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Report



November
2010



Sustainable Pathways for Attaining the Millennium Development Goals: Cambodia Case Study

Sustainable Pathways for Attaining the Millennium Development Goals: Cambodia Case Study

Special Report

A CDRI Publication



**CDRI – Cambodia’s leading
independent development policy research institute**
Phnom Penh, November 2010

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**Sustainable Pathways for Attaining the Millennium Development Goals: Cambodia
Case Study**

Special Report

November 2010

Team Members: Nang Phirun, Yem Dararath, Lonn Pich Dara, Ros Bansok, Dr Koy Ra and Dr Rebecca F Catalla

Responsibility for the ideas, facts and opinions presented in this research paper rests solely with the authors. Their opinions and interpretations do not necessarily reflect the views of the Cambodia Development Resource Institute.

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CDRI Special Report

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Nang Phirun
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ACRONYMS & ABBREVIATIONS

CDRI	Cambodia Development Resource Institute
CMDG	Cambodia Millennium Development Goals
CPR	Common Property Resources
FGD	Focus Group Discussion
GMDG	Global Millennium Development Goals
MDGs	Millennium Development Goals
MOE	Ministry of Environment
MOP	Ministry of Planning
MOPS	Moving Out of Poverty Study
NAPA	National Adaptation Programme of Action to Climate Change
NBSAP	National Biodiversity Strategy and Action Plan
NEAP	National Environmental Action Plan
NTFP	Non-Timber Forest Products
PARD	Poverty, Agriculture and Rural Development (a research programme at CDRI)
PPA	Participatory Poverty Assessment
RGC	Royal Government of Cambodia
RUPP	Royal University of Phnom Penh
SEI	Stockholm Environmental Institute
TWGFE	Technical Working Group on Forestry and Environment

Executive Summary

The Cambodia Millennium Development Goals 2003 (CMDGs) and the National Strategic Development Plan (2006-2010) have been developed by the Royal Government of Cambodia (RGC) in accordance with the Global Millennium Development Goals (GMDGs). The aim is to enhance environmental protection and natural resources conservation and the use of ecosystem services in the context of sustainable development to benefit the social and economic development of the communities concerned.

The protection and conservation of ecosystems towards the integration of biodiversity conservation and sustainable natural resource use concepts into an overall poverty reduction strategy has been prioritised by the Cambodian government. It finds support in the National Constitution, the Law on Environmental Protection and Natural Resources Management (1996), the National Environmental Action Plan (NEAP) 1998-2002, the Sub-Decree on Forest Concession Management 2000, the Forestry Law 2002, the Sub-Decree on Economic Land Concession 2005 and the National Adaptation Programme of Action to Climate Change (NAPA) 2006.

The Stockholm Environment Institute (SEI) initiative is contributing to a better understanding of sustainable pathways for attaining the MDGs bringing in ecosystem thinking in the wider context of climate change while securing social and ecological resilience and long-term environmental sustainability. In Cambodia, the project has been undertaken in partnership with CDRI through local level case studies – specifically, in one village in the province of Kratie and another village in Kampot province, both study sites being part of CDRI's Moving Out of Poverty Study (MOPS). The case studies seek to complement the national-level analysis with more local-level analyses of ecosystems-services-livelihoods/ poverty reduction relationships in locations that are representative of priority stresses in ecosystems. Data collection for these case studies involved a survey of 80 households: 40 in the study village of Kanhchor in Kratie and another 40 in Kompong Tnaot village in Kampot. Kanhchor represented villagers' substantial forestry dependence, while Kompong Tnaot exemplified marine ecosystem dependence (coastal fishing and salt mining). Three focus group discussions (FGD) with community leaders, local authorities and household interviewees accompanied the household survey.

Findings reveal that the median annual net value of the study households' income is obtained mainly from crops, livestock, biomass fuel and the fishery sector followed by forest timber and fibre in Kratie, and wild food in Kampot. Only a few people derive a high income from forest timber and fibre, which is not a long term income source because the concession company has prevented villagers from gaining access to these resources. Poor households are more likely to rely on these ecosystem services compared to medium and well off households. However, their access to these resources is being greatly reduced.

Ecological services, which mostly contribute to household income in the two study provinces, have gradually decreased over the period 1999 to 2008. This declining trend stems from a range of reasons including increased population in the localities, the cutting of forest for plantations or agricultural farming, the banning of access to forestry resources once concession contracts

have been awarded, the lack of monitoring, and the weak law enforcement measures. Villagers also indicated that the river has become shallower and more algae flourish on the water's surface due to the dam construction in the upper Mekong. They report that the dry season has become longer than the rainy season and that the weather is becoming hotter and hotter. The rain is said to be uneven. The amount of insects that damage the crops has also increased and villagers unthinkingly use a lot of pesticide and insecticide. Such a downward trend in the ecosystem services would, in turn, bring down the rate of family incomes and impact on the livelihoods of local people. At the same time, the apparent effects of climate change could lead to ecosystem services degradation and increase the number of the poor living in rural areas.

To catch up with the CMDGs, appropriate action should be taken. The government and local authorities should pay more attention to cracking down on illegal activities which lead to the degradation of natural resources. They should also regularly undertake appropriate activities to monitor the performance of economic land concession contracts to ensure that these follow Cambodia's forestry regulations (i.e., the Forestry Law, National Forest Sector Policy, the Sub-Decree on Forest Concession Management and the Sub-Decree on Economic Land Concession) which aim to generate state revenues and increase employment opportunities, and to intensify and diversify livelihoods within a framework of natural resource management based on an ecological system. The Cambodian NAPA, a framework to guide the coordination and implementation of adaptation initiatives through a participatory approach, should be implemented. This would address the urgent and immediate needs of people at grassroots level so that they may adapt to the adverse effects of climate change.

I

INTRODUCTION

The Millennium Ecosystem Assessment stimulated much of the current, widespread, scientific international debate about the importance of ecosystem services to human beings. Enhancing the conservation and sustainable use of ecosystems and their contribution to human well-being is critical. The protection and conservation of ecosystems have been prioritised by the Cambodian government, as stated under the Constitution in Article 59, “*The State shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecological systems, mines, energy, petrol and gas, rocks and sand, gems, forests and forestry products, wildlife, fish and aquatic resources*”.

The Law on Environmental Protection and Natural Resources Management (1996) provides the basic legal framework for the operation of the Ministry of Environment (MOE). The objectives of the law are to protect, manage and enhance the environment and promote socio-economic development in a sustainable way. The aim of the subsequent National Environmental Action Plan 1998-2002 (NEAP) was to integrate environmental concerns with economic activity to ensure the sustainability of the functional capacities of Cambodia’s ecosystems.

The National Biodiversity Strategy and Action Plan 2002 (NBSAP) was created with a view towards the integration of biodiversity conservation and sustainable natural resource use concepts into an overall poverty reduction strategy. The NBSAP provides a framework for action at all levels to enhance the productivity, diversity and integrity of natural resources.

Ensuring environmental sustainability is also addressed in the Cambodia Millennium Development Goals (CMDGs) 2003. The National Strategic Development Plan (2006-2010) stipulates that high priority be accorded to environment and conservation in the government’s efforts towards sustainable development to benefit the socio-economic development of the communities concerned.

However, efforts to redress environmental degradation, especially forest depletion and water resources, fell critically short of meeting the CMDG 2005 targets. Cambodia’s natural resources are being degraded at an accelerating pace. Cambodia’s forest cover was 73 percent of total country’s land area in 1965. It had declined to 58.7 percent of Cambodia’s total land area by 1997 despite the re-planting of 11,125 hectares between 1985 and 2002. In 2007, the Technical Working Group on Forestry and Environment (TWGFE) revealed that Cambodia’s forest cover declined from 61 percent to 59 percent of the total land area during the period 2002-2006, slightly below the CMDG target of 60 percent (from 2005 to 2015). The 2 percent decline in forest cover represents an estimated loss of 373,510 hectares of forest (TWGFE 2007).

1.1 Objectives of the study

Worldwide, there are ongoing discussions and consultations on the most effective approach to create a better understanding of sustainable pathways for attaining the Millennium Development Goals (MDGs) that embraces ecosystem thinking in the wider context of climate change. The objectives of the two-year Stockholm Environment Institute (SEI) initiative on Sustainable Pathways for Attaining the MDGs are: (i) to increase awareness, understanding and knowledge among decision makers, (ii) to provide concrete policy recommendations, and (iii) to provide assistance to the Swedish government on the importance of incorporating environmental and climate change issues into strategies for meeting the MDGs while securing social and ecological resilience and long-term environmental sustainability.

The initiative entails three main activities to attain its objectives:

- Comprehensive review of the most essential ecosystem services needed in order to meet the MDGs and the effects of climate change on the supply of these services;
- Dialogue with international stakeholders on policy options; and
- National level policy engagement based on local and regional analysis carried out in Cambodia.

In part, the project will be undertaken through local level case studies – at least four in Cambodia. The case studies in Cambodia will be carried out in villages in upland forest, lowland agricultural, inland fishery and coastal areas. The purpose of the case studies is to complement the national level analysis by more local level analyses of ecosystems services – livelihoods/poverty reduction relationships in a number of locations that are representative of priority stresses in ecosystems. To plan and implement the initiative, SEI invited national partners to undertake the case studies and play a major role in the national dialogue.

The SEI and the Cambodia Development Resource Institute (CDRI) agreed to jointly carry out the national-level policy engagement in Cambodia by primarily conducting and facilitating the national dialogue. CDRI took on the development and preparation of two local case studies²: one village in Kratie province and another village in Kampot province, both being part of CDRI's Moving Out of Poverty Study (MOPS).

1.2 Research questions

The study sought to answer the following questions:

- What types of ecosystem services do people have access to?
- How does climate change affect ecosystem services and livelihoods and how do people cope with or adapt to the effects of climate change?
- Which ecosystem services do their livelihoods depend on?
- How important is each ecosystem service to each livelihood?
- What risks and uncertainties to the ecosystems can be identified?

² Cambodia's Royal University of Phnom Penh (RUPP), SEI's second research partner in the country, conducted the other two case studies in the lowland agricultural and inland fishery areas.

II

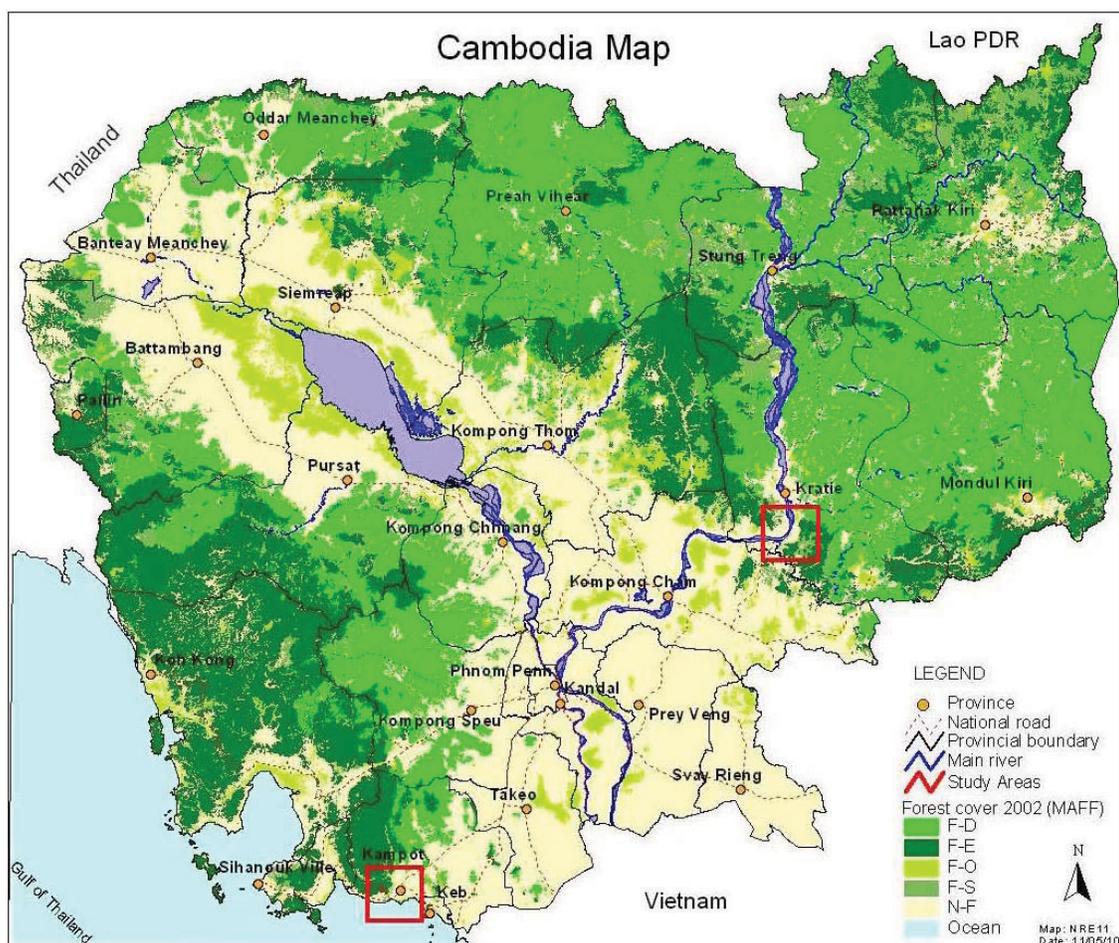
RESEARCH METHODOLOGY

2.1 Site Selection

The two provinces of Kampot and Kratie were, as previously noted, identified for the study (Figure 1). The study sites were selected along with CDRI's third round of the Moving Out of Poverty Study (MOPS). The specific village sites were as follows:

- Kanhchor village in Kratie province for its substantial forestry dependence; and
- Kompong Tnaot village in Kampot province for its marine ecosystem dependence (coastal fishing and salt mining).

Figure 1: Map of the Study Sites



2.2 Research Team

2.2.1 Enumerators

The research team has sufficient experience of natural resources and environment management, especially in the field of forestry. It has undertaken a number of field work studies and has built up close links with local authorities in the study sites. Enumerators were carefully selected to administer the household survey. Most were third-year students at the Royal University of Phnom Penh (RUPP) in the field of natural resources and environment and graduate students in forestry at the Royal University of Agriculture. They had taken part in previous CDRI field studies, are highly qualified and have sufficient experience and knowledge in interviewing households to obtain quality data and information.

Local assistants were also hired during the field surveys to help the research team, though they were not allowed to accompany the research team during the interviews. This was done to give the households privacy and freedom to share information with the research team.

2.2.2 Sample Households

A total of 80 sample households were randomly selected in the two villages of Kompong Tnaot and Kanhchor. The villages were selected to capture variation in marine resource-based income in the coastal province of Kampot and upland forest-based income in Kratie in the northeast. The distribution of household respondents in the study villages is shown on Table 1.

Table 1: Sample Frame for the Study Provinces, Villages and Households

Province	District	Number of study villages	Number of sample households	Number of households in each village ^{a/}
Kampot	Kampot	1	40	363
Kratie	Chhloung	1	40	267
Total		2	80	630

^{a/} The number of households in each village has been taken from Fitzgerald and So, 2007.

2.2.3 Preparing and Translating the Questionnaires

The questionnaire was prepared in accordance to the joint research protocol between CDRI and SEI. It was then translated by the research team into Khmer language prior to the pre-test. The people in the selected study sites only speak Khmer. Simple, clear and understandable language was used in the questionnaire for it to be easily understood by the research team and household interviewees.

2.3 Field Work

The survey team was required to follow fieldwork guidelines: (i) train the field team to explain the questionnaire; (ii) inform the community leaders of the selected villages about the study purposes and the team's proposed field trip dates; (iii) pre-test the questionnaire with a few households in the selected villages; (iv) conduct a first focus group discussion with the communities to map the local geography and resources used; (v) interview selected households; (vi) conduct a second focus group discussion with local authorities to verify and validate the data and information obtained during the first group discussion with the communities; and (vii) conduct a final focus group discussion with the communities to verify and validate the data and information obtained during the first group discussion with the communities.

conduct a third focus group discussion with household interviewees to verify and validate the data and information obtained during the household interviews.

2.3.1 Focus Group Discussions

Three focus group discussions (FGDs), two in Kratie and one in Kampot province, were held. The first was done with community leaders to verify the resource map, which was drawn by the MOPS study team. The second focus group discussion was conducted with local authorities to verify and validate the data and information obtained during the first group discussion with the communities. The last FGD was with the household interviewees to verify and validate the data and information obtained during the survey. Each focus group discussion had 12 villager participants.

2.3.2 Household Interviews

The household survey questionnaire was structured in three parts: (i) general information about the respondent; (ii) questions based on a diagram of different provisioning and cultural ecosystem services; and (iii) questions based on a diagram of changes in climate and regulating ecosystem services.

III

FINDINGS

3.1 Study area descriptions

Kompong Tnaot village is located in Kampot district and is about 3 km from the national road. The village has a total population of 2150, with 363 households (Table 2). Fishing is a main source of income earning for most. The village covers about 70.41 ha of mangrove forest. Fitzgerald and So (2007) note that wet season rice is grown between late July and January, but due to poor soil, damage from rising seas and lack of modern farming inputs, yields are low at only 0.9 tonnes per hectare. Forty percent of households also grow cash crops. About 20 percent of households lack agricultural land. The majority also fish and gather marine animals and products, but illegal fishing has increased, partly due to rising demand for small marine creatures, and declining fish stocks and common property resources (CPR). Salt farming has been an important source of employment, particularly for women. Road access improved in 2003 with the construction of the national road. A school, built in 1998, provides primary education. Private medical practitioners are available in the village and there is a health centre in the commune. For serious illnesses, villagers travel to Kampot town.

Kanhchor is located in Chhloung district. The village has a total population of 1107, with 267 households. It has relatively little agricultural land compared to other villages in Kanhchor commune. Forest-based logging and CPR are important income sources, though these are declining as a result of over-exploitation in the last 10 years. Households grow both wet and dry season rice, and yields of 2.5–3 tonnes per hectare can be achieved without chemical fertilisers. An estimated 25 percent of households are landless. Households also raise livestock and earn income from fishing, albeit fish stocks have substantially declined over the past decade due to illegal fishing. Some villagers migrate to Poipet (within Kratie) and to Phnom Penh for work. Kanhchor has experienced improved security since the end of armed conflict in 1998. The road linking Kanhchor to urban areas in Kratie was built in 2002, but has since degraded due to heavy use by logging trucks. Primary and secondary schools are available in Kanhchor commune, two to three kilometres from the village; some children from the village also attend a high school 10 kilometres away. A health centre is available in Kanhchor commune, but people often use local private providers or private clinics (Fitzgerald and So 2007).

Table 2: Key Characteristics of the Survey Villages

Village	District	Province	Reason for selection	Households	Road access
Kompong Tnaot	Kampot	Kampot	Coastal fishing and salt mining	363	On national road between Kep and Kampot
Kanhchor	Chhloung	Kratie	Substantial forest dependence	267	Improved road access since 2002

Source: Fitzgerald and So, 2007

Table 3 shows that the total number of better off households in Kompong Tnaot decreased between 2004 and 2008 from 29 to 2 households. This suggests a decline in living conditions among the local people in this village compared to those in Kanhchor. The statistics also indicate that in both study villages, poor households have increasingly depended upon ecosystem services for their livelihoods. Even the better off households appear to have done so as well.

Table 3: Importance Placed by Study Households on CPR/ Ecosystem Services ^{a/}

Poverty level	Degrees of importance placed on CPR				Total ^{b/}
	Very important	Important	Not very important	Don't know	
<i>Kompong Tnaot (2004) ^{c/}</i>					
Poor	1	0	0	0	1
Medium	7	0	0	0	7
Better off	25	3	1	0	29
Total	33	3	1	0	37
<i>Kanhchor (2004) ^{c/}</i>					
Poor	3	6	3	0	12
Medium	7	5	5	0	17
Better off	2	3	0	1	6
Total	12	14	8	1	35
<i>Kompong Tnaot (2008) ^{d/}</i>					
Poor	17	0	0	0	17
Medium	17	3	0	0	20
Better off	1	0	1	0	2
Total	35	3	1	0	39
<i>Kanhchor (2008) ^{d/}</i>					
Poor	5	4	3	1	13
Medium	7	9	7	0	23
Better off	2	2	0	0	4
Total	14	15	10	1	40

^{a/} The terms CPR and ecosystem services have equal meaning. Importance attached to CPR/ ecosystem services was not asked of household respondents for this SEI-CDRI Cambodia Case Study.

^{b/} Total number of households in 2004 and 2008 differ due to missing households in 2004.

^{c/} Data obtained from CDRI's Poverty, Agriculture and Rural Development (PARAD) Programme, 2004.

^{d/} Data obtained from CDRI's PARAD Programme, 2008. Poverty groupings in 2008 were based on a wealth ranking activity undertaken in the same year.

3.2 Sources of Income

Survey respondents were asked to rank their sources of income (primary, secondary, and tertiary). Figure 2 presents the main sources of income in the two villages of Kompong Tnaot and Kanhchor. In Kompong Tnaot, 60 percent of the household respondents indicated that marine fishing was the main source of income, and salt farming was an additional source. FGD participants stated that there were three salt farm owners in this village. They also noted that marine resources have declined due to the increasing number of fishers who use

illegal equipment such as small nets to collect marine resources. As a result, ordinary people go further out to sea and face risks of big waves and storms to collect resources. Some said they have changed their jobs due to the lower income being obtained from the declining catches.

Figure 2: Households' Primary Sources of Income (percent)

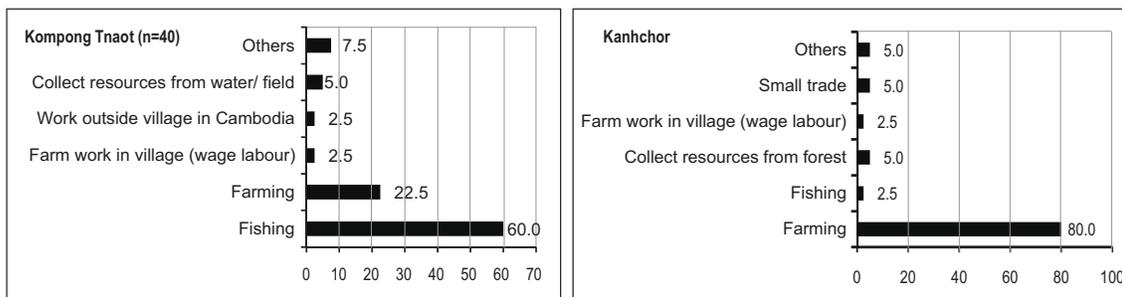
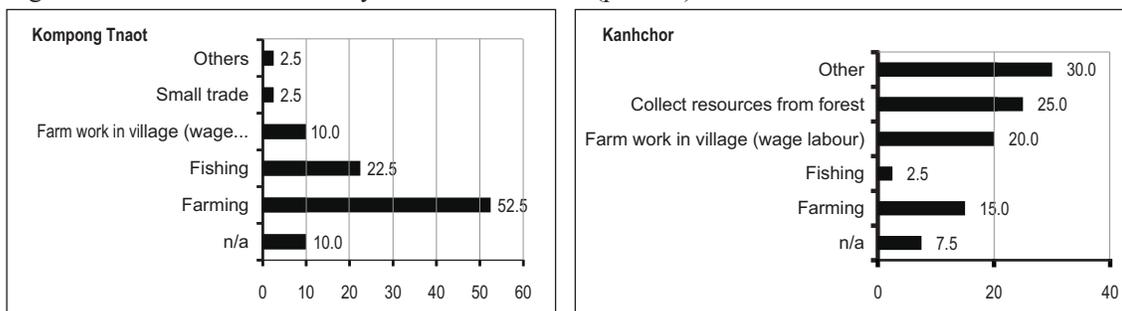


Figure 2 also shows that in Kanhchor village, 80 percent of respondents are into farming (rice and crop cultivation) as a major source of income. Interviewees in this village also claimed that collecting resources from the forests (mainly non-forest timber products) is a major activity because income earned from this source could supplement that obtained from farming. Most households in Kanhchor additionally collect other wild foods (Figure 3). They gather all wild foods from the rice field and *chamkar* (crop farm) or from areas other than the forests.

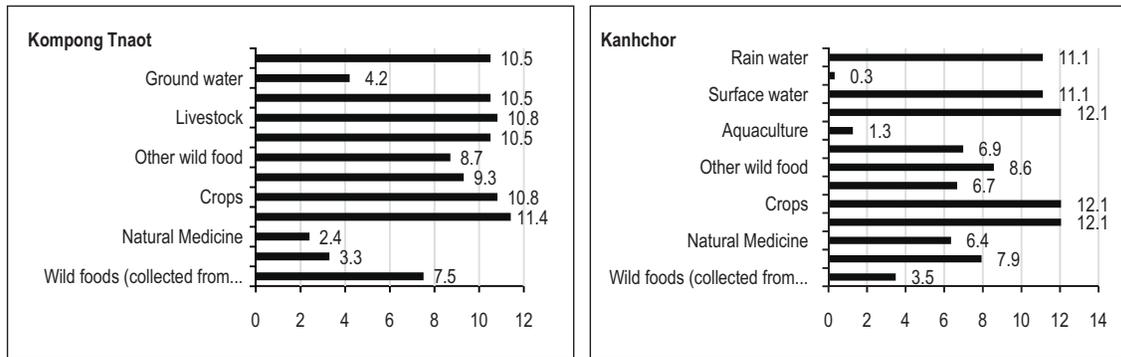
Figure 3: Households' Secondary Sources of Income (percent)



3.3 Resource Types

Respondents were asked to state the types of resources they collect and use. Of the resources, crops, livestock, biomass fuel, inland and marine fisheries as well as forest timber and fibre are mainly depended upon by the study households, followed by rain and surface water, and capture fisheries (Figure 4). Aquaculture is not yet practiced in the study villages. Only 0.3 per cent of respondent households in Kanhchor said they used groundwater for domestic consumption.

Figure 4: Percentage Distribution of Study Households Collecting and Using Different Resources

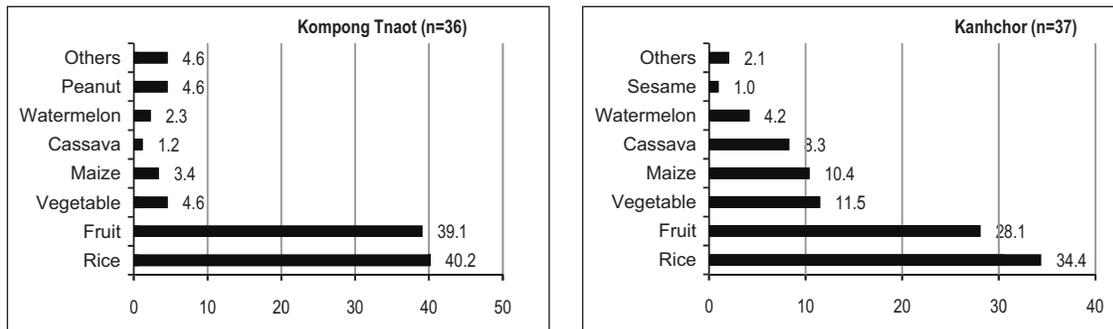


3.4 Provisioning Services

3.4.1 Crops, Fruits, and Vegetables

The survey shows that rice cultivation is the primary livelihood for people who live in Kompong Tnaot and Kanhchor villages. Main cash crops in Kompong Tnaot village include fruits, coconut, and mango, while fruits, vegetables, cassava, and water melon are the main sources of income earning in Kanhchor village (Figure 5).

Figure 5: Types of Crops, Fruits, and Vegetables Grown by Households (percent distribution)



Gross household incomes were measured in dry and wet seasons in both villages to compare seasonal variations in income (Table 4). Survey results show that the median gross income of the survey households in Kompong Tnaot village in the wet season was about USD146.70, higher than that of USD96.82 in the dry season. In Kanhchor, the median gross income of the survey households in the dry season was higher than in the wet season since they can grow seasonal crops and productivity is higher in the dry season. Additionally, fruit harvests are more common in the dry season.

Standard deviations for both seasons are twice as much as the means. This indicates that a few households have high income derived from growing cash crops. Survey findings reveal that high income households earn more due to two main reasons: (i) they have many plots of land; and (ii) they grow high value cash crops.

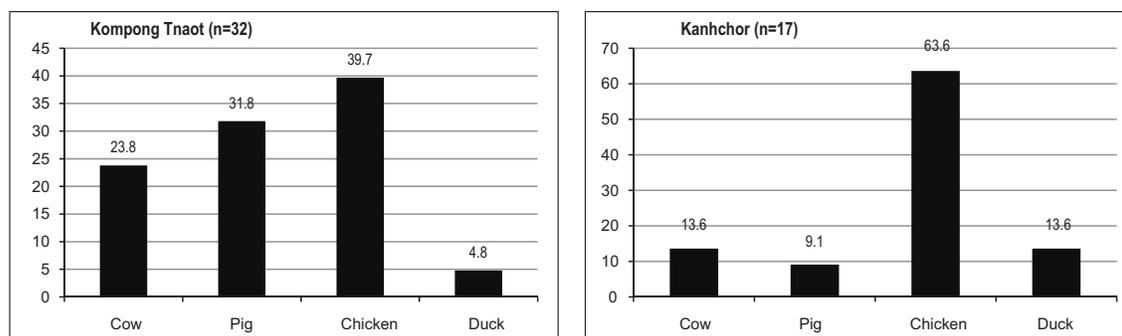
Table 4: Income (USD) of Study Households from Crops, Fruits, and Vegetables in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
Kompong Tnaot						
Gross value in dry season	31	96.8	156.8	265.6	6.1	1513.9
Cost value in dry season	31	6.9	17.6	27.6	0.0	122.2
Net value in dry season	31	68.5	139.2	265.0	1.9	1500.9
Gross value in rainy season	27	146.7	227.9	290.8	1.5	1301.9
Cost value in rainy season	27	0.0	32.8	65.8	0.0	244.5
Net value in rainy season	27	105.6	195.9	275.9	1.5	1301.9
Annual gross value	36	195.6	306.0	421.2	14.7	2314.7
Annual cost value	36	15.9	39.7	59.4	0.0	244.5
Annual net value	36	132.1	266.9	412.2	12.2	2240.5
Kanhchor						
Gross value in dry season	28	256.4	692.1	1,222.5	19.5	5281.2
Cost value in dry season	28	3.2	49.2	72.2	0.0	232.3
Net value in dry season	28	201.1	642.8	1,204.6	19.5	5232.3
Gross value in rainy season	25	154.0	341.4	573.5	6.1	2310.5
Cost value in rainy season	25	0.0	21.2	45.3	0.0	183.4
Net value in rainy season	25	144.9	320.3	553.5	6.1	2176.0
Annual gross value	37	358.4	754.4	1,169.4	34.1	5672.4
Annual cost value	37	8.9	51.6	73.8	0.0	232.3
Annual net value	37	293.4	702.9	1,154.2	34.1	5623.5

3.4.2 Livestock and Poultry

Cows and pigs are the main types of livestock, while chickens and ducks are main poultry raised in the study villages (Figure 6). Chicken raising, in particular, is a major source of income for many households in Kompong Tnaot and Kanhchor. Household interviewees in both villages reported that they raise chickens for sale and for consumption.

Figure 6: Percentage Distribution of Households Raising Livestock for Sale and Consumption



Survey results reveal that the median annual gross income derived from livestock and poultry in Kompong Tnaot and Kanhchor villages in the dry season was higher than in the wet season (Table 5). During the survey, interviewees reported that livestock production decreased due to disease. FGD participants noted that their cows had been affected by disease in the previous year.

Table 5: Income (USD) of Study Households from Livestock and Poultry in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
<i>Kompong Tnaot</i>						
Gross value in dry season	30	189.5	269.5	241.9	11.0	855.8
Cost value in dry season	30	30.6	55.9	74.9	0.0	366.8
Net value in dry season	30	155.6	213.5	201.1	11.0	750.6
Gross value in rainy season	22	59.3	118.0	140.0	7.3	475.6
Cost value in rainy season	22	8.2	24.3	30.8	0.0	99.0
Net value in rainy season	22	42.2	93.7	123.9	-3.3	440.1
Annual gross value	32	254.4	333.8	271.3	18.3	978.0
Annual cost value	32	42.8	69.2	84.5	0.0	415.6
Annual net value	32	203.8	264.6	226.4	18.3	795.8
<i>Kanhchor</i>						
Gross value in dry season	17	44.0	365.7	717.9	13.2	2713.9
Cost value in dry season	17	0.0	33.0	117.7	0.0	489.0
Net value in dry season	17	42.9	332.6	685.8	-0.7	2713.9
Gross value in rainy season	12	23.8	61.1	76.4	11.0	244.5
Cost value in rainy season	12	0.0	2.8	6.5	0.0	18.0
Net value in rainy season	12	16.1	58.3	78.2	3.9	244.5
Annual gross value	17	76.3	408.8	713.6	25.7	2713.9
Annual cost value	17	0.0	34.9	117.6	0.0	489.0
Annual net value	17	76.3	373.8	683.9	7.9	2713.9

3.4.3 Capture Fisheries

Study households in Kompong Tnaot village are more dependent on marine fish than freshwater fish (Figure 7). Also, their income earning from capture fisheries in Kompong Tnaot village is much higher compared to that in Kanhchor village. Their median annual gross income from marine resources is USD610.64, a much higher figure than the median annual gross income of all the study households in Kanhchor village of USD48.41 (Table 6).

Although the income obtained from capture fisheries was not as high in Kanhchor, aquaculture was not observed to be a significant source of income for the households in this village.

Figure 7: Percentage Distribution of Households Collecting Capture Fisheries Products, by Type

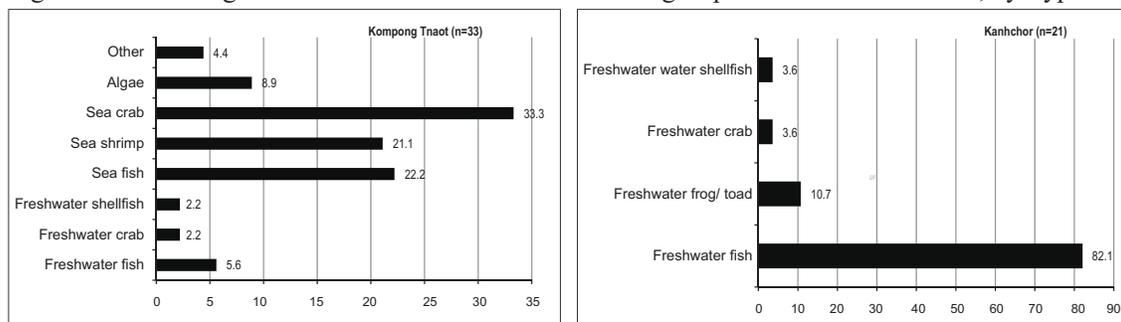


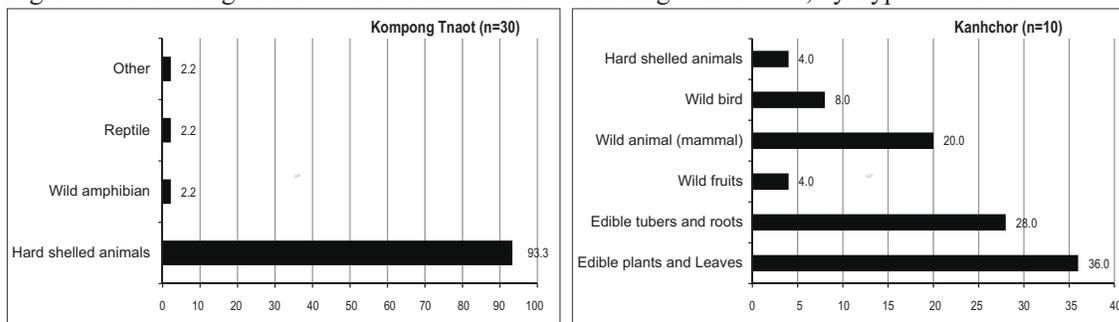
Table 6: Income (USD) of Study Households from Capture Fisheries in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
<i>Kompong Tnaot</i>						
Gross value in dry season	33	305.6	744.0	1,310.6	1.2	6454.8
Cost value in dry season	33	22.0	60.4	104.6	0.0	528.6
Net value in dry season	33	278.7	683.6	1,247.3	0.0	6234.7
Gross value in rainy season	23	246.9	334.3	349.7	7.8	1640.1
Cost value in rainy season	23	9.8	27.5	35.6	0	112.0
Net value in rainy season	23	211.5	306.9	331.6	7.8	1548.9
Annual gross value	33	610.6	977.0	1,467.8	1.2	6454.8
Annual cost value	33	24.5	79.6	127.1	0.0	640.6
Annual net value	33	437.7	897.4	1,392.0	1.2	6234.7
<i>Kanhchor</i>						
Gross value in dry season	15	22.0	71.2	129.0	1.5	456.6
Cost value in dry season	15	0.0	2.7	4.3	0.0	14.7
Net value in dry season	15	17.1	68.5	128.7	1.5	453.3
Gross value in rainy season	18	29.3	104.6	219.7	2.9	889.2
Cost value in rainy season	18	0.0	2.0	5.1	0.0	17.1
Net value in rainy season	18	29.3	102.6	219.9	2.9	889.2
Annual gross value	21	48.4	140.5	260.3	1.5	890.9
Annual cost value	21	0.0	3.6	7.5	0.0	31.8
Annual net value	21	47.9	136.9	260.3	1.5	889.2

3.4.4 Wild Foods

The main wild food collected by households in Kompong Tnaot village is shell fish (e.g., crabs, snails, lobster, etc) (Figure 8). About 90 percent of respondents in Kompong Tnaot village collect shell fish for their income earning. In Kanhchor, respondent households primarily gather edible plants and leaves.

Figure 8: Percentage Distribution of Households Gathering Wild Foods, by Type of Wild Food



Findings also indicate that households in Kompong Tnaot village could earn more from gathering wild foods than those in Kanhchor (Table 7). Study households in Kompong Tnaot produced a gross maximum income of USD3154.03 from wild foods in the dry season which is much higher than that of USD1652.81 during the wet season. In Kanhchor, wild foods did not seem to be a significant income source. Less than half of the study households in this village depend on wild foods.

Table 7: Income (USD) of Study Households from Gathering Wild Foods in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
Kompong Tnaot						
Gross value in dry season	23	36.7	296.2	724.8	1.3	3154.0
Cost value in dry season	23	0.0	9.8	45.8	0.0	220.1
Net value in dry season	23	36.7	286.4	705.5	1.3	3154.0
Gross value in rainy season	19	15.3	135.7	375.1	1.8	1652.8
Cost value in rainy season	19	0.0	13.3	52.6	0.0	229.8
Net value in rainy season	19	12.8	122.4	323.9	1.8	1423.0
Annual gross value	30	25.1	313.0	827.9	0.0	3423.0
Annual cost value	30	0.0	15.9	82.0	0.0	449.9
Annual net value	30	24.9	297.1	772.1	0.0	3178.5
Kanhchor						
Gross value in dry season	10	2.1	11.9	16.5	0.2	46.9
Cost value in dry season	10	0.0	0.0	0.0	0.0	0.0
Net value in dry season	10	2.1	11.9	16.5	0.2	46.9
Gross value in rainy season	4	26.2	30.9	28.6	2.2	69.0
Cost value in rainy season	4	0.0	1.7	3.3	0.0	6.6
Net value in rainy season	4	26.2	29.2	25.7	2.2	62.4
Annual gross value	10	3.2	24.2	30.9	0.2	78.7
Annual cost value	10	0.0	0.7	2.1	0.0	6.6
Annual net value	10	3.2	23.6	29.6	0.2	72.1

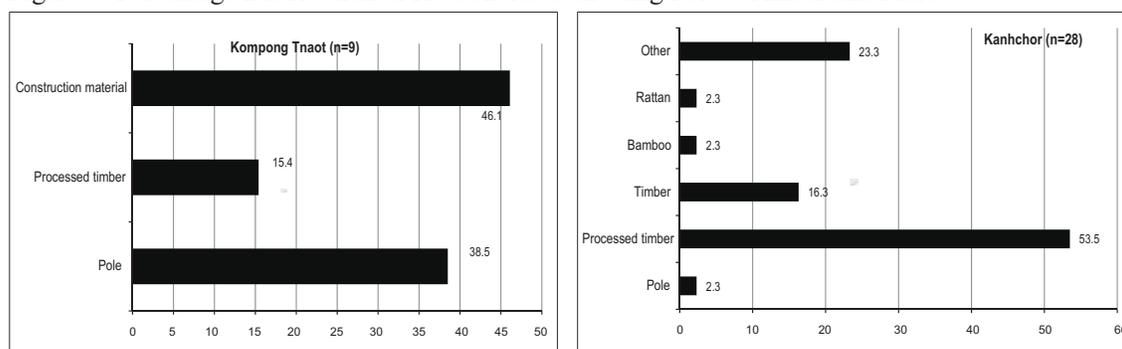
3.4.5 Forest Timber and Fibre

FGD findings reveal that the forest resources in Kanhchor village have declined since the government issued forest concession awards. FGD participants said that people were not being allowed to collect non-timber forest products (NTFP) and firewood within the areas owned by the forest land concession companies. Around 60,000 riels per load on a small tractor or oxcart (which is too costly for local poor people) is paid by those who collect NTFPs and firewood in the areas belonging to the company. People have to travel far from their village (about 15 to 40 km) if they want to gather NTFPs to earn an income.

The cutting of the trees depended upon by the villagers for timber was continuing during the survey period. FGD participants pointed out that about 80 chainsaws were used to cut the trees in 2003. Some 20 chainsaws were still in use during the survey period; forest clearance in the forest land concession areas continues to be active until now.

Figure 9 shows that about 53 per cent of collected forest resources in Kanhchor village was processed timber (i.e., sawn wood), much higher than the 15 percent in Kompong Tnaot village. Other forestry resources (e.g., bamboo, rattan and timber) were also harvested by study households in Kanhchor village for income earning purposes. This suggests that people in Kanhchor village rely more on forest resources than those in Kompong Tnaot.

Figure 9: Percentage Distribution of Households Collecting Forest Timber and Fibre



The maximum annual gross income of the survey households in Kanhchor village from forest timber and fibre is USD31,784.84, suggesting that forest timber and fibre is a major source of income (Table 8). This figure is much higher than the maximum annual gross income of USD17.11 earned by those in Kompong Tnaot, implying that households in the latter are not mainly dependent on forest timber and fibre as a main income source.

Table 8: Income (USD) of Study Households from Forest Timber and Fibre in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
<i>Kompong Tnaot</i>						
Gross value in dry season	7	8.1	7.0	5.6	0.2	15.8
Cost value in dry season	7	0.0	0.4	0.9	0.0	2.4
Net value in dry season	7	5.6	6.6	5.6	0.2	15.8
Gross value in rainy season	4	5.1	6.9	8.1	0.2	17.1
Cost value in rainy season	4	0.0	0.0	0.0	0.0	0.0
Net value in rainy season	4	5.1	6.9	8.1	0.2	17.1
Annual gross value	9	9.8	8.5	5.8	0.3	17.1
Annual cost value	9	0.0	0.3	0.8	0.0	2.4
Annual net value	9	9.8	8.2	5.9	0.3	17.1
<i>Kanhchor</i>						
Gross value in dry season	27	792.2	2567.2	5599.0	12.0	28,606.4
Cost value in dry season	27	44.0	287.8	750.3	0.0	3423.0
Net value in dry season	27	660.2	2269.2	5427.9	11.7	28,117.4
Gross value in rainy season	16	465.2	1308.9	1733.5	8.6	5550.1
Cost value in rainy season	16	1.2	232.9	619.8	0.0	2445.0
Net value in rainy season	16	257.3	1076.0	1610.7	8.6	5501.2
Annual gross value	28	978.0	3202.9	6308.1	12.0	31,784.8
Annual cost value	28	46.5	410.6	1196.7	0.0	5868.0
Annual net value	28	929.6	2811.7	6014.7	12.0	31,295.8

3.4.6 Natural Medicine

Survey results indicate that tree extracts, honey, and plants are collected by the study households as natural medicines (Figure 10). In Kanhchor, 85 per cent of the survey households' tree extracts collected from the forest is used to make medicines, compared to only 60 per cent in Kompong Tnaot. Gross maximum household earnings in Kanhchor of USD44.01 from this resource substantiate this observation, compared to that of USD29.34 in Kompong Tnaot (Table 9). This confirms that the forest is a more important income source for study households in Kanhchor village than for those in Kompong Tnaot. In both villages, some amount of various kinds of plants and honey had also been wild harvested to sell.

FGD participants reported that villagers in Kanhchor had stopped using traditional medicines due to the improvement of the health centre in the village. For this reason, natural medicines gathered by some households are sold outside the village.

Figure 10: Percentage Distribution of Households Collecting Natural Medicine, by Type Collected

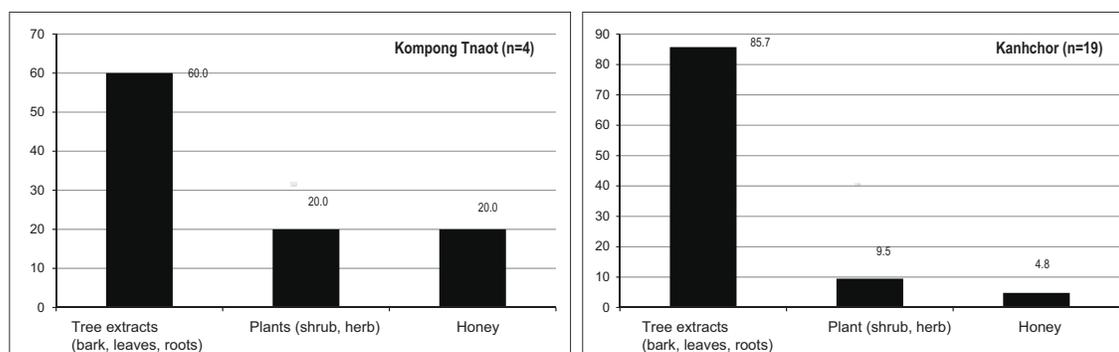


Table 9: Income (USD) of Study Households from Natural Medicines in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
<i>Kompong Tnaot</i>						
Gross value in dry season	4	5.3	10.2	12.9	1.0	29.3
Cost value in dry season	4	0.0	0.1	0.2	0.0	0.5
Net value in dry season	4	5.3	10.1	13.1	0.5	29.3
Gross value in rainy season	2	3.6	3.6	3.7	1.0	6.2
Cost value in rainy season	2	0.0	0.0	0.0	0.0	0.0
Net value in rainy season	2	3.6	3.6	3.7	1.0	6.2
Annual gross value	4	8.4	12.0	12.4	2.0	29.3
Annual cost value	4	0.0	0.1	0.2	0.0	0.5
Annual net value	4	8.4	11.9	12.5	1.5	29.3
<i>Kanhchor</i>						
Gross value in dry season	15	2.2	3.8	5.5	0.1	22.0
Cost value in dry season	15	0.0	0.0	0.0	0.0	0.0
Net value in dry season	15	2.2	3.8	5.5	0.1	22.0
Gross value in rainy season	10	2.0	4.7	6.6	0.5	22.0
Cost value in rainy season	10	0.0	0.0	0.0	0.0	0.0
Net value in rainy season	10	2.0	4.7	6.6	0.5	22.0
Annual gross value	19	2.4	5.2	10.1	0.1	44.0
Annual cost value	19	0.0	0.0	0.0	0.0	0.0
Annual net value	19	2.4	5.2	10.1	0.1	44.0

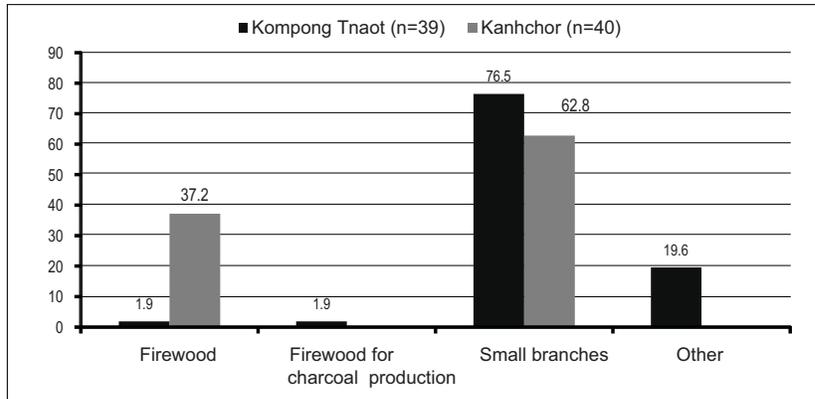
3.4.7 Biomass Fuel

Findings of the 2007 Participatory Poverty Assessment (PPA) in forest villages (CDRI 2007) noted that firewood collection and charcoal production are villagers' two most important wood energy activities. In general, all villagers in the PPA forest villages gather firewood for their own use though some better off households buy firewood from poorer people who augment their income by collecting wood in the forest.

Respondent households in the two study villages were also asked about collecting firewood, wood for charcoal production, small branches, animal manure, and other biomass fuel sources. Most in Kompong Tnaot and Kanhchor reported gathering small branches and wood for

biomass fuel (Figure 11). A small number in Kompong Tnaot said they gather wood for charcoal production for domestic consumption.

Figure 11: Percentage Distribution of Households Collecting Biomass Fuel for Selling and for Consumption, by Type Collected



The median annual net income obtained by the survey households in Kanhchor from biomass fuel was reportedly USD51.71, much higher than the USD29.34 earned in Kompong Tnaot village. The standard deviation for the annual net value in Kompong Tnaot is slightly higher than the mean, suggesting that a few households earn more from biomass fuel than others. In Kanhchor village, the standard deviation for the annual net value is less than the mean, indicating that earnings from biomass fuel by the study households are more or less the same.

Table 10: Income (USD) of Study Households from Collecting Biomass Fuel in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
<i>Kompong Tnaot</i>						
Gross value in dry season	39	14.7	29.0	45.7	0.2	234.7
Cost value in dry season	39	0.0	0.1	0.2	0.0	0.8
Net value in dry season	39	14.7	28.9	45.7	0.2	234.7
Gross value in rainy season	36	13.8	21.9	23.7	1.5	110.0
Cost value in rainy season	36	0.0	0.1	0.5	0.0	2.4
Net value in rainy season	36	13.8	21.8	23.8	1.5	110.0
Annual gross value	39	29.3	49.2	57.9	1.7	234.7
Annual cost value	39	0.0	0.2	0.6	0.0	3.2
Annual net value	39	29.3	49.1	58.0	1.7	234.7
<i>Kanhchor</i>						
Gross value in dry season	40	33.0	37.8	28.9	4.9	122.3
Cost value in dry season	40	0.0	0.2	0.9	0.0	4.4
Net value in dry season	40	33.0	37.6	28.8	4.9	122.3
Gross value in rainy season	32	24.5	34.7	30.8	1.0	146.7
Cost value in rainy season	32	0.0	0.1	1.0	0.0	4.4
Net value in rainy season	32	24.5	34.6	30.8	1.0	146.7
Annual gross value	40	52.6	65.6	51.9	6.6	234.7
Annual cost value	40	0.0	0.3	1.5	0.0	8.8
Annual net value	40	51.7	65.3	51.9	6.6	234.7

3.4.8 Other Wild Foods

Study households collect other wild foods, including edible plants and leaves, edible tubers and roots, fruits, animals, insects, birds, amphibians such as frogs and toads, shell fish, reptiles; process wild food products (e.g., salting and drying butchered wild pigs); and, preserve bamboo shoots for their own consumption, with some amounts being sold in local markets (Figure 12 and Table 11). Study households in the two villages reported mostly collecting edible plants and leaves.

Figure 12: Percentage Distribution of Households Collecting Other Wild Foods for Consumption and for Selling, by Type Collected

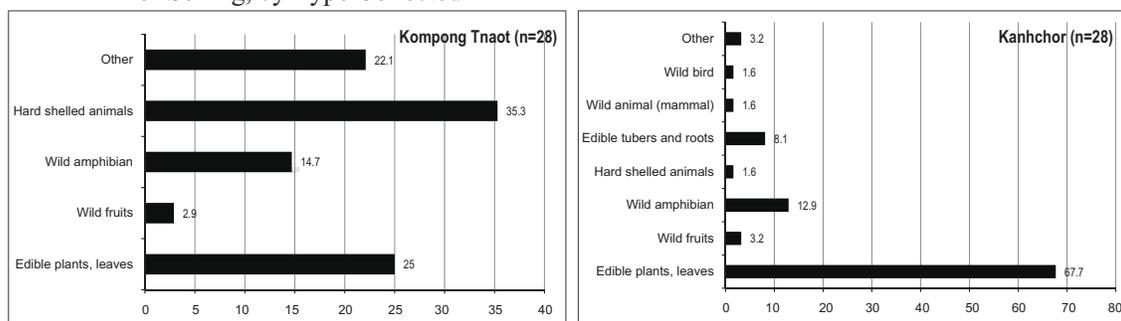


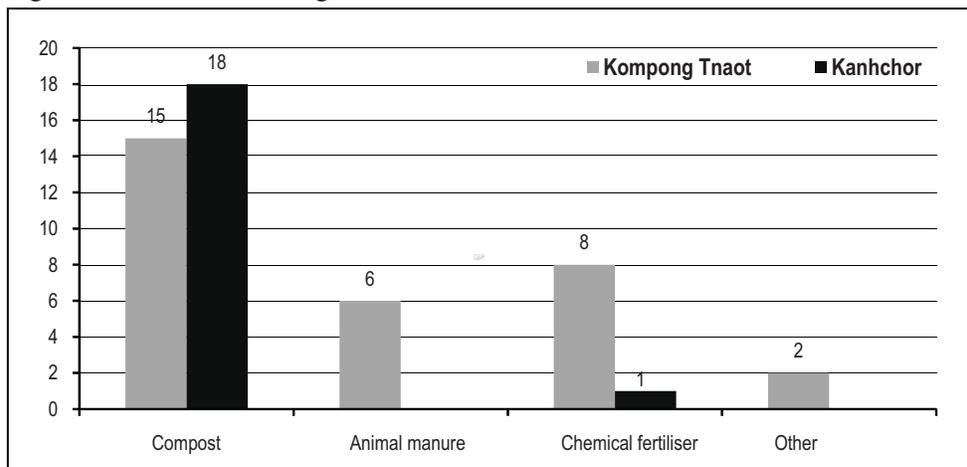
Table 11: Income (USD) of Study Households from Other Wild Foods in Kompong Tnaot and Kanhchor Villages, by Season

Variable	n	Median	Mean	Std Dev	Min	Max
<i>Kompong Tnaot</i>						
Gross value in dry season	18	3.6	7.3	15.0	0.2	66.3
Cost value in dry season	18	0.0	0.0	0.0	0.0	0.2
Net value in dry season	18	3.6	7.3	15.0	0.2	66.3
Gross value in rainy season	26	9.2	17.5	32.3	0.2	162.6
Cost value in rainy season	26	0.0	1.0	2.5	0.0	9.8
Net value in rainy season	26	7.7	16.5	30.6	0.2	152.9
Annual gross value	28	10.6	20.9	32.3	0.7	162.6
Annual cost value	28	0.0	0.9	2.4	0.0	9.8
Annual net value	28	10.2	20.0	30.8	0.7	152.9
<i>Kanhchor</i>						
Gross value in dry season	14	2.0	14.2	27.2	0.2	91.0
Cost value in dry season	14	0.0	0.0	0.0	0.0	0.0
Net value in dry season	14	2.0	14.2	27.2	0.2	91.0
Gross value in rainy season	27	12.2	28.0	45.9	0.2	227.4
Cost value in rainy season	27	0.0	0.2	0.9	0.0	4.9
Net value in rainy season	27	12.2	28.0	45.9	0.2	227.4
Annual gross value	28	14.8	34.1	52.6	0.4	227.4
Annual cost value	28	0.0	0.2	0.9	0.0	4.9
Annual net value	28	14.8	33.9	52.6	0.4	227.4

3.4.9 Fertilisers

The study households use compost to fertilise their rice fields, according to the survey. Around 15 interviewees in Kompong Tnaot and 18 in Kanhchor claimed to mainly use compost on their fields (Figure 13). However, chemical fertiliser remains important for the study households in Kompong Tnaot village.

Figure 13: Households' Usage of Purchased Fertilisers



3.4.10 Fresh Water

In Kanhchor village, FGD participants reported that the river had become shallower, which has affected water quality. Eutrophication and explosive growth of algae were also mentioned by the interviewees during the survey period. These appear to have resulted from the decreasing river flow, which could be an effect of dam constructions in the upstream areas of the Mekong River. Some parts of the village are always affected by flood in July every year. In 2008-2009, farmers were able to harvest high rice yields because there was enough water for irrigation. It should be noted that Kanhchor had previously experienced an exceptionally long dry season.

Villagers were asked to share their experiences of dealing with flood and drought, and to describe the ways they adapt to cope with the impacts of flood and drought. Most said that they did not make any preparation for such shocks at all. Traditional adaptation measures include building elevated enclosures for livestock, increasing the household's food stocks, increasing feedstock for animals, and preparing boats for travelling during the floods. Some households move to a safer place in anticipation of the floods.

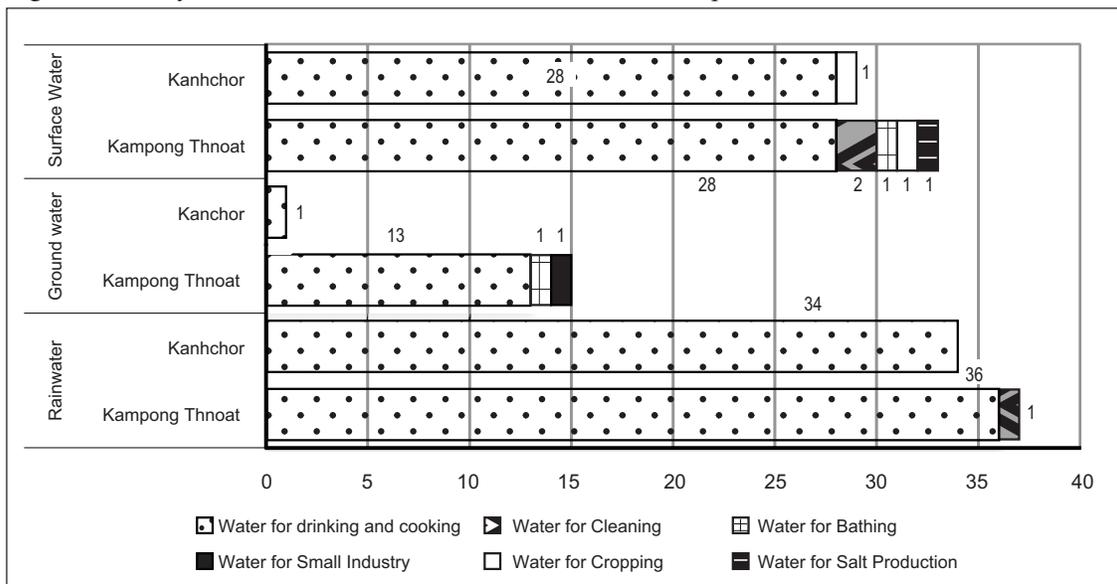
Respondents were also asked about their sources of water for cleaning, drinking and cooking, bathing, small industry, transporting goods, cropping, and salt production. Among the three sources (rain water, ground water, and surface water), 16 study households in the two villages extract a small volume of ground water for domestic purposes (drinking and cooking) (Figure 14). In Kompong Tnaot village, respondents depend on ponds and rainwater as their water source. Some households use water from pump wells in the rainy season. Water shortage is a major problem during the dry season.

3.5 Cultural Services

3.5.1 Tourism

Survey households in the two study villages are unable to earn incomes from the tourism sector. Based on the interviews, none of the respondents reported that benefits from the tourism sector could contribute to household income.

Figure 14: Study Households' Sources of Water for Various Purposes



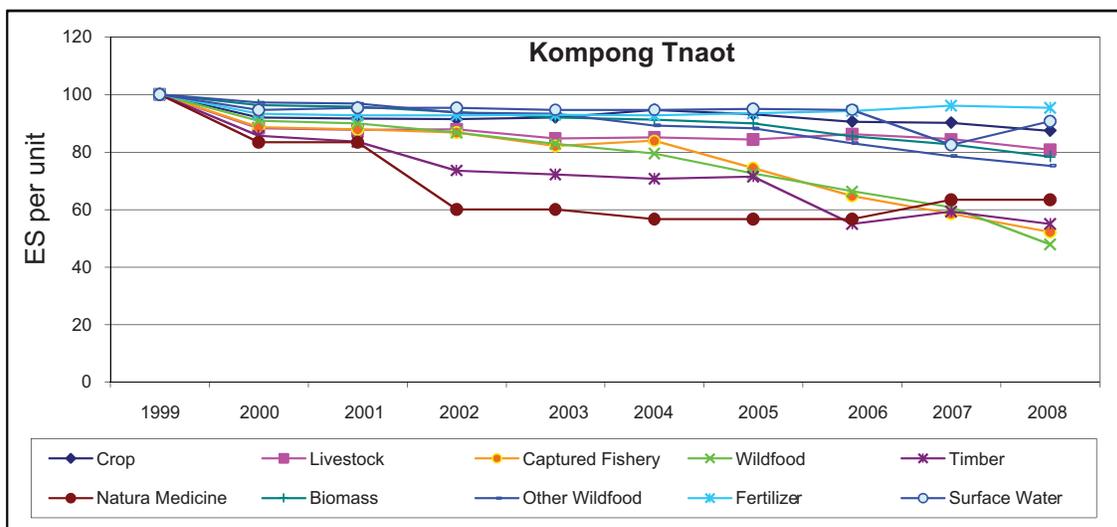
3.6 General Trends

3.6.1 Ecological Services

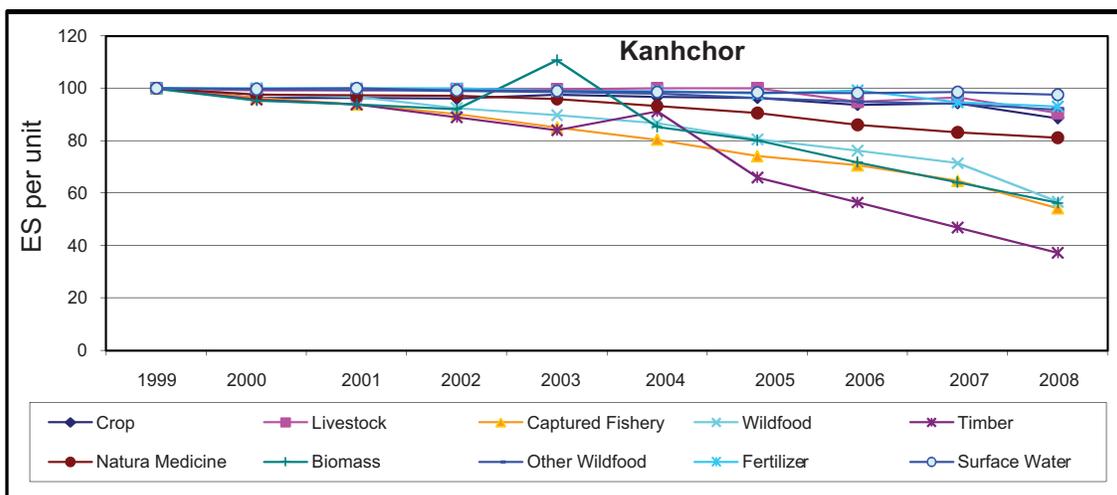
Ecological services, which mostly contribute to household income in the two study provinces, have generally shown a decreasing trend (Figure 15). In Kampot, all resources are on the decline. This is due to the increasing numbers of people who collect these resources using illegal equipment such as small nets and who cut mangroves for salt farms. The lack of law enforcement also contributes to the problem. Fishermen have to fish further out in the deep sea at high risk of big waves and storms. Some people have changed their jobs while others have kept doing the same income earning work even though they may earn less from such work from year to year.

In Kratie province, the degradation of resources due to forest clearance, deforestation, and the entrance fee that has been charged to get access to resources since the forest was occupied by a forest concession company have created difficulties for the villagers' livelihoods. The villagers observed that the resources in the study village had markedly declined and people could hardly find the forest products they rely upon for food and income for their daily lives nearby their villages.

Figure 15: Trends in Households' Collections from Ecological Services in the Study Areas



Note: 100 is the benchmark of the amount of resource collected in 1999.



FGD participants also clearly indicated that the river is shallower and the covering of *slae* (algae) that often appear on the surface of the water is increasingly dense. This is due to the slower flow of the river which may have resulted from dam construction on the upper Mekong River. Kanhchor village is often flooded and river fishing is no longer practiced because more and more people block the rivers in Kampong Cham province to fish using *manh* (small net).

The dry season has become longer than the rainy season and the weather is becoming hotter, according to the FGD participants. The rain is said to be uneven. Villagers think that the decreasing forest is the reason for the hotter weather. The amount of insect damage to crops has also increased in the survey areas and to cope with this issue, villagers unthinkingly use a lot of pesticides and insecticides.

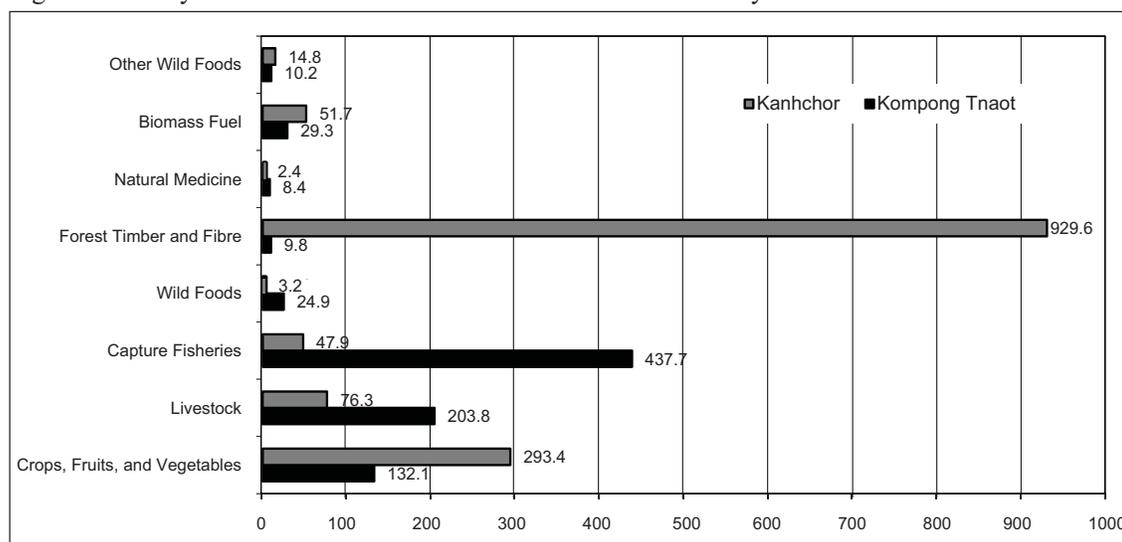
In general, the key ecological services including fishery, wild food, forest timber and fibre, natural medicine, biomass fuel and other wild foods, have gradually decreased over the period 1999 to 2008 due to the many above mentioned reasons.

3.6.2 Ecosystem Services as a Key Resource

During the field interviews, most villagers in the study sites said they mainly rely on the ecosystem services for their daily livelihood and income earning. The declining trend in such ecosystem services would, in turn, bring down family incomes and the livelihoods of local people.

Figure 16 shows that the study households' annual net value (in median terms) from ecosystem services is obtained mainly from crops, livestock, biomass fuel and fisheries followed by forest timber and fibre in Kratie, and wild food in Kampot. Only a few people derive a high income from forest timber and fibre. However, it is no longer a long term income source because the concession company has gradually stopped villagers from accessing these resources.

Figure 16: Study Households' Median Annual net Value from Ecosystem Services



3.6.3 Poverty Levels and Ecosystem Services

As Table 12 shows, about 36 out of 40 households – particularly those in the poor and medium groups – heavily depend upon five main ecosystem services. Poor and medium households are more likely to rely on the entire range of main ecosystem services, with an almost equal number of them citing their dependence on these due perhaps to their lack of access to substantial works or businesses that they could otherwise draw upon. Better off households in Kanhchor tend to rely on four of the five ecosystem services, while those in Kompong Tnaot rely on three, suggesting their dependence on livelihoods that do not necessarily draw upon these ecosystem services. These latter households have adequate means to purchase daily food items without having to go to the forests unlike poor and medium households who consider ecosystem services as being very important for their daily subsistence.

The situation of the poor has become difficult from time to time because of the reduced means of access to ecosystem services (especially crops, fruits and vegetables, fishery and forest products, biomass fuel and wild foods). As observed in the above sections on the different provisioning services, poor households are less able to gain access to crops, fruits and vegetables, fishery and forest products, biomass fuel and wild foods as main sources of income since their opportunities or means to do so are lower compared to the better off households.

Table 12: Study Households' Poverty Groupings and Dependence on Four Main Ecosystem Services (percent distribution)

Poverty levels ^{a/}	Main Types of Ecosystem Services						
	n ^{b/}	Wild food (n=25)	Forest timber (n=11)	Biomass (n=38)	Crops (n=36)	Capture fishery (n=35)	Total (n=107)
<i>Kompong Tnaot</i>							
Poor	17	48.0	45.4	42.1	36.1	42.9	42.7
Medium	20	52.0	54.6	52.6	55.6	54.3	53.7
Better off	3	0.0	0.0	5.2	8.3	2.9	4.1
Total	40	17.4	7.5	26.2	24.3	24.1	100.0
Poverty levels ^{a/}	n ^{b/}	Wild food (n=11)	Forest timber (n=25)	Biomass (n=38)	Crops (n=38)	Capture fishery (n=22)	Total (n=96)
<i>Kanhchor</i>							
Poor	13	36.4	36.0	34.2	28.9	36.4	33.5
Medium	23	63.6	56.0	57.9	60.5	54.6	58.2
Better off	4	0.0	8.0	7.9	10.5	9.1	8.2
Total	40	8.2	18.1	28.3	28.3	16.4	100.0

^{a/} Poverty groupings are based on the 2008 wealth ranking activity of CDRI's PARD Programme.

^{b/} This represents the total number of households.

IV

CONCLUSION

The research findings indicate that ecosystem services remain significant for dependent households in rural areas. In Kompong Tnaot village, fishery resources are a main income source for households, followed by biomass fuel and wild foods; villagers that have adequate tools and equipment earn more than those who do not. In Kanhchor, villagers were frequently affected by flood and drought. Poor households often did not know how to cope with the serious impacts of flood and drought and they employed traditional mechanisms to mitigate these shocks. The apparent effects of climate change, including flood, changes in water regime and quality, higher temperatures and stronger winds, long dry season and late rainy season, uneven rains, and increased number of insects would lead to ecosystem services degradation and increase the rate of poverty in the rural areas.

As the ostensible impact of climate change becomes a real challenge for rural people, the relevant government ministries and agencies should make appropriate efforts to implement the Cambodian NAPA. The purpose of the NAPA framework is to guide the coordination and implementation of adaptation initiatives through a participatory approach, and to build synergies with other relevant environment and development programmes. The aim is to address the urgent and immediate needs and concerns of people at the grassroots level for adaptation to the adverse effects of climate change in key sectors such as agriculture, water resources, coastal zone and human health.

The analyses show that the number of poor households depending on ecosystem services, especially crops, fruits and vegetables, fishery, forest products and wild foods, as their main income sources is higher than the number of medium and well off households relying on these resources (see also Figure 15). In Kanhchor village, forest timber and fibre is a major ecosystem resource that contributes to high income for the study households followed by livestock. It must be noted from FGD participants' reports, however, that poor households find it increasingly difficult to access forest areas because these areas now belong to the forest land concession owner. Deforestation, which seriously affects the NTFPs collected by local people for their daily needs, was continuing within the land concession areas during the survey period.

The government and the local authorities should pay more attention to cracking down on illegal activities which lead to the degradation of natural resources including the use of harmful equipment that causes the destruction of aquatic resources, forest clearance, land encroachment and, deforestation. And, since some former forest concession areas³ have now become economic land concessions, regulatory institutions and local authorities should periodically undertake appropriate activities (including law enforcement measures if needed) to monitor

3 The former area under the Kasotin Forest Concession Company in Kanhchor village has now been converted to an economic land concession area.

the performance of the economic land concession contracts. This is to ensure that they follow the Forestry Law, the National Forest Sector Policy, the Sub-Decree on Forest Concession Management and the Sub-Decree on Economic Land Concession. The aim of these legal guidelines is not only to generate state or provincial or communal revenues but also to increase employment in rural areas within the framework of the intensification and diversification of livelihood opportunities, improvement of food security, reduction of poverty and integrated natural resource management based on ensuring the sustainability of appropriate ecological systems.

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ANNEX

HOUSEHOLD SURVEY QUESTIONNAIRE ON ECOSYSTEM SERVICES

SEI PROJECT

Control information

Task	Date(s)	By whom?	Status ok? if not, give comments
Interview			
Checking questionnaire			
Coding questionnaire			
Entering data			
Checking & approving data entry			

I. General Information

1. Questionnaire number in village..... (Numbered by team leader prior to the interview)
2. Duration: |__|__| minutes (started at finished at.....)
3. Name of the team leader: Code: |__|__| Name:
- Note for the questionnaire
4. Name of province: Code: |__|__| Name:.....
5. District: Code: |__|__| Name:.....
6. Commune: Code: |__|__| Name:.....
7. Village: Code: |__|__| Name:.....
8. Name of the interviewee: Sex of interviewee: 1= male 2= female |__|
9. Age of interviewee: |__|__| years
10. Marital status |__| 1=married 2= single 3=divorced 4=other (specify).....
11. Relationship of interviewee to household head: (Code below) |__|
1 = head of household 2 = spouse 3 = child 4 = parents 5 = other
12. Highest education completed.....
13. Family member: name of head of household: Spouse's name:
14. Sex of head of household: 1= male, 2=female |__|

How many people are currently living in the household? Exclude those who have never visited house in the past 6 months. (enter number of people)	Male	Female
1. Total		
2. Adolescents 0 – 14 years		
3. Adults 15-64 years		
4. Elderly 65+ years		

15. How many plots of agricultural land does your household possess?plots

Farm land	Size (Area) m ²	Distance from home (m)	Is land used owned or leased? (1=owned 2=leased)
First plot			
Second plot			
Third plot			
Fourth plot			
Fifth plot			
Other plots (eg. residential area.....)			

16. What are the household's main income sources? Rank max 3

1. Farming
2. Farm work within the village (labour wage work)
3. Work outside village in Cambodia
4. Work in Thailand
5. Migration to Thai-Cambodian border
6. Small trade
7. Palm juice/sugar production
8. Fishing
9. Collecting resources from water or fields
10. Collecting resources from the forests
11. Government official
12. Other (specify.....)

Income Sources	Rank
	Primary income source
	Secondary income source
	Tertiary income source

II Mapping of Provisioning and Cultural Ecosystem Services

2.1. What types of resources does your household collect and use?

1. Resources	2. Ownership (code-tenure)	3. Approx. area (ha)	Main users ^b (max. 5)					Main products (max. 5) (code-product)				
			4. 1 st	5. 2 nd	6. 3 rd	7. 4 th	8. 5 th	9. 1 st	10. 2 nd	11. 3 rd	12. 4 th	13. 5 th
<p>1. Wild foods (collected from the forests) 1=edible plants and leaves 2=edible tubers and roots 3=wild fruits 4= wild animals (mammals) 5= wild insects 6= wild birds 7= wild amphibians 8= hard shelled animal (crab, snail, lobster...) 9= reptiles 10=processed wild food products 11=other (specify).....</p> <p>2. Forest timber and other fibre 1=timber 2=pole 3=processed timber (sawn wood, equipment...) 4=construction materials 5=resin 6= bamboo 7=rattan 8=cotton 9=hemp 10=silk 11=other (specify).....</p> <p>3. Natural Medicine 1=tree extracts (tree, bark, leaves, roots...) 2=wild life 3=plants (like shrubs or herbs) 4=honey 5=other, (specify).....</p> <p>4. Biomass fuel 1=firewood 2=firewood for charcoal production 3=small branches 4= animal (manure) 5= other (specify).....</p> <p>5. Crops 1= fruit 2= rice 3= vegetables 4= maize 5= sweet potato 6= soy bean 7= mung bean 8=sesame 9=peanuts 10= watermelon 11= cassava 12= other (specify).....</p> <p>6. Fertilisers for fields 1=composting 2=animal manure 3=EM fertiliser 4= chemical fertiliser 5=other (specify).....</p> <p>7. Other wild food (not planted or raised) from rice field and chamkar or from other areas (not collected from the forest) 1=edible plants and leaves 2=edible tubers and roots 3=wild fruits 4=wild animals (mammals) 5=wild insects 6= wild birds 7=wild amphibians 8=hard shelled animal (crab, snail, lobster) 9=reptiles 10=processed wild food products 11=other (specify).....</p> <p>8. Capture fisheries (from natural river, stream, lake, pond, sea...) 1= fresh water fish 2=fresh water shrimp 3=fresh water lobster 4= fresh water frog/toad 5= fresh water crab 6= fresh water shellfish (snail, shell) 7= sea fish 8= sea shrimp 9= sea lobster 10= sea crabs 11= sea shellfish 12= sea grass 13= coral reef 14= algae 15=other (specify).....</p>												

<p>9. Aquaculture 1= fresh water fish 2= fresh water shrimp 3= fresh water lobster 4= fresh water frogs and toads 5= fresh water crab 6= fresh water shellfish (snail, shell) 7= sea fish 8= sea shrimp 9= sea lobster 10= sea crabs 11= sea shellfish 12= sea grass 13=coral reef 14= algae 15=other (specify).....</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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2.2. What are the quantities and values of products the members of your household collected for both own uses and sales over last year?

Season	Dry season	Rainy season	1. Provisional and cultural services	2. Collected by whom?	3. Collected from where?	4. Unit	5. Own use (incl. gifts)	6. Sold (incl. barter)	7. Price per unit	8. Type of market (code-market)	9. Cost inputs & hired labour
	2. Collected by whom?	2. Collected by whom?	3. Collected from where?	3. Collected where?	4. Unit	5. Own use (incl. gifts)	6. Sold (incl. barter)	7. Price per unit	8. Type of market (code-market)	9. Cost inputs & hired labour	
			Land type (code -land)	Land type (code -land)	Ownership (code-tenure)	Ownership (code-tenure)					
			1. Wild foods (collected from the forests) 1=edible plants and leaves 2=edible tubers and roots 3=wild fruits 4= wild animals (mammals) 5= wild insects 6= wild birds 7= wild amphibians 8= hard shelled animal (crab, snail, lobster...) 9= reptiles 10=processed wild food products 11=other (specify).....								
			2. Forest timber and other fibre 1=timber 2=pole 3= processed timber (sawn wood, equipment) 4= construction material 5=resin 6= bamboo 7= rattan 8=cotton 9=hemp 10= silk 11=other (specify).....								
			3. Natural medicine 1= tree extracts (tree, bark, leaves, roots...) 2=wild life 3=plants (e.g. shrubs or herbs) 4= honey 5= other (specify).....								

2.3. Resource trend

	If you collected 100 in 1999	How much did you collect in 2000?	How much did you collect in 2001?	How much did you collect in 2002?	How much did you collect in 2003?	How much did you collect in 2004?	How much did you collect in 2005?	How much did you collect in 2006?	How much did you collect in 2007?	How much did you collect in 2008?
1. Wild foods (collected from the forests) 1=edible plants and leaves 2=edible tubers and roots 3=wild fruits 4= wild animals (mammals) 5=wild insects 6=wild birds 7=wild amphibians 8=hard shelled animal (crab, snail, lobster...) 9=reptiles 10=processed wild food products 11=other (specify).....										
1 st										
Why?										
Coping strategy										
2 nd										
Why?										
Coping strategy										
3 rd										
Why?										
Coping strategy										
2. Forest timber and other Fibre 1=timber 2=pole 3=processed timber (sawn wood, equipment...) 4= construction material 5=resin 6=bamboo 7=rattan 8=cotton 9=hemp 10=silk 11=other (specify)	If you collected 100 in 1999, ...	How much could you collect in 2000?	How much did you collect in 2001?	How much did you collect in 2002?	How much did you collect in 2003?	How much did you collect in 2004?	How much did you collect in 2005?	How much did you collect in 2006?	How much did you collect in 2007?	How much did you collect in 2008?
1 st										
Why?										
Coping strategy										
2 nd										
Why?										

Coping strategy	If you collected 100 in 1999	How much did you collect in 2000?	How much did you collect in 2001?	How much did you collect in 2002?	How much did you collect in 2003?	How much did you collect in 2004?	How much did you collect in 2005?	How much did you collect in 2006?	How much did you collect in 2007?	How much did you collect in 2008?
3 rd										
Why?										
Coping strategy										
3. Natural Medicine 1= tree extracts (tree, bark, leaves, roots...) 2=wild life 3=plants (like shrubs or herbs) 4= honey 5= other, (specify).....										
1 st										
Why?										
Coping strategy										
2 nd										
Why?										
Coping strategy										
3 rd										
Why?										
Coping strategy										

<p>4. Biomass fuel 1=firewood 2=firewood for charcoal production 3=small branches 4= animal (manure) 5= other (specify).....</p>	<p>How much did you collect in 2000? How much did you collect in 2001? How much did you collect in 2002? How much did you collect in 2003? How much did you collect in 2004? How much did you collect in 2005? How much did you collect in 2006? How much did you collect in 2007?</p>	<p>If you collected 100 in 1999</p>										<p>How much did you collect in 2008?</p>																																																																																																																																																																																																																																																																																																																																																																																																																						
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<p>Why? Coping strategy</p>																																																																																																																																																																																																																																																																																																																																																																																																																																		

Coping strategy	If you collected 100 in 1999	How much did you collect in 2000?	How much did you collect in 2001?	How much did you collect in 2002?	How much did you collect in 2003?	How much did you collect in 2004?	How much did you collect in 2005?	How much did you collect in 2006?	How much did you collect in 2007?	How much did you collect in 2008?
9. Other wild food (not planted or raised) from rice field and chamkar or from other areas (not collected from the forest) 1=edible plants and leaves 2=edible tubers and roots 3=wild fruits 4= wild animals (mammals) 5= wild insects 6=wild birds 7=wild amphibians 8= hard shelled animals (crab, snail, lobster...) 9= reptile 10=processed wild food products 11=other (specify).....										
1 st										
Why?										
Coping strategy										
10. Capture fisheries (from natural river, stream, lake, pond, sea...) 1= fresh water fish 2= fresh water shrimp 3= fresh water lobster 4= fresh water frogs and toads 5= fresh water crab 6= fresh water shellfish (snail, shell) 7= sea fish 8= sea shrimp 9= sea lobster 10= sea crabs 11= sea shellfish 12=sea grass 13=coral reef 14=algae 15=other, specify.....										
1 st										
Why?										
Coping strategy										
2 nd										
Why?										
Coping strategy										
3 rd										
Why?										
Coping strategy										

	If you collected 100 in 1999	How much did you collect in 2000?	How much did you collect in 2001?	How much did you collect in 2002?	How much did you collect in 2003?	How much did you collect in 2004?	How much did you collect in 2005?	How much did you collect in 2006?	How much did you collect in 2007?	How much did you collect in 2008?
11. Aquaculture 1= fresh water fish 2= fresh water shrimp 3= fresh water lobster 4= fresh water frogs and toads 5= fresh water crab 6= fresh water shellfish (snail, shell) 7=sea fish 8=sea shrimp 9=sea lobster 10= sea crabs 11=sea shellfish 12=sea grass 13=coral reef 14=algae 15=other (specify)..... 1 st Why? Coping strategy 2 nd Why? Coping strategy 3 rd Why? Coping strategy										
12. Livestock How has the quantity of animal fodder changed? 1= cow 2= buffalo 3=pig 4=chicken 5=duck 6=other (specify)..... 1 st Why? Coping strategy 2 nd Why? Coping strategy	If you collected 100 in 1999	How much did you collect in 2000?	How much did you collect in 2001?	How much did you collect in 2002?	How much did you collect in 2003?	How much did you collect in 2004?	How much did you collect in 2005?	How much did you collect in 2006?	How much did you collect in 2007?	How much did you collect in 2008?

	If your income was 100 in 1999	What was your income in 2000?	What was your income in 2001?	What was your income in 2002?	What was your income in 2003?	What was your income in 2004?	What was your income in 2005?	What was your income in 2006?	What was your income in 2007?	What you're your income in 2008?
16. Tourism (income from tourists, hiking or touring the area) 1=accommodation 2=hiking 3=tour guiding 4=serving food 5=other (specify).....										
1 st										
Why?										
Coping strategy										
17. Ethical values 1=spiritual from forest land 2=spiritual from river 3=spiritual from specific places (specify).....	If people still practiced this belief 100 % in 1999	How about in 2000?	How about in 2001??	How about in 2002	How about in 2003?	How about in 2004?	How about in 2005?	How about in 2006?	How about in 2007?	How about in 2008?
1 st										
Why?										

Thank you!

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