Appendix table 6. Classification combinations of investment groups**

	<b>Stocking</b>	<b>Feed</b>	<b>Water</b>	<b>Classification</b>
1	High	High	High	<b>High</b>
2	High	High	None	<b>High</b>
3	High	Low	High	<b>High</b>
4	Low	High	High	<b>High</b>
5	High	Low	None	<b>Medium</b>
6	High	None	High	<b>Medium</b>
7	Low	None	High	<b>Medium</b>
8	Low	High	None	<b>Medium</b>
9	Low	Low	High	<b>Medium</b>
10	None	Low	High	<b>Medium</b>
11	None	High	High	<b>Medium</b>
12	Low	None	None	<b>Low</b>
13	Low	Low	None	<b>Low</b>
14	None	High	None	<b>Low</b>
15	High	None	None	<b>Low</b>
16	None	Low	None	<b>Low</b>
17	None	None	High	<b>Low</b>
18	None	None	None	<b>None</b>

### **Chi squared tests – environmental attributes and investment groups**

The difference between investment groups by environmental factors were tested using the Chi square test, [formula (1)] for multiple comparisons.

$$(1) \quad \chi^2 = \sum d^2 / e$$

Where, d is the difference between the observed and expected frequency for each category and e is the expected frequency for each category.

The contingency tables and tests of significance between investment groups across all districts are given in Appendix table 7 to Appendix table 12.

**Appendix table 7. Contingency table – Investment group\*irrigation distance**

Irrigation distance		Investment groups				Total
		High	Medium	Low	None	
In irrigated area	Observed	14	23	16	20	73
	Expected	5.474222412	25.16276	33.18747	9.175543	73
1-2000 meters	Observed	30	75	53	23	181
	Expected	13.57307201	62.38986	82.28675	22.75032	181
> 2000 metres	Observed	132	711	998	252	2093
	Expected	156.9527056	721.4474	951.5258	263.0741	2093
Total	Observed	176	809	1067	295	2347
	Expected	176	809	1067	295	2347

**Appendix table 8. Contingency table – Investment group\*distance to river**

River distance		Investment groups				Total
		High	Medium	Low	None	
0-50	Observed	12	55	81	30	178
	Expected	13.34810396	61.35577	80.92288	22.37324	178
51-500	Observed	126	538	670	206	1540
	Expected	115.4835961	530.8308	700.1193	193.5663	1540
>500	Observed	38	216	316	59	629
	Expected	47.16829996	216.8134	285.9578	79.0605	629
Total	Observed	176	809	1067	295	2347
	Expected	176	809	1067	295	2347

**Appendix table 9. Contingency table – Investment group\*road distance**

Road distance		Investment groups				Total
		High	Medium	Low	None	
0-50	Observed	28	140	215	45	428
	Expected	32.09544099	147.5296	194.5786	53.79634	428
51-500	Observed	120	594	730	183	1627
	Expected	122.0076694	560.8193	739.6715	204.5015	1627
500-1000	Observed	23	62	114	51	250
	Expected	18.74733703	86.17384	113.6557	31.42309	250
>1000	Observed	5	13	8	16	42
	Expected	3.14955262	14.4772	19.09416	5.27908	42
Total	Observed	176	809	1067	295	2347
	Expected	176	809	1067	295	2347

**Appendix table 10. Contingency table – Investment group\*land use**

Land use		Investment groups				Total
		High	Medium	Low	None	
Forested land	Observed	49	115	151	54	369
	Expected	27.67106945	127.1926	167.7559	46.38049	369
Agricultural land	Observed	123	620	830	226	1799
	Expected	134.9058372	620.1069	817.8666	226.1206	1799
Urban area	Observed	4	74	86	15	179
	Expected	13.42309331	61.70047	81.3775	22.49893	179
Total	Observed	176	809	1067	295	2347
	Expected	176	809	1067	295	2347

**Appendix table 11. Contingency table – Investment group\*soil type**

Soil type		Investment groups				Total
		High	Medium	Low	None	
Fluvisols	Observed	2	4	3	0	9
	Expected	0.674904133	3.102258	4.091606	1.131231	9
Solonchaks	Observed	2	7	3	1	13
	Expected	0.974861525	4.48104	5.910098	1.634001	13
Arenosols	Observed	29	44	78	15	166
	Expected	12.44823179	57.21943	75.46741	20.86493	166
Regosols	Observed	7	17	24	14	62
	Expected	4.649339582	21.37111	28.18662	7.792927	62
Solonetz	Observed	0	21	14	21	56
	Expected	4.199403494	19.30294	25.45888	7.038773	56
Alisols	Observed	67	287	308	124	786
	Expected	58.94162761	270.9305	357.3336	98.79421	786
Acrisols	Observed	17	37	101	29	184
	Expected	13.79804005	63.42395	83.65062	23.1274	184
Luvisols	Observed	14	191	297	39	541
	Expected	40.56923732	186.4802	245.951	67.99957	541
Cambisols	Observed	36	193	225	49	503
	Expected	37.7196421	173.3818	228.6753	63.22326	503
Reservoir	Observed	0	1	0	0	1
	Expected	0.074989348	0.344695	0.454623	0.125692	1
Leptosols	Observed	2	7	14	3	26
	Expected	1.949723051	8.962079	11.8202	3.268002	26
Total	Observed	176	809	1067	295	2347
	Expected	176	809	1067	295	2347

**Appendix table 12. Contingency table – Investment group\*road type**

Road type		Investment groups				Total
		High	Medium	Low	None	
National	Expected	31	238	284	69	622
	Observed	46.643	214.4005	282.775	78.180	622
Provincial	Expected	28	125	109	29	291
	Observed	21.821	100.3063	132.295	36.576	291
Local	Expected	117	445	656	194	1412
	Observed	105.884	486.7098	641.927	177.477	1412
Unknown	Expected	0	1	18	3	22
	Observed	1.649	7.583	10.001	2.765	22
Total	Expected	176	809	1067	295	2347
	Observed	176	809	1067	295	2347

## Appendix B

### *Market survey and trader interviews method*

Data was collected weekly for 12 months in form markets using the survey form summarised in Appendix figure 1.

#### English

Market:	Date:	Price (kip/kg)	Time of day:	Entered:
Species	Culture or Capture	Price (kip/kg)	Quantity today	Source Location (Village and/or waterbody)
1				

#### Lao

ຕະລາດ:	ວັນ:	ລາຄາ /ກິໂລ	ເວລາ:	ປາມາແຕ່ປ້າໃດ, ມາຈາກແຫຼ່ງ້າໃດ
ຊະນິດປາ	ປາລ້ຽງ/ ປາທໍາມະຊາດ	ລາຄາ /ກິໂລ	ມີຈັກກິໂລ	ປາມາແຕ່ປ້າໃດ, ມາຈາກແຫຼ່ງ້າໃດ
1				

Appendix figure 1 Sample marketing survey form in English and Lao

Training was given to three district staff members to market data. The instructions for the survey are summarised below:

Item	Instructions
• Species	Write the Lao or scientific name of the fish in the space provided.
• AC or WC	Indicate whether the fish is a culture or capture fish.
• Price	Write the price of the fish per kilogram, i.e. 10000 kip/kg
• Quantity Today	The total amount of fish that the trader has sold today
• Source Location	The village and/or water body and the district that fish came from

A similar form was used for meat products. Instructions for this part of the survey are as follows:

<b>Item</b>	<b>Instructions</b>
• Meat Product	Collect information on three types of meat sold in the market.
• Price	Write the price of the meat per kilogram, i.e. 10000 kip/kg
• Quantity	The total amount of meat that the trader has to sell that day
• Source	Village and district that the meat came from

Markets and traders are difficult to study due to the sensitivity of the subject area. Traders are reticent to provide accurate information on their main livelihood activity. These issues are difficult to deal with however can be addressed through a prolonged interaction and building trusting relationships (Harriss 1993). Other associated problems faced in conducting such research are gender biases from male researchers in a female dominated occupation and associating the research with government agencies. As shown in other market studies in Laos such biases are not uniform (Bush 2004). In some cases foreign researchers may have greater access to traders than national researchers as they are seen as taking this information outside the country that not directly impact upon them.

The interviews with traders were conducted over a number of months following a series of topic areas. The main points of discussion are listed below:

- Barriers of entry to trade, including required infrastructure and capital.
- Establishment of trading relations with suppliers and buyers.
- The number of different retail and wholesale traders in the various markets.
- Description of the prices of capture and culture species in the market.
- Determinants of price of the different types of fish.
- Price classifications of fish in the market.
- Seasonal variation of trade in both capture and culture species.
- The destination and source of fish in the markets.
- Description of the quantities of both culture and capture fish traded in the market in each of the months.
- A description of the physical characteristics of the market.

- Preferences for trading culture and capture fish.
- Thoughts on future and historical trends in marketing of capture and culture fish.

### **Species composition of trade**

A large number of species were traded in each of the markets. Appendix table 13 shows the species composition of trade and Appendix table 14 shows the average price of each fish in each market.

**Appendix table 13 Species composition of study markets**

Species	Khengkhek		Samakheysai		Savansai		Seno		All Markets	
	n	%	n	%	n	%	n	%	n	%
<i>Tilapia (Sex Reversed)</i>	63	11.33	60	8.55	76	6.38	131	8.84	330	8.39
<i>Channa spp.</i>	89	16.01	36	5.13	80	6.71	91	6.14	296	7.53
<i>Clarius batrachus</i>			36	5.13	40	3.36	147	9.92	223	5.67
<i>Clarius macrocephalus</i>	31	5.58	40	5.70	73	6.12	44	2.97	188	4.78
Mackerel	8	1.44	34	4.84	54	4.53	88	5.94	184	4.68
<i>Notopterus notopterus</i>	34	6.12	15	2.14	57	4.78	47	3.17	153	3.89
<i>Pangasius hypothalmus</i>			7	1.00	37	3.10	85	5.74	129	3.28
<i>Mystus spp.</i>	44	7.91	15	2.14	12	1.01	6	0.40	77	1.96
<i>Wallago attu</i>	38	6.83	15	2.14	19	1.59	3	0.20	75	1.91
<i>Puntius goniotus</i>	22	3.96	15	2.14	10	0.84	20	1.35	67	1.70
<i>Monopterus albus</i>	30	5.40	5	0.71	21	1.76	8	0.54	64	1.63
<i>Cyprinus carpio</i>	8	1.44	9	1.28	30	2.52	15	1.01	62	1.58
<i>Mystus mysticetus</i>	50	8.99	1	0.14	1	0.08	8	0.54	60	1.53
<i>Hampala dispar</i>	54	9.71	1	0.14	1	0.08	1	0.07	57	1.45
Unidentified	16	2.88	13	1.85	12	1.01	6	0.40	47	1.20
<i>Micronema micronema</i>	5	0.90	6	0.85	19	1.59	2	0.13	32	0.81
<i>Trichogaster spp.</i>	30	5.40	1	0.14					31	0.79
<i>Morulus spp.</i>	9	1.62	9	1.28	8	0.67			26	0.66
<i>Cirrhina mrigala</i>							19	1.28	19	0.48
<i>Wallago leeri</i>	13	2.34	3	0.43			1	0.07	17	0.43
<i>Hypophthalmichthys molitrix</i>			4	0.57	4	0.34	5	0.34	13	0.33
<i>Chitala ornata</i>	2	0.36	2	0.28	7	0.59	1	0.07	12	0.31
<i>Tilapia nilotica</i>	5	0.90	2	0.28	3	0.25	2	0.13	12	0.31
<i>Belodontichthys dinema</i>			4	0.57	5	0.42			9	0.23
<i>Oxyeleotris marmorata</i>					9	0.76			9	0.23
<i>Labeo rohita</i>					1	0.08	7	0.47	8	0.20
<i>Barbodes altus</i>	1	0.18	2	0.28	3	0.25			6	0.15
<i>Cyclocheilichthys enoplos</i>	3	0.54	1	0.14	2	0.17			6	0.15
<i>Aristichthys nobilis</i>					1	0.08	4	0.27	5	0.13
<i>Heliophagus waandersii</i>			2	0.28	3	0.25			5	0.13
<i>Hemibagrus aubentoni</i>			3	0.43	2	0.17			5	0.13
<i>Macrogathus siamensis</i>	1	0.18	4	0.57					5	0.13
<i>Ctenopharyngodon idellus</i>			2	0.28	2	0.17			4	0.10
<i>Ompok krattensis</i>			2	0.28	1	0.08			3	0.08
<i>Cirrinhus microlepis</i>			1	0.14	1	0.08			2	0.05
<i>Dasyathys laosensis</i>					2	0.17			2	0.05
<i>Bagarius spp.</i>			1	0.14					1	0.03
<b>Grand Total</b>	<b>556</b>	<b>100</b>	<b>702</b>	<b>100</b>	<b>1192</b>	<b>100</b>	<b>1482</b>	<b>100</b>	<b>3932</b>	<b>100</b>

Appendix table 14 Average price per species

No.	Species	Savansai kip/kg	Samakheysai kip/kg	Seno kip/kg	Khengkhok kip/kg	All markets kip/kg
1	<i>Ompok krattensis</i>	6000	5500			5667
2	Mackerel	6370	6206	6989	7250	6674
3	<i>Mystus mysticetus</i>	7000	4000	10000	4240	5050
4	<i>Hampala dispar</i>	8000	5000	10000	5231	5360
5	<i>Hypophthalmichthys molitrix</i>	8000	9000	10800		9385
6	<i>Pangasius hypothalmus</i>	8054	11857	7847		8124
7	<i>Ctenopharyngodon idellus</i>	8500	11000			9750
8	<i>Tilapia spp.</i>	10000	10000	11000	10000	10167
9	<i>Chitala ornata</i>	10143	9000	15000	9000	10167
10	<i>Puntius goniotus</i>	10700	9733	11700	7136	9612
11	<i>Tilapia (Sex Reversed)</i>	10750	10783	12145	10016	11170
12	<i>Clarius batrachus</i>	10825	11111	11340		11211
13	<i>Notopterus notopterus</i>	11281	13267	13681	7691	11415
14	<i>Barbodes altus</i>	12333	7500		20000	12000
15	<i>Labeo rohita</i>	13000		11857		12000
16	<i>Monopterus albus</i>	13571	14600	13500	11600	12719
17	<i>Morulus spp.</i>	14500	12889		21667	16423
18	<i>Aristichthys nobilis</i>	15000		10500		11400
19	<i>Cyprinus carpio</i>	15067	12889	11667		13242
20	<i>Channa spp.</i>	15725	15861	14505	11472	14088
21	Unidentified	16250	13231	13667	4469	11074
23	<i>Mystus spp.</i>	16917	17667	14000	9920	12838
24	<i>Wallago attu</i>	17316	11267	16667	9118	11927
25	<i>Belodontichthys dinema</i>	18000	23250			20333
26	<i>Dasyathis laosensis</i>	19000				19000
27	<i>Clarius macrocephalus</i>	20644	21650	16886	12323	18606
28	<i>Hemibagrus aubentoni</i>	21500	16000			18200
29	<i>Heliophagus waandersii</i>	21667	19000			20600
30	<i>Oxyeleotris marmorata</i>	22000				22000
31	<i>Micronema micronema</i>	24684	20500	9500	10000	20656
32	<i>Cirrinhus microlepis</i>	25000	30000			27500
33	<i>Cyclocheilichthys enoplos</i>	27500	25000		15833	21250
34	<i>Bagarius spp.</i>		16000			16000
35	<i>Cirrhina mrigal</i>			10579		10579
36	<i>Macrogathus siamensis</i>		18250		4000	15400
37	<i>Trichogaster spp.</i>		5000		6200	6161
38	<i>Wallago leeri</i>		5000	10000	6192	6206

## Price and quantity per market

Appendix table 15 Price and quantity data for each market

Market	Fish type	Item	N	Minimum	Maximum	Mean	S.D.
Savansai	Capture species	Price (kip)	424	5000	35000	15203	6651
		Quantity (kg)	423	0.2	100	12	14
	Culture species	Price (kip)	173	4000	25000	10289	2866
		Quantity (kg)	171	0.2	50	10	8
Samakheysai	Capture species	Price (kip)	234	3000	35000	14440	6508
		Quantity (kg)	234	0.2	60	9	9
	Culture species	Price (kip)	117	6000	30000	10701	2614
		Quantity (kg)	117	2	30	8	4
Seno	Capture species	Price (kip)	319	6000	30000	12176	4249
		Quantity (kg)	318	1	80	12	10
	Culture species	Price (kip)	406	5000	18000	10882	2104
		Quantity (kg)	406	1	120	13	9
Khengkhek	Capture species	Price (kip)	486	3000	45000	8715	4582
		Quantity (kg)	486	0.1	50	17	9
	Culture species	Price (kip)	70	10000	11000	10014	120
		Quantity (kg)	70	10	50	24	9
All markets	Capture species	Price (kip)	1471	3000	45000	12278	6142
		Quantity (kg)	1469	0.1	100	13	11
	Culture species	Price (kip)	774	4000	30000	10655	2299
		Quantity (kg)	772	0.2	120	13	9

Appendix table 16 Correlation of quantity between culture and capture fish sold by month over 12 month survey period

		Capture fish	Culture fish
Total quantity of capture fish surveyed	Pearson Correlation	1	.678(*)
	Sig. (2-tailed)	.	.015
	N	12	12
Total quantity of capture fish surveyed	Pearson Correlation	.678(*)	1
	Sig. (2-tailed)	.015	.
	N	12	12

\* Correlation is significant at the 0.05 level (2-tailed).

Appendix table 17 Correlation of quantity between culture (without sex reversed Tilapia) and capture fish sold by month over 12 month survey period

		Capture fish	Culture fish
Total quantity of capture fish surveyed	Pearson Correlation	1	.332
	Sig. (2-tailed)	.	.292
	N	12	12
Total quantity of capture fish surveyed	Pearson Correlation	.332	1
	Sig. (2-tailed)	.292	.
	N	12	12

**Appendix table 18 Correlation between price and quantity of capture and culture fish over 12 month survey period**

<b>All fish</b>			<b>Price (kip)</b>	<b>Quantity per day (kg)</b>
<b>Culture</b>	Price (kip)	Pearson Correlation	1	.016
		Sig. (2-tailed)	.	.663
		N	774	772
	Quantity Today	Pearson Correlation	.016	1
		Sig. (2-tailed)	.663	.
		N	772	772
<b>Capture</b>	Price (kip)	Pearson Correlation	1	-.424**
		Sig. (2-tailed)	.	.000
		N	1471	1469
	Quantity Today	Pearson Correlation	-.424**	1
		Sig. (2-tailed)	.000	.
		N	1469	1469

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Appendix table 19 Correlation between quantity and price of small-scale aquaculture species (without sex reversed Tilapia)**

<b>Aquaculture fish</b>		<b>Price (kip)</b>	<b>Quantity per day (kg)</b>
Price (kip)	Pearson Correlation	1	-.079
	Sig. (2-tailed)	.	.095
	N	445	445
Quantity per day (kg)	Pearson Correlation	-.079	1
	Sig. (2-tailed)	.095	.
	N	445	445

**Appendix table 20 Correlation between capture fish price and quantity per market**

Capture species			Price (kip)	Quantity Today (kg)
Market				
<b>Savansai</b>	Price (kip)	Pearson Correlation	1	-0.444**
		Sig. (2-tailed)	.	0.000
		N	424	423
	Quantity Today	Pearson Correlation	-0.444**	1
		Sig. (2-tailed)	0.000	.
		N	423	423
<b>Samakheysai</b>	Price (kip)	Pearson Correlation	1	-0.412**
		Sig. (2-tailed)	.	0.000
		N	234	234
	Quantity Today	Pearson Correlation	-0.412**	1
		Sig. (2-tailed)	0.000	.
		N	234	234
<b>Seno</b>	Price (kip)	Pearson Correlation	1	-0.591**
		Sig. (2-tailed)	.	0.000
		N	319	318
	Quantity Today	Pearson Correlation	-0.591**	1
		Sig. (2-tailed)	0.000	.
		N	318	318
<b>Khengkhok</b>	Price (kip)	Pearson Correlation	1	-0.086
		Sig. (2-tailed)	.	0.059
		N	486	486
	Quantity Today	Pearson Correlation	-0.086	1
		Sig. (2-tailed)	0.059	.
		N	486	486

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Appendix table 21 Correlations between culture fish price and quantity**

<b>Aquaculture</b>				
<b>Market</b>			<b>Price (kip)</b>	<b>Quantity Today (kg)</b>
<b>Savansai</b>	Price (kip)	Pearson Correlation	1	-0.278**
		Sig. (2-tailed)	.	0.000
		N	173	171
	Quantity Today	Pearson Correlation	-0.278**	1
		Sig. (2-tailed)	0.000	.
		N	171	171
<b>Samakheysai</b>	Price (kip)	Pearson Correlation	1	-0.197*
		Sig. (2-tailed)	.	0.033
		N	117	117
	Quantity Today	Pearson Correlation	-0.197*	1
		Sig. (2-tailed)	0.033	.
		N	117	117
<b>Seno</b>	Price (kip)	Pearson Correlation	1	0.241**
		Sig. (2-tailed)	.	0.000
		N	406	406
	Quantity Today	Pearson Correlation	0.241**	1
		Sig. (2-tailed)	0.000	.
		N	406	406
<b>Khengkhok</b>	Price (kip)	Pearson Correlation	1	0.084
		Sig. (2-tailed)	.	0.492
		N	70	70
	Quantity Today	Pearson Correlation	0.084	1
		Sig. (2-tailed)	0.492	.
		N	70	70

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Appendix table 22 Seasonal variation in culture and capture fish price and quantity sold**

<b>Month</b>	<b>Culture fish</b>		<b>Capture fish (kg)</b>	<b>Culture (kip)</b>	<b>Capture fish (kip)</b>	<b>Estimated total sold (Kg)</b>	<b>Average price (kip)</b>
	<b>Culture fish (kg)</b>	<b>- No sex reversed Tilapia (kg)</b>					
August	5824	444	12291	10595	15192	16305	13653
September	2589	280	9773	9912	12414	11465	11802
October	4875	132	22337	10229	10745	25243	10649
November	5730	378	10374	10167	12133	13614	11465
December	6231	433	11013	10247	12706	15438	11618
January	6080	390	14849	10352	12583	17197	11698
February	1967	329	7805	10787	11209	9366	11060
March	8618	623	21669	10442	12158	27102	11522
April	8528	620	19526	11171	12417	26036	12012
May	9238	576	22053	11304	12691	27330	12185
June	7613	428	12544	11388	11633	16631	11523
July	5999	309	14307	10591	9551	17546	9995

Appendix table 23 Species frequency by aqua-ecosystem

Species	Fish Pond			Cage culture			Irrigation Dam			Major Tributary			Mekong			Minor Tributary			Water body			Ocean			Rice Field			Don't Know	Grand Total
	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	f			
<i>Aristichthys nobilis</i>	4	1	12				1	0	20				1	1	15													5	
<i>Bagarius spp.</i>													1	1	15													1	
<i>Barbodes altus</i>														1	1	16	3	1	13				1	1	6	1		6	
<i>Belodontichthys dinema</i>										1	4	6	5	5	8	3	3	8										9	
<i>Channa spp.</i>	13	3	6				73	16	2				1	1	15	5	4	6	102	33	1				48	45	1	54	296
<i>Chitala ornata</i>							7	2	14							4	4	7									1	12	
<i>Cirrhinus cirrhosus</i>	18	4	5				1	0	20																			19	
<i>Cirrhinus microlepis</i>							1	0	20										1	0	16							2	
<i>Clarius batrachus</i>	218	46	1				2	0	19	1	4	6	1	1	15							1	1	4	1	1	6	1	225
<i>Clarius macrocephalus</i>	12	3	7				45	10	3				1	1	15	3	3	8	56	18	2				44	42	2	25	186
<i>Ctenopharyngodon idellus</i>	2	0	16										1	1	15												1	4	
<i>Cyclocheilichthys enoplos</i>							3	1	17							3	3	8										6	
<i>Cyprinus carpio</i>	20	4	4				22	5	8				7	7	7	3	3	8	8	3	9						2	62	
<i>Dasyathis laosensis</i>										1	4	6	1	1	15													2	
<i>Hampala dispar</i>							45	10	3							1	1	16	11	4	7							57	
<i>Heliophagus waandersii</i>													3	3	13	2	2	13										5	
<i>Hemibagrus aubentoni</i>							1	0	20	1	4	6	1	1	15	1	1	16	1	0	16							5	
<i>Hypophthalmichthys molitrix</i>	12	3	7										1	1	15													13	
<i>Labeo rohita</i>	6	1	10				1	0	20										1	0	16							8	
Mackerel	7	1	9										2	2	14							175	96	1				184	
<i>Macroglyphus siamensis</i>													4	4	10				1	0	16							5	
<i>Micronema micronema</i>	1	0	18				3	1	17	1	4	6	8	8	5	13	11	2	2	1	14				1	1	6	3	32
<i>Monopterus albus</i>	3	1	13				26	6	7				1	1	15				27	9	4				2	2	4	5	64
<i>Morulius spp.</i>							5	1	16	1	4	6	11	11	2	9	8	4										26	

Appendix table 11 (cont.)

Species	Fish Pond			Cage culture			Irrigation Dam			Major Tributary			Mekong			Minor Tributary			Water body			Ocean			Rice Field			Don't Know	Grand Total
	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f	%	R	f				
<i>Mystus mysticetus</i>							34	7	5	4	17	2				3	3	8	15	5	6					4	60		
<i>Mystus spp.</i>	1	0	18				8	2	13	5	21	1	9	9	4	39	34	1	8	3	9				5	5	3	2	77
<i>Notopterus notopterus</i>	3	1	13				86	18	1				4	4	10	2	2	13	31	10	3	4	2	2				23	153
<i>Ompok krattensis</i>																										3	3		
<i>Oxyeleotris marmorata</i>	2	0	16				7	2	14																			9	
<i>Pangasius hypothalmus</i>	107	23	2							4	17	2	8	8	5	2	2	13				2	1	3			6	129	
<i>Puntius goniotus</i>	34	7	3				18	4	10				4	4	10	1	1	16	10	3	8							6	67
<i>Tilapia (Sex Reversed)</i>				327	100	1	1	0	20	1	4	6														1	330		
<i>Tilapia spp.</i>	6	1	10										5	5	8				1	0	16							12	
<i>Trichogaster spp.</i>							22	5	8							6	5	5	2	1	14				1	1	6	31	
<i>Unidentified</i>	3	1	13				14	3	11	2	8	4	13	13	1				4	1	12				2	2	4	9	47
<i>Wallago attu</i>							28	6	1	2	8	4	11	11	2	13	11	2	18	6	5				1	1	6	2	75
<i>Wallago leeri</i>							11	2	3										6	2	2							17	
Total%/Count	472	100	19	327	100	1	465	100	25	24	100	12	103	100	23	114	100	19	308	100	20	182	100	4	106	100	10	143	2152

f – frequency, % - percentage of total count for species

## Appendix C

### *Fish consumption survey*

The survey was carried out over four periods of time 14 days in length. This was achieved in all time periods except for October when 10 days were sampled due to administration difficulties in each of the districts. Each of the survey months was considered representative of different times fishing seasons. October is the peak of the wet season, February is the middle of the cold season, May is the middle of the dry season and also Lao New Year and finally, August which is the beginning of the wet season.

In total four families were sampled from each of the six study villages. Two from each village had a fish pond and two did not have a fish pond. To assist accurate measurement of fish and OAA a 1 kg scale was given to each of the families. Each family was trained how to use the scale accurately and record the weights in the log book (Appendix Table 24).

**Appendix Table 24 Consumption survey form**

Village:.....		Family Name:.....			Date:.....				
Meal	Fish/Meat	Preparation	Time	Weight	Aquaculture/ Wildcapture	No. of People Eating Meal	Caught	Bought/Exc hange	Gift
				Grams			Water Resource	Price/Kg	
<b>Breakfast</b>									
<b>Lunch</b>									
<b>Dinner</b>									
Instructions									
Instructions									

The following considerations and assumptions were made when processing the data:

- **Edible Portion** - Other studies have calculated the edible parts of the fish. Hortle and Bush (2003) used a proportion of 74.8% while Mogensen (2001) calculated species specific figures ranging from 46-93%.
- **Fresh Fish Equivalent** - Processed fish was converted to Fresh Fish Equivalent values using the conversion factors given by Hortle and Bush (2003). These are as follows: Dried fish (x3), Smoked Fish (x2.5), Fish sauce (0.4), and fermented fish (x1).
- **Unidentified fish** – It is assumed that unidentified fish are capture fish. This is based on interviews after the survey was completed.

Appendix Table 25 Annual per capita consumption (kg/person/yr)

Meat classification	Outhomphone		Chumphone		Khantabouli		
	Total	Ahung Nyay	Nong Kham Het	Phone Muang	Kadan	Keng Hin Soung	Gnang Soung
Native species	20.0	14.5	18.7	19.0	34.9	21.6	11.6
Culture species	15.1	6.0	25.9	0.8	25.2	22.0	10.5
Fish (unidentified)	2.7	3.1	3.3	0.0	5.8	3.0	0.9
<b>Inland fresh fish</b>	<b>37.8</b>	<b>23.6</b>	<b>47.9</b>	<b>19.8</b>	<b>65.9</b>	<b>46.6</b>	<b>23.0</b>
Dried fish	9.2	2.2	13.8	1.4	30.9	4.3	2.8
Salted fish	0.3	0.1	0.3	0.0	0.4	1.0	0.0
Smoked fish	0.3	0.0	1.6	0.1	0.0	0.0	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	1.5	1.2	1.1	1.9	2.2	1.6	1.2
Fish sauce	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Processed fish</b>	<b>11.4</b>	<b>3.5</b>	<b>16.9</b>	<b>3.4</b>	<b>33.5</b>	<b>7.0</b>	<b>4.1</b>
Mollusc	23.4	15.9	26.1	18.3	41.2	35.2	3.5
Crustacean	8.1	4.6	8.8	1.5	23.1	9.1	1.5
Amphibian	13.3	12.8	17.8	3.4	27.1	12.4	6.1
<b>Other aquatic animals (OAA)</b>	<b>44.7</b>	<b>33.3</b>	<b>52.7</b>	<b>23.1</b>	<b>91.5</b>	<b>56.7</b>	<b>11.2</b>
<b>Total Inland Fish and OAA</b>	<b>93.9</b>	<b>60.4</b>	<b>117.5</b>	<b>46.3</b>	<b>190.9</b>	<b>110.3</b>	<b>38.2</b>
Canned fish	0.2	0.1	0.0	0.0	0.0	1.2	0.0
Marine fish	2.8	4.7	3.2	0.0	0.0	7.5	1.1
<b>Total marine</b>	<b>3.0</b>	<b>4.8</b>	<b>3.2</b>	<b>0.0</b>	<b>0.0</b>	<b>8.7</b>	<b>1.1</b>
<b>Total fish and OAA</b>	<b>96.9</b>	<b>65.2</b>	<b>120.7</b>	<b>46.3</b>	<b>190.9</b>	<b>119.0</b>	<b>39.3</b>
Dried meat	0.2	0.0	0.3	0.0	0.6	0.4	0.1
Beef	13.8	9.6	15.0	5.8	21.2	20.0	11.1
Buffalo	7.3	3.8	11.1	4.1	15.6	6.0	3.4
Goat	0.8	0.0	2.1	0.0	0.0	2.8	0.0
Pork	6.4	8.2	6.0	0.5	8.1	11.8	3.6
Insect	5.2	7.4	5.8	1.7	12.2	2.3	1.7
Poultry	13.3	20.0	9.5	5.1	9.9	23.3	12.3
Sausage	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Native fowl	5.4	0.5	0.0	0.3	30.4	0.7	0.3
Reptile	2.3	0.9	7.6	0.0	3.3	1.7	0.0
Rodent	0.1	0.5	0.0	0.0	0.0	0.0	0.0
Meat (unidentified)	5.3	9.5	5.0	0.7	7.8	3.2	5.8
<b>Other meat</b>	<b>60.1</b>	<b>60.6</b>	<b>62.6</b>	<b>18.1</b>	<b>109.0</b>	<b>72.1</b>	<b>38.3</b>
<b>Total meat</b>	<b>157.0</b>	<b>125.8</b>	<b>183.4</b>	<b>64.4</b>	<b>299.9</b>	<b>191.0</b>	<b>77.6</b>

Appendix Table 26 Ahung Nyay g/per/d

Meat classification	Total	October	February	May	August
Native species	39.6	49.3	34.2	35.2	44.1
Culture species	16.4	0.0	30.4	19.9	8.6
Fish (unidentified)	8.6	0.0	6.0	2.4	25.6
<b>Inland fresh fish</b>	<b>64.6</b>	<b>49.3</b>	<b>70.6</b>	<b>57.6</b>	<b>78.3</b>
Dried fish	6.1	0.0	8.9	6.0	7.7
Salted fish	0.3	0.0	1.2	0.0	0.0
Smoked fish	0.0	0.0	0.0	0.0	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	3.2	4.6	3.2	2.7	3.1
Fish sauce	0.0	0.0	0.0	0.0	0.0
<b>Processed fish</b>	<b>9.7</b>	<b>4.6</b>	<b>13.3</b>	<b>8.7</b>	<b>10.7</b>
Mollusk	43.6	0.0	71.5	24.3	69.5
Crustacean	12.5	10.8	20.1	8.0	11.2
Amphibian	35.0	36.7	38.3	27.8	39.6
<b>Other aquatic animals</b>	<b>91.1</b>	<b>47.5</b>	<b>130.0</b>	<b>60.1</b>	<b>120.4</b>
<b>Inland Fresh Fish and OAA</b>	<b>165.4</b>	<b>101.4</b>	<b>213.9</b>	<b>126.4</b>	<b>209.4</b>
Canned fish	0.2	0.0	0.0	0.0	0.7
Marine fish	13.0	0.0	10.1	19.0	17.4
<b>Total marine</b>	<b>13.1</b>	<b>0.0</b>	<b>10.1</b>	<b>19.0</b>	<b>18.1</b>
<b>Total fish and OAA</b>	<b>178.5</b>	<b>101.4</b>	<b>224.0</b>	<b>145.5</b>	<b>227.5</b>
Dried meat	0.0	0.0	0.0	0.0	0.0
Beef	26.2	20.8	19.2	14.5	52.7
Buffalo	10.3	15.9	28.6	0.0	0.0
Goat	0.0	0.0	0.0	0.0	0.0
Pork	22.5	23.6	9.5	23.6	34.2
Insect	20.4	37.4	11.9	23.0	14.1
Poultry	54.8	67.6	39.6	16.2	111.7
Sausage	0.6	0.0	0.0	1.8	0.0
Native fowl	1.3	0.0	5.0	0.0	0.0
Reptile	2.6	0.0	6.3	3.1	0.0
Rodent	1.3	0.0	0.0	0.0	5.1
Meat (unidentified)	26.0	0.0	0.0	19.3	81.1
<b>Other meat</b>	<b>166.1</b>	<b>165.3</b>	<b>120.0</b>	<b>101.5</b>	<b>299.0</b>
<b>All meat</b>	<b>344.6</b>	<b>266.6</b>	<b>344.0</b>	<b>246.9</b>	<b>526.5</b>
<b>%Inland fish and OAA</b>	<b>48.0</b>	<b>38.0</b>	<b>62.2</b>	<b>51.2</b>	<b>39.8</b>
<b>%Aquaculture fish of IFF</b>	<b>25.4</b>	<b>0.0</b>	<b>43.1</b>	<b>34.6</b>	<b>11.0</b>
<b>% Aquaculture fish of IFF and OAA</b>	<b>9.9</b>	<b>0.0</b>	<b>14.2</b>	<b>15.8</b>	<b>4.1</b>

Appendix Table 27 Gnang Soung g/per/d

Meat classification	Total	October	February	May	August
Native species	31.8	42.8	25.8	28.5	32.4
Culture species	28.7	13.0	8.2	41.2	45.6
Fish (unidentified)	2.4	2.2	0.4	5.7	1.5
<b>Inland fresh fish</b>	<b>63.0</b>	<b>58.0</b>	<b>34.3</b>	<b>75.5</b>	<b>79.4</b>
Dried fish	7.7	24.5	2.7	9.0	0.0
Salted fish	0.0	0.0	0.1	0.0	0.0
Smoked fish	0.0	0.0	0.0	0.0	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	3.4	6.5	2.1	2.4	3.4
Fish sauce	0.0	0.0	0.0	0.0	0.0
<b>Processed fish</b>	<b>11.2</b>	<b>31.1</b>	<b>4.9</b>	<b>11.4</b>	<b>3.4</b>
Mollusk	9.6	6.8	12.5	0.0	16.8
Crustacean	4.2	1.4	0.0	5.0	8.8
Amphibian	16.8	1.6	1.2	18.3	38.3
<b>Other aquatic animals</b>	<b>30.6</b>	<b>9.8</b>	<b>13.7</b>	<b>23.3</b>	<b>63.9</b>
<b>Inland Fresh Fish and OAA</b>	<b>104.7</b>	<b>98.8</b>	<b>52.9</b>	<b>110.2</b>	<b>146.7</b>
Canned fish	0.0	0.0	0.0	0.0	0.0
Marine fish	3.0	0.0	1.0	11.2	0.0
<b>Total marine</b>	<b>3.0</b>	<b>0.0</b>	<b>1.0</b>	<b>11.2</b>	<b>0.0</b>
<b>Total fish and OAA</b>	<b>107.8</b>	<b>98.8</b>	<b>53.9</b>	<b>121.3</b>	<b>146.7</b>
Dried meat	0.4	0.0	1.5	0.0	0.0
Beef	30.5	53.0	16.1	36.0	23.4
Buffalo	9.3	21.7	10.5	9.5	0.0
Goat	0.0	0.0	0.0	0.0	0.0
Pork	9.8	0.6	10.2	17.8	8.7
Insect	4.7	2.3	7.4	6.2	2.8
Poultry	33.6	58.0	19.7	16.6	43.3
Sausage	0.0	0.0	0.0	0.0	0.0
Native fowl	0.8	0.0	0.0	0.0	2.5
Reptile	0.0	0.0	0.0	0.0	0.0
Rodent	0.0	0.0	0.0	0.0	0.0
Meat (unidentified)	15.8	0.0	0.0	17.8	37.4
<b>Other meat</b>	<b>104.8</b>	<b>135.6</b>	<b>65.4</b>	<b>103.9</b>	<b>118.1</b>
<b>All meat</b>	<b>212.6</b>	<b>234.5</b>	<b>119.3</b>	<b>225.2</b>	<b>264.8</b>
<b>%Inland fish and OAA</b>	<b>49.3</b>	<b>42.2</b>	<b>44.4</b>	<b>48.9</b>	<b>55.4</b>
<b>%Aquaculture fish of IFF</b>	<b>45.7</b>	<b>22.4</b>	<b>23.8</b>	<b>54.6</b>	<b>57.4</b>
<b>% Aquaculture fish of IFF and OAA</b>	<b>27.4</b>	<b>13.1</b>	<b>15.4</b>	<b>37.4</b>	<b>31.1</b>

Appendix Table 28 Keng Hin Soung g/per/d

Meat classification	Total	October	February	May	August
Native species	59.2	62.2	54.3	50.4	71.2
Culture species	60.2	60.6	81.0	47.8	50.1
Fish (unidentified)	8.2	16.7	13.6	0.5	4.0
<b>Inland fresh fish</b>	<b>127.6</b>	<b>139.5</b>	<b>148.8</b>	<b>98.6</b>	<b>125.3</b>
Dried fish	11.9	0.0	1.3	36.8	7.0
Salted fish	2.7	6.7	0.0	5.4	0.0
Smoked fish	0.0	0.0	0.0	0.0	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	4.5	6.4	3.6	3.5	5.1
Fish sauce	0.1	0.0	0.0	0.0	0.6
<b>Processed fish</b>	<b>19.3</b>	<b>13.1</b>	<b>4.9</b>	<b>45.7</b>	<b>12.6</b>
Mollusk	96.5	86.8	91.4	109.4	95.9
Crustacean	25.0	13.3	31.8	25.7	25.2
Amphibian	33.9	51.0	16.0	27.5	47.3
<b>Other aquatic animals</b>	<b>155.4</b>	<b>151.1</b>	<b>139.3</b>	<b>162.6</b>	<b>168.5</b>
<b>Inland Fresh Fish and OAA</b>	<b>302.2</b>	<b>303.7</b>	<b>293.0</b>	<b>306.9</b>	<b>306.4</b>
Canned fish	3.2	16.8	0.0	0.0	0.0
Marine fish	20.6	11.1	12.3	17.8	39.1
<b>Total marine</b>	<b>23.8</b>	<b>27.9</b>	<b>12.3</b>	<b>17.8</b>	<b>39.1</b>
<b>Total fish and OAA</b>	<b>326.0</b>	<b>331.6</b>	<b>305.3</b>	<b>324.7</b>	<b>345.5</b>
Dried meat	1.0	0.0	1.9	0.0	1.8
Beef	54.7	19.4	28.3	72.1	90.8
Buffalo	16.4	0.0	50.7	7.9	0.0
Goat	7.6	0.0	7.4	20.8	0.0
Pork	32.4	18.3	29.2	42.2	36.1
Insect	6.2	13.3	4.4	2.1	7.1
Poultry	63.7	22.3	59.8	42.1	119.0
Sausage	0.0	0.0	0.0	0.0	0.0
Native fowl	1.8	0.0	4.0	0.0	2.7
Reptile	4.6	17.5	4.2	0.6	0.0
Rodent	0.0	0.0	0.0	0.0	0.0
Meat (unidentified)	8.9	0.0	21.7	2.4	7.9
<b>Other meat</b>	<b>197.4</b>	<b>90.9</b>	<b>211.5</b>	<b>190.3</b>	<b>265.4</b>
<b>All meat</b>	<b>523.4</b>	<b>422.5</b>	<b>516.8</b>	<b>515.0</b>	<b>610.9</b>
<b>%Inland fish and OAA</b>	<b>57.7</b>	<b>71.9</b>	<b>56.7</b>	<b>59.6</b>	<b>50.2</b>
<b>%Aquaculture fish of IFF</b>	<b>47.2</b>	<b>43.4</b>	<b>54.4</b>	<b>48.4</b>	<b>40.0</b>
<b>% Aquaculture fish of IFF and OAA</b>	<b>19.9</b>	<b>20.0</b>	<b>27.7</b>	<b>15.6</b>	<b>16.4</b>

Appendix Table 29 Nong Kham Het g/per/d

<b>Meat classification</b>	<b>Total</b>	<b>October</b>	<b>February</b>	<b>May</b>	<b>August</b>
Native species	51.2	56.1	20.5	57.9	74.1
Culture species	71.0	62.2	90.7	69.3	58.0
Fish (unidentified)	9.0	36.5	0.0	4.5	2.9
<b>Inland fresh fish</b>	<b>131.2</b>	<b>154.8</b>	<b>111.2</b>	<b>131.7</b>	<b>134.9</b>
Dried fish	37.9	38.7	43.2	34.9	34.5
Salted fish	0.8	0.0	0.2	0.0	2.9
Smoked fish	4.4	0.0	0.0	17.7	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	3.0	4.0	3.3	2.4	2.6
Fish sauce	0.0	0.0	0.0	0.1	0.0
<b>Processed fish</b>	<b>46.2</b>	<b>42.7</b>	<b>46.7</b>	<b>55.1</b>	<b>40.0</b>
Mollusk	71.5	83.9	71.9	33.4	97.5
Crustacean	24.2	17.6	25.0	27.5	25.3
Amphibian	48.8	54.1	36.5	53.8	53.2
<b>Other aquatic animals</b>	<b>144.5</b>	<b>155.6</b>	<b>133.5</b>	<b>114.8</b>	<b>176.0</b>
<b>Inland Fresh Fish and OAA</b>	<b>322.0</b>	<b>353.1</b>	<b>291.3</b>	<b>301.5</b>	<b>350.9</b>
Canned fish	0.0	0.0	0.0	0.0	0.0
Marine fish	8.9	0.0	1.6	30.5	3.0
<b>Total marine</b>	<b>8.9</b>	<b>0.0</b>	<b>1.6</b>	<b>30.5</b>	<b>3.0</b>
<b>Total fish and OAA</b>	<b>330.8</b>	<b>353.1</b>	<b>292.9</b>	<b>332.1</b>	<b>353.9</b>
Dried meat	0.9	4.5	0.0	0.0	0.0
Beef	41.1	38.0	49.0	45.5	30.9
Buffalo	30.5	62.1	64.2	0.0	0.0
Goat	5.8	16.3	0.0	0.0	9.6
Pork	16.5	0.0	14.3	13.4	33.7
Insect	16.0	18.2	9.6	24.8	13.0
Poultry	26.1	16.0	24.1	29.9	32.1
Sausage	0.0	0.0	0.0	0.0	0.0
Native fowl	0.0	0.0	0.0	0.0	0.0
Reptile	20.9	45.5	12.1	25.3	8.3
Rodent	0.0	0.0	0.0	0.0	0.0
Meat (unidentified)	13.8	0.0	0.0	5.4	46.6
<b>Other meat</b>	<b>171.6</b>	<b>200.6</b>	<b>173.3</b>	<b>144.2</b>	<b>174.2</b>
<b>All meat</b>	<b>502.5</b>	<b>553.7</b>	<b>466.2</b>	<b>476.2</b>	<b>528.1</b>
<b>%Inland fish and OAA</b>	<b>64.1</b>	<b>63.8</b>	<b>62.5</b>	<b>63.3</b>	<b>66.4</b>
<b>%Aquaculture fish of IFF</b>	<b>54.1</b>	<b>40.2</b>	<b>81.6</b>	<b>52.6</b>	<b>43.0</b>
<b>% Aquaculture fish of IFF and OAA</b>	<b>22.0</b>	<b>17.6</b>	<b>31.1</b>	<b>23.0</b>	<b>16.5</b>

Appendix Table 30 Phone Muang g/per/d

<b>Meat classification</b>	<b>Total</b>	<b>October</b>	<b>February</b>	<b>May</b>	<b>August</b>
Native species	52.1	27.6	55.7	59.2	58.6
Culture species	2.1	0.0	3.1	4.4	0.0
Fish (unidentified)	0.0	0.0	0.0	0.0	0.0
<b>Inland fresh fish</b>	<b>54.2</b>	<b>27.6</b>	<b>58.7</b>	<b>63.6</b>	<b>58.6</b>
Dried fish	3.7	11.3	1.4	4.3	0.0
Salted fish	0.0	0.0	0.0	0.0	0.0
Smoked fish	0.4	0.0	0.0	1.4	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	5.1	5.0	10.7	2.8	2.3
Fish sauce	0.0	0.0	0.0	0.0	0.0
<b>Processed fish</b>	<b>9.2</b>	<b>16.2</b>	<b>12.1</b>	<b>8.4</b>	<b>2.3</b>
Mollusk	50.1	23.4	43.9	26.7	100.4
Crustacean	4.0	1.4	1.0	0.0	13.1
Amphibian	9.3	18.1	9.3	11.1	0.9
<b>Other aquatic animals</b>	<b>63.3</b>	<b>42.9</b>	<b>54.2</b>	<b>37.8</b>	<b>114.4</b>
<b>Inland Fresh Fish and OAA</b>	<b>126.8</b>	<b>86.7</b>	<b>125.0</b>	<b>109.8</b>	<b>175.4</b>
Canned fish	0.0	0.0	0.0	0.0	0.0
Marine fish	0.0	0.0	0.0	0.0	0.0
<b>Total marine</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Total fish and OAA</b>	<b>126.8</b>	<b>86.7</b>	<b>125.0</b>	<b>109.8</b>	<b>175.4</b>
Dried meat	0.0	0.0	0.0	0.0	0.0
Beef	15.9	0.0	41.2	0.0	18.9
Buffalo	11.3	14.1	32.7	0.0	0.0
Goat	0.0	0.0	0.0	0.0	0.0
Pork	1.3	0.0	0.0	4.4	0.0
Insect	4.6	6.1	13.0	0.0	0.0
Poultry	14.1	19.1	26.9	0.7	12.1
Sausage	0.0	0.0	0.0	0.0	0.0
Native fowl	0.8	0.0	2.9	0.0	0.0
Reptile	0.0	0.0	0.0	0.0	0.0
Rodent	0.0	0.0	0.0	0.0	0.0
Meat (unidentified)	1.9	0.0	0.0	6.7	0.0
<b>Other meat</b>	<b>49.7</b>	<b>39.2</b>	<b>116.5</b>	<b>11.8</b>	<b>31.0</b>
<b>All meat</b>	<b>176.5</b>	<b>125.9</b>	<b>241.5</b>	<b>121.6</b>	<b>206.4</b>
<b>%Inland fish and OAA</b>	<b>71.8</b>	<b>68.8</b>	<b>51.8</b>	<b>90.3</b>	<b>85.0</b>
<b>%Aquaculture fish of IFF</b>	<b>3.8</b>	<b>0.0</b>	<b>5.2</b>	<b>6.9</b>	<b>0.0</b>
<b>% Aquaculture fish of IFF and OAA</b>	<b>1.6</b>	<b>0.0</b>	<b>2.4</b>	<b>4.0</b>	<b>0.0</b>

Appendix Table 31 Kadan g/per/d

<b>Meat classification</b>	<b>Total</b>	<b>October</b>	<b>February</b>	<b>May</b>	<b>August</b>
Native species	95.6	79.2	129.8	100.9	71.0
Culture species	69.0	20.5	99.2	56.2	93.9
Fish (unidentified)	15.9	17.1	1.2	32.3	12.5
<b>Inland fresh fish</b>	<b>180.6</b>	<b>116.7</b>	<b>230.2</b>	<b>189.5</b>	<b>177.4</b>
Dried fish	84.7	82.1	71.0	90.2	89.6
Salted fish	1.0	0.0	0.0	0.0	4.6
Smoked fish	0.0	0.0	0.0	0.0	0.0
Fermented fish sauce ( <i>Pa Dek</i> )	5.9	7.1	3.7	6.8	6.0
Fish sauce	0.0	0.0	0.0	0.1	0.0
<b>Processed fish</b>	<b>91.7</b>	<b>89.3</b>	<b>74.7</b>	<b>97.0</b>	<b>100.2</b>
Mollusk	113.0	29.5	194.5	125.0	70.5
Crustacean	63.4	54.9	117.4	51.1	26.3
Amphibian	74.2	58.4	100.3	75.4	57.9
<b>Other aquatic animals</b>	<b>250.7</b>	<b>142.8</b>	<b>412.2</b>	<b>251.6</b>	<b>154.7</b>
<b>Inland Fresh Fish and OAA</b>	<b>522.9</b>	<b>348.9</b>	<b>717.1</b>	<b>538.1</b>	<b>432.4</b>
Canned fish	0.0	0.0	0.0	0.0	0.0
Marine fish	0.0	0.0	0.0	0.0	0.0
<b>Total marine</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Total fish and OAA</b>	<b>522.9</b>	<b>348.9</b>	<b>717.1</b>	<b>538.1</b>	<b>432.4</b>
Dried meat	1.7	0.0	0.0	5.3	0.8
Beef	58.1	42.3	70.7	68.2	54.8
Buffalo	42.8	50.9	83.4	0.0	48.5
Goat	0.0	0.0	0.0	0.0	0.0
Pork	22.3	21.1	43.6	0.0	10.0
Insect	33.3	31.6	41.6	33.7	26.7
Poultry	27.0	19.4	8.7	50.5	30.5
Sausage	0.0	0.0	0.0	0.0	0.0
Native fowl	83.3	79.2	113.6	84.1	56.5
Reptile	9.0	0.0	0.0	5.6	33.3
Rodent	0.0	0.0	0.0	0.0	0.0
Meat (unidentified)	21.4	0.0	0.0	51.7	31.6
<b>Other meat</b>	<b>298.7</b>	<b>244.5</b>	<b>361.5</b>	<b>299.2</b>	<b>292.8</b>
<b>All meat</b>	<b>821.6</b>	<b>593.4</b>	<b>1078.7</b>	<b>837.3</b>	<b>725.2</b>
<b>%Inland fish and OAA</b>	<b>63.6</b>	<b>58.8</b>	<b>66.5</b>	<b>64.3</b>	<b>59.6</b>
<b>%Aquaculture fish of IFF</b>	<b>38.2</b>	<b>17.5</b>	<b>43.1</b>	<b>29.7</b>	<b>52.9</b>
<b>% Aquaculture fish of IFF and OAA</b>	<b>13.2</b>	<b>5.9</b>	<b>13.8</b>	<b>10.4</b>	<b>21.7</b>

Appendix Table 32 Frequency of fish and OAA in meals

	Ahung Nyay	Nong Kham Het	Gnang Soung	Keng Hin Soung	Kadan	Phone Muang	Grand Total
<b>Meat classification</b>	<b>n</b>	<b>n</b>	<b>n</b>	<b>n</b>	<b>n</b>	<b>n</b>	<b>n</b>
Native species	254	118	138	127	261	718	1616
Culture species	15	117	47	44	27	5	255
Fish							
(unidentified)	6	4	14	5	33	0	62
<b>Inland fresh fish</b>	<b>275</b>	<b>239</b>	<b>199</b>	<b>176</b>	<b>321</b>	<b>723</b>	<b>1933</b>
Dried fish	5	13	12	8	45	7	90
Salted fish	10	7	1	4	3	0	25
Smoked fish	0	3	0	0	0	1	4
Fermented fish							
sauce ( <i>Pa Dek</i> )	378	581	314	516	600	385	2774
Fish sauce	0	3	0	10	1	0	14
<b>Processed fish</b>	<b>393</b>	<b>607</b>	<b>327</b>	<b>538</b>	<b>649</b>	<b>393</b>	<b>2907</b>
Mollusk	25	44	5	49	33	17	173
Crustacean	33	41	7	38	45	11	175
Amphibian	91	153	32	76	103	27	482
<b>Other aquatic animals</b>	<b>149</b>	<b>238</b>	<b>44</b>	<b>163</b>	<b>181</b>	<b>55</b>	<b>830</b>
<b>Total inland fish and OAA</b>	<b>817</b>	<b>1084</b>	<b>570</b>	<b>877</b>	<b>1151</b>	<b>1171</b>	<b>5670</b>
Canned fish	3	0	0	5	0	0	8
Marine fish	7	15	9	23	0	0	54
<b>Total marine</b>	<b>10</b>	<b>15</b>	<b>9</b>	<b>28</b>	<b>0</b>	<b>0</b>	<b>62</b>
<b>Total fish and OAA</b>	<b>827</b>	<b>1099</b>	<b>579</b>	<b>905</b>	<b>1151</b>	<b>1171</b>	<b>5732</b>
Dried meat	0	1	5	3	2	0	11
Beef	15	36	74	22	27	8	182
Buffalo	11	23	39	8	24	6	111
Goat	0	6	0	3	0	0	9
Pork	27	13	25	21	11	1	98
Insect	44	33	14	10	35	23	159
Poultry	38	29	83	25	18	20	213
Sausage	2	0	0	0	0	0	2
Native fowl	2	0	1	2	0	1	6
Reptile	6	8	1	5	2	0	22
Rodent	1	0	0	0	0	0	1
Meat (unidentified)	22	14	22	5	14	2	79
<b>Total surveyed meals</b>	<b>624</b>	<b>624</b>	<b>624</b>	<b>624</b>	<b>624</b>	<b>624</b>	<b>3744</b>

Appendix Table 33 Percentage frequency of fish and OAA in meals

	Ahung Nyay	Nong Kham Het	Gnang Soung	Keng Hin Soung	Kadan	Phone Muang	Grand Total
<b>Meat classification</b>	%	%	%	%	%	%	%
Native species	40.7	18.9	22.1	20.4	41.8	115.1	43.2
Culture species	2.4	18.8	7.5	7.1	4.3	0.8	6.8
Fish (unidentified)	1	0.6	2.2	0.8	5.3	0	1.7
<b>Inland fresh fish</b>	<b>44.1</b>	<b>38.3</b>	<b>31.9</b>	<b>28.2</b>	<b>51.4</b>	<b>115.9</b>	<b>51.6</b>
Dried fish	0.8	2.1	1.9	1.3	7.2	1.1	2.4
Salted fish	1.6	1.1	0.2	0.6	0.5	0	0.7
Smoked fish	0	0.5	0	0	0	0.2	0.1
Fermented fish sauce ( <i>Pa Dek</i> )	60.6	93.1	50.3	82.7	96.2	61.7	74.1
Fish sauce	0	0.5	0	1.6	0.2	0	0.4
<b>Processed fish</b>	<b>63</b>	<b>97.3</b>	<b>52.4</b>	<b>86.2</b>	<b>104</b>	<b>62.98</b>	<b>77.6</b>
Mollusk	4	7.1	0.8	7.9	5.3	2.7	4.6
Crustacean	5.3	6.6	1.1	6.1	7.2	1.8	4.7
Amphibian	14.6	24.5	5.1	12.2	16.5	4.3	12.9
<b>Other aquatic animals</b>	<b>23.9</b>	<b>38.1</b>	<b>7.05</b>	<b>26.1</b>	<b>29</b>	<b>8.814</b>	<b>22.2</b>
<b>Total inland fish and OAA</b>	<b>131</b>	<b>174</b>	<b>91.3</b>	<b>141</b>	<b>184</b>	<b>187.7</b>	<b>151</b>
Canned fish	0.5	0	0	0.8	0	0	0.2
Marine fish	1.1	2.4	1.4	3.7	0	0	1.4
<b>Total marine</b>	<b>1.6</b>	<b>2.4</b>	<b>1.44</b>	<b>4.49</b>	<b>0</b>	<b>0</b>	<b>1.66</b>
<b>Total fish and OAA</b>	<b>133</b>	<b>176</b>	<b>92.8</b>	<b>145</b>	<b>184</b>	<b>187.7</b>	<b>153</b>
Dried meat	0	0.2	0.8	0.5	0.3	0	0.3
Beef	2.4	5.8	11.9	3.5	4.3	1.3	4.9
Buffalo	1.8	3.7	6.3	1.3	3.8	1	3
Goat	0	1	0	0.5	0	0	0.2
Pork	4.3	2.1	4	3.4	1.8	0.2	2.6
Insect	7.1	5.3	2.2	1.6	5.6	3.7	4.2
Poultry	6.1	4.6	13.3	4	2.9	3.2	5.7
Sausage	0.3	0	0	0	0	0	0.1
Native fowl	0.3	0	0.2	0.3	0	0.2	0.2
Reptile	1	1.3	0.2	0.8	0.3	0	0.6
Rodent	0.2	0	0	0	0	0	0
Meat (unidentified)	3.5	2.2	3.5	0.8	2.2	0.3	2.1

**Appendix Table 34 Example of Wealth Ranking Criteria in Gnang Soung Village, Khantabouli**

<b>Respondent</b>	<b>Rich 17/50 Households</b>	<b>Middle 18/50 Households</b>	<b>Poor 15/50 Households</b>
<b>1</b>	Tuk tuk Rice mill 10 ha of rice 15 Cows 4 Buffalo 20 Pigs Tractor 6 fish ponds Motorcycle Money from United States	1 ha of rice Enough rice to eat Sell a little rice 1 Buffalo 3 Cows 1 Fish pond	0.6 ha of rice Not enough rice to eat A lot of people 1 Buffalo
<b>2</b>	2.5 ha of rice Sell rice 2 Buffalo 4 Cows Motorcycle Fish Pond Money from United States	0.5 ha of rice Not enough rice to eat Builder 3 Cows New family	No rice Hired labourer Not enough to eat No animals New family
<b>3</b>	2 ha of rice Enough rice to eat and sell 5 Cows 3 Buffalo Shop 1 Fish pond	1 ha rice Enough rice to eat Sell a little rice 3 cows 1 Buffalo	0.5 ha of rice Not enough to eat New family No animals
<b>4</b>	1 ha of rice Sell rice 4 Cows 2 Buffalo 1 Fish pond	1 ha of rice Enough rice to eat 1 Buffalo 3 Cows	0.5 ha of rice Not enough to eat No energy No husband 1 Buffalo