



RESEARCH REPORT

No. 2010-RR10

A Cost and Benefit Analysis of the Community Forestry Project in Chumkiri District, Kampot Province, Cambodia

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In Cambodia, past attempts at forest management have proved to be unsustainable and have contributed to a significant decline in the country's forest cover. In recent years, the country's authorities have responded by introducing a major Community Forestry (CF) programme that aims to enhance community involvement in forest management. To see whether this scheme is worth supporting, a new EEPSEA study has analysed the costs and benefits of the CF management scheme in one area of the country.

The study is the work of a team led by Kalyan Hou from the CBNRM-Learning Institute in Phnom Penh, Cambodia. It examines three CF management scenarios and compares them to the 'base-line' non-CF management approach. It finds that the CF Conservation Option, in which only a restricted forest zone is exploited, is the approach that provides the most benefits to local communities and to the environment. The study therefore recommends that Cambodia should strengthen its plans for CF in the future.

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September 2008

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EEPSEA is supported by the International Development Research Centre (IDRC); the Swedish International Development Cooperation Agency (Sida); and the Canadian International Development Agency (CIDA).

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ACKNOWLEDGEMENTS

The research team would like to express our deep thanks to the ladies, gentlemen, and all local people of Thmei, Damrei Koun, Kandal village of Chum Pouvan commune and Damnak Snoul, Prey Yav and Tbaeng Pok village of Srae Knong commune, Chumkiri District, Kampot Province. They gave a lot of time and knowledge to the research team during the data collection.

The team also thanks the Economy and Environment Program for Southeast Asia (EEPSEA) and The Community-Based Natural Resources Management Learning Institute (CBNRM LI) for both technical and financial support for us to complete this research and produce an important document for the future of community forestry development in Cambodia.

Our gratitude goes to Dr. David Glover, Dr. Hermi Francisco, Director of EEPSEA Program; Dr. Orapan Nabangchang, Senior Economist of EEPSEA; Mr. Toby Carson, Program Advisor of CBNRM LI; Mr. Ken Serey Rotha, outgoing Executive Director of CBNRM LI; and Mr. Srey Marona, Program Coordinator of CBNRM LI, who has strongly supported and advised the research team.

We are also grateful to Mr. Muong Sideth, Local Advisor of the EVNRM Project, and Dr. Top Neth, who assisted with the data analysis.

Finally, the EVNRM team is extremely thankful to all our partners as well as the agencies, commune councils, village chiefs, and local people in the study area, Chumkiri District, Kampot Province. These stakeholders have not only provided information valuable to the study, but they have also shown us the kindest support, utmost cooperation, and active participation in the research activities.

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Published by the Economy and Environment Program for Southeast Asia (EEPSEA)
22 Cross Street #02-55 South Bridge Court Singapore 048421 (www.eepsea.org)
Tel: +65-6438-7877 Fax: +65-6438-4844 Email: eepsea@idrc.org.sg

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ISBN: 978-981-08-8664-6

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LIST OF ABBREVIATIONS

AGB	Abovet Ground Biomass
CBNRM LI	Community-Based Natural Resource Management Learning Institute
CBA	Cost-Benefit Analysis
CDRI	Cambodia Development Resource Institute
CIDA	Canadian International Development Agency
CIDSE	Cooperation International for Development and Solidarity
CF	Community Forestry
CFDO	Community Fisheries Development Office
CFMC	Community Forestry Management Committee
CFRP	Community Forestry Research Project
CPADO	Community Protected Areas Development Office
DPA	Development Partnership Agency
EEPSEA	Economy and Environment Program for Southeast Asia
EVNRM	Economic Valuation Natural Resource Management
FA	Forestry Administrative
FGD	Focus Group Discussion
HH	Households
IDRC	International Development Research Centre
IO	International Organization
MoE	Ministry of Environment
NGO	Non-Government Organization
NPV	Net Present Value
NRM	Natural Resource Management
NTFP	Non-Timber Forest Product
PLG	Partnership for Local Governance
PRA	Participatory Rural Appraisal
PV	Present Value
RUA	Royal University of Agriculture, Phnom Penh, Cambodia
SIDA	Swedish International Development Cooperation Agency

A COST AND BENEFIT ANALYSIS OF THE COMMUNITY FORESTRY PROJECT IN CHUMKIRI DISTRICT, KAMPOT PROVINCE, CAMBODIA.

Kalyan Hou and Sothunvathanak Meas

EXECUTIVE SUMMARY

Past experience with the forest management system of Cambodia has shown that the open-access forest scheme has contributed to the decline of timber and non-timber forest products collected from the forests. Authorities have responded by introducing a major program of Community Forestry (CF) in more than 237 CF areas covering 71,724 ha and involving 411,440 people. To assess if this scheme is worth supporting, an economic analysis of a CF managed forest is compared with alternative management schemes in Chumkiri district of Kampot province was carried out. The study examined three scenarios of CF management.

In the first management option, the Conservation Option, only 389.5 ha out of 992 ha of forest was used for timber (12.3 m³/ha/yr) and non-timber product collection. The present value of total costs over a 30-year time period at a 10% discount rate was about USD 821,000 (Table A-2). This option could generate benefits of up to USD 6.30 million measured in terms of present value.

The second option, the Exploitation Option, involved the exploitation of forest products with CF management. The present value of total costs over a 30-year time period at a 10% discount rate would be USD 1.16 million, and the present value of benefits would be about USD 5.01 million (Table A-3).

The third option, which combined the Conservation and Exploitation Options, showed that the present value of total costs over a 30-year time period at a 10% discount rate would be nearly USD 1 million while the present value of benefits would be up to USD 5.92 million (Table A-4).

Cost-Benefit Analysis was used to estimate the incremental net benefit of the three CF management options relative to the base case scenario (non-CF management). The study ranked the three options in terms of the incremental net benefit over the base case.

The Conservation Option turned out to be the most economically viable, followed by the Combined Option, and lastly by the Exploitation Option. A Sensitivity Analysis showed that the Conservation Option ranked first even under the assumptions of higher price of timber and non-timber products, and different project duration and discount rates.

1.0 INTRODUCTION

1.1 Historical Background of Forest Management in Cambodia

Natural resources, especially forest resources, play a significant role in the economy of Cambodia as well as in the livelihood of rural Cambodians. Although most of the population is primarily dependent on agriculture, forest resources are highly valued for daily consumption and use. Forests provide resources for construction materials, human food, animal fodder, medicines, and income generation, and a place for pursuit of spiritual well-being.

The management of forests in Cambodia has gone through various stages over the last 50 years. Before 1975, legal forest harvesting took place under a system of “collection permits” that had been established during French colonial times (McKenney and Prom, 2002:81). After paying a certain fee for the permits, loggers then had a fixed time to fell trees. The loggers did not have to make management plans or define the harvesting area. From 1975 to 1979, there was no record of forest management programs in the government. In the 1980s, the management task fell to the control of the Forestry Department. However, the pace of forest exploitation by powerful interest groups in the country increased starting in the late-1980s, which continued until before the elections in 1993. Following the elections, the Government went back to the system of issuing permits and having private industrial forest concessions.

From 1973 to 1976, the forest of Cambodia covered approximately 12.7 million ha, or 72% of the country’s total land area. Over the years, the forest area has been gradually lost. In 2002, the area covered by forests had decreased to 10.4 million ha, or 57% of the country’s total land area. Large areas of once forest land have been degraded (McKenney et al 2004). Seeing the problem of forest destruction and degradation almost everywhere in the country, the government started to look for other approaches to forest management that called for more participation from local communities. With this in mind, Community Forestry (CF) began to receive considerable attention as a potential alternative (or complement) to forest concession management (McKenney and Prom, 2002).

Broadly speaking, CF is an effort to support and empower communities to continue their traditional uses of forest resources and to encourage sustainable practices. CF plays an important role in the reformation of the forestry sector. It is also a strategy for poverty reduction of the Royal Government of Cambodia (Chea Sam Ang, Sok Heng and Prak Marina, 2005). As an alternative management system, CF enables the effective participation of local people and communities in managing forest resources by focusing on the forest resources on which they depend (CBNRM LI presentation, 2006).

Legal instruments were enacted to guide and support the CF formulation and implementation. These include the Forestry Law, CF Sub-Decree, and CF Prakas on CF guidelines. So far, over 237 CF areas have been established totalling 71,724 ha and involving 411,440 people (CDRI, 2002). Most of these CF areas were established through projects with support from local NGOs, international organizations (IOs), and government agencies.

One example of these CF areas in Cambodia is the CF project in Chumkiri, Kampot Province, which is supported by the Community Forestry Research Project (CFRP ¹). This CF area was developed in early 2001 and covers 992 ha of degraded forest connected to a population of 633 households from three villages. CF rules and regulations were formulated and were recognized at the provincial level. Five committee members were selected from the three villages to lead and implement the CF activities.

After more than 4 years of implementation, it is timely to assess whether or not CF had been a good approach for better forest management in the area in terms of its costs and benefits to the local community and to other key stakeholders. Hence, this research assessed the costs and benefits of the CF program. It also determined the factors that contributed to the optimisation of costs and benefits of the CF program.

1.2 Scope of the Study

The research was conducted in two communities: one where the primary focus was CF management and one without any CF management. The community under the CF initiative consisted of three villages: Prey Yav, Tbaeng Pok, and Damnark Snuol villages in Srae Knong commune. The community without CF (Non-CF) consisted of three villages: Thmei, Kandal and Damrei Koun villages in Chumpouvoan commune, and Chumkiri District, Kampot Province. The selected communities under both CF and Non-CF management had similar key biophysical and socio-economic characteristics. These similar characteristics included forest type, social structure, and income level. In the Non-CF community, the forest area was degraded, and people accessed forests outside their commune's forest area. This case was mirrored throughout the whole country.

The study focused on both the direct and indirect use values of the forest. Direct values comprised NTFPs, timber forest products, and wildlife collected from the CF and Non-CF areas. The indirect values of the forest included watershed management, soil erosion, and environmental values (ETAP, 1998). The ETAP paper (ETAP 1998) cited a survey showing reduced soil erosion in the CF area and soil erosion problems in the non-CF area, but nothing about soil erosion values. This raised the larger question of how to include and utilise indirect values and present them in a way relevant to this study.

1.3 Limitations

Several components of use value were considered. However, the team could not address all of these immediately as it had limited time and resources available for the study.

1.4 Target Audience

The results should be useful to the CBNRM LI, Forestry Administration, Royal University of Agriculture, and other NGOs working in CF.

The findings may also be used as recommendations to policy makers for making better decisions in CF management.

¹ CFRP was a government project incorporating three government agencies including the Forestry Administration, the Royal University of Agriculture and the Ministry of Environment. It was supported by Canada's International Development Research Centre (IDRC).

2.0 RESEARCH METHODOLOGY

2.1 Research Objectives

The overall objective of the study was to assess the costs and benefits of the ongoing CF project in Chumkiri; to identify the factors influencing the outcomes of CF implementation; and to compare these to a Non-CF area. In this study, the specific objectives were:

- To identify the main costs of both a CF and a Non-CF managed forest in terms of project costs and costs to community members (e.g., time, money)
- To identify the main benefits of both a CF and a Non-CF managed forest in terms of environmental benefits and biodiversity conservation
- To quantify the main benefits of both CF and a Non-CF managed forest in terms of economic/tangible benefits and improvements in local livelihoods
- To compare the costs and benefits of the CF project with the costs and benefits in a Non-CF area
- To develop policy recommendations and areas for future research

2.2 Data Collection

The study used both primary and secondary data (2000-2006) for both forest areas (CF and Non-CF). Primary data were collected through household surveys, focus group discussions (FGDs), and direct community observation. Secondary data were gathered from existing reports, official records, and research papers.

For this study, no information was obtained on the capture of wildlife in either area. Capturing wildlife is banned by the CF by-laws and regulations. The Cambodian forest law bans hunting, which includes trapping. Under the current forestry and wildlife law, hunting wildlife is prohibited, hence, illegal hunting in the study area, mostly in the non-CF area, is decreasing. However, some members of the community still hunt for their household's own consumption. The research team observed, for instance, that wildlife was being sold in the market. Nevertheless, information on hunted wildlife has become very difficult to ascertain. The research team found it difficult to get the required information from the respondents through pre-determined/pre-tested interview questions.

2.2.1 Primary Data Collection

A final draft of the questionnaire was tested with both genders through household interviews within the target communities. The pre-test included 15 randomly selected households (HH) in the CF and 20 randomly selected households in the Non-CF area. The objective of the project was to test the 'wording' and flow of the draft questionnaire and to ensure that the data collected are sufficient to answer the research objectives. No major changes were made based on the pre-test. The household data for the study were collected from a survey of 137 randomly selected households, with 69 households in the CF area and 68 households in the Non-CF area.

Household survey: This method was used to collect primary data from the household units in the study areas. The households were asked about the utilization as well as the marketing (e.g. where these products were being sold) of timber and non-timber forest products.

Focus group discussion: In the FGD, there were 55 participants: 27 people from the Non-CF area and 28 people from the CF area. FGDs took place for one and half days in each site.

2.2.2 Secondary Data Collection

Collection of secondary data focused on several studies and reports produced from the study sites by university students, CFRP staff, and others. These included: Rapid Rural Appraisal on the Users' Right System of Natural Resources (2000), Forest Use and Product Flow in the Chumkiri District, Kampot Province (2001), and Economic Analysis on Community Forestry Establishment, Chumkiri District, Kampot Province and others (2004). The findings of these reports were used as baseline data for the research. However, there was insufficient data from these sources to support the required analysis. Therefore, other data were gathered from interviews and reports from CIDSE, Forestry Administration, and district officers in Chumkiri, Kampot Province.

3.0 MAJOR FINDINGS

3.1 Non-Community Forestry

There are seven villages in Chumpouvoan commune, Chumkiri District. The commune has 1,608 households with a population of 7,823 people, including 4,129 females. The total land area of this commune is 3,977 ha (Figure 3-1). This consists of 992 ha of forest land, 1,491 ha of rice fields, 153 ha of farmland and 426 ha of residential land. The commune centre is 2 km from the district centre. The forest area is gradually being degraded by human activities such as illegal harvesting of forest products, burning of the forest for farming, and encroaching on the land to secure tenure. Deforestation has also led to soil erosion from the upland areas to lowland areas.

Table 3-1: Population of the Seven Villages in the Chumpouvoan Communes

Name of commune	Name of village	HHs	Population	Females	Males
Chumpouvoan	Chek	169	779	420	359
	Chheu Teal	397	1,958	1,058	900
	<i>Damrei Koun</i>	149	661	363	298
	<i>Kandal</i>	257	1,343	661	682
	Khley	158	758	431	327
	Monou Nob	257	1,215	638	577
	<i>Thmei</i>	221	1,109	558	551
	Total	1,608	7,823	4,129	3,694

Notes: Villages in italic are target villages. Source: Report of population in Chumkiri district in 2006.

Of the seven villages, the study was conducted in three villages of the Non-CF area, including Damrei Koun, Kandal and Thmei villages (shown in *Italic* in Table 3-1 above). This area was chosen for the Non-CF site because it has a similar population density, forest size and condition, villagers' livelihood activities, security and accessibility as the CF site. Local people rely heavily on agricultural production, animal raising, sale of labour, small businesses, and collection of forest products for sale and for household use.

Based on the interviews and observations of the villagers in this study area, this area was covered by primary forest that was rich in many wood species and biodiversity before 1998. At the time of the study, however, the forest had been degraded because of several factors. First, there were illegal activities on forest resources by local communities living in the area and by outsiders accessing the forest area without obtaining permission from authorities. Secondly, the high demand and high value of forest products in the market have encouraged entrepreneurs to collect these resources from local people and sell these to more central markets and abroad. Finally, there was no clear management system in place, especially on the rights of local resource users to manage the forest area.

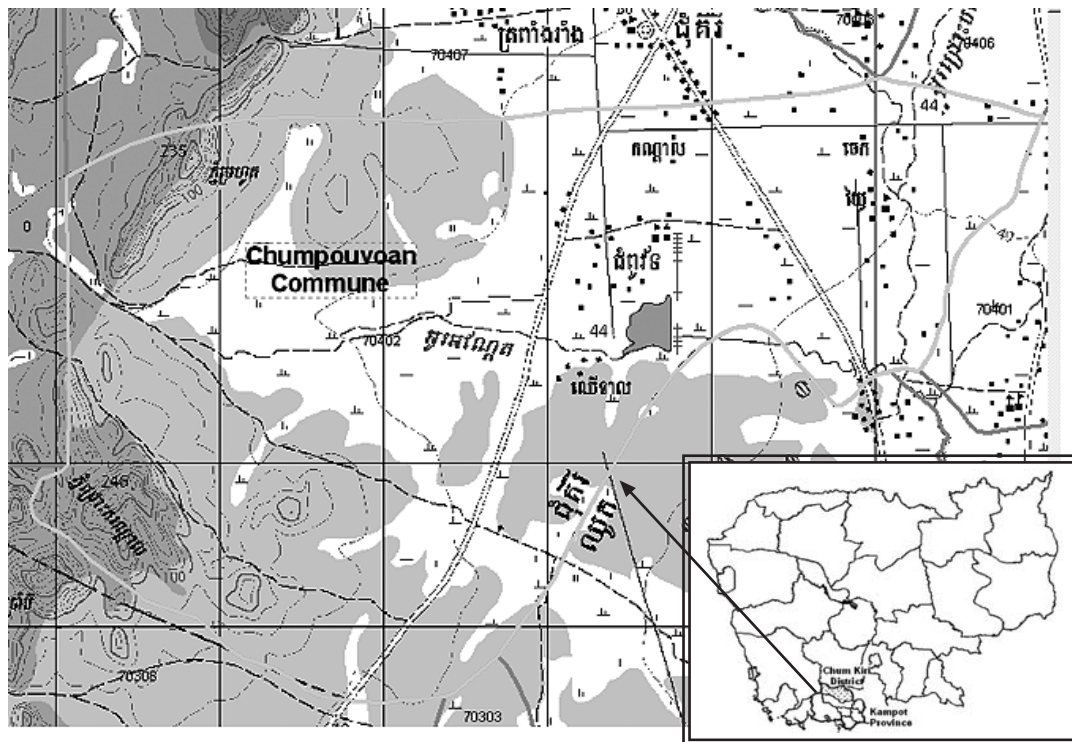


Figure 3-1: Location of the Non-CF Site in the Chumpouvoan Commune

3.1.1 Timber Forest Products

Villagers reported accessing the forest area far from their home or a distance of 10 to 50 km in areas such as Phnum Prahout and Taken Koh Slar. It took the local people 4 to 15 days per trip. They also reported spending 30 days per trip to gather forest resources.

Table 3-2: Timber Value of Non-CF at Market Price

Items	HH (%)	Total (m ³)	Price (USD)	Total Value (USD)
Log	53	888	39.41	34,975
Sawn wood	24	685	184.73	126,527
Small pole	26	1,806	14.16	25,573
Big pole	21	832	22.41	18,649
Grand Total		4,210		205,725

Source: Field Survey, 2007.

Respondents reported that the households collected logs (53%), harvested sawn wood (24%), harvested small poles (26%), and collected big poles (21%) (Table 3-2). Regarding the amount of timber collected, adjusted for comparing to a forest of equal size, people reported harvesting 888 m³ of logs, about 685 m³ of sawn wood, 1,806 m³ of small poles, and 832 m³ of big poles. Based on market values, the total benefit of timber as a product was valued at nearly USD 206,000 per year.

3.1.2 Non-Timber Forest Products

To access forest areas, people said they had to walk from 1 to 30 km and spend from about 0.5 to 5 days to collect NTFPs. They reported six locations for accessing NTFPs, namely: Toul Khlong, Phnum Prahout, Phnum Thom, Prey Lech and Toul Samrong.

The survey showed that 87% of the households collected fuel wood for their consumption, adding up to 2,269 m³ per year. Exactly 69% of the households collected bamboo culms for their consumption and sale, amounting to 203,130 culms per year. A total of 32% of the households collected bamboo shoots for consumption and fewer amounts for sale, amounting to 4,024 kg per year. Meanwhile, 35% of the households collected 480 kg of mushroom per year, while 13% harvested 254 kg per year of wild vegetables.

Only 1% of households collected honey from the Non-CF area, equalling 10 litres per year. A total of 7% of households collected wild fruit from the forest, totalling 149 kg annually. A few households (3%) collected 24 kg per year of traditional medicine. The total monetary value of non-timber products collected in this area was estimated to be USD 19,100.

Generally, people in Non-CF area collected NTFPs for sale, except for the wild fruits and traditional medicines used for household consumption. The value of NTFPs in the Non-CF market was USD 36,958 (Table 3-3).

Table 3-3: Value of NTFPs Market Price at the Non-CF Site

Items	HH (%)	Quantity	Price (USD per unit)	Total Value (USD)
Fuel wood (m ³)	87	2,269	3.69	8,382
Bamboo (number of culms)	69	203,130	0.05	10,006
Bamboo shoot (kg)	32	4,024	0.12	496
Mushroom (kg)	35	480	0.12	59
Wild vegetable (kg)	13	254	0.10	25
Honey (litre)	1	10	9.85	95
Wild fruit (kg)	7	149	0.10	15
Traditional medicine (kg)	3	24	0.94	22

Source: Field Survey, 2007.

3.1.3 Soil Erosion

The results of the FGD indicated that soil erosion was a problem in the non-CF area. The respondents believed that when the forest was cleared, raindrops directly contacted with and exposed the topsoil, hence leading to soil loss. They also said that erosion washed away the organic matter, micro-organisms, and other important nutrients needed for plant growth, which decreased crop production.

3.1.4 Perceptions of Non-Use Values of Forestry Resources

In the Non-CF area, a few respondents had received lessons in natural resources management regarding fire prevention, protection, and reforestation. However, no activities showed application of these lessons in that area. Some villagers had also attended a few training sessions and study tours on agriculture, animal raising, health, sanitation, and use of clean water.

3.2 Community Forestry

There are six villages in Srae Khnong commune, Chumkiri district. The commune has 1,106 households with a total population of 5,633 people, including 3,031 females. The total land area of this commune is 2,873 ha (Figure 3-2). It consists of 1,080 ha of forest land, 1,396 ha of paddy field, 104 ha of farm land, and 293 ha of residential land. This commune is 12 km away from the Chumkiri district centre.

Table 3-4: Population of the Six Target Villages in Srae Khnong Commune

Name of commune	Name of village	HHs	Population	Females	Males
Srae Khnong	Doung	176	914	487	427
	Prey Veang	159	710	372	338
	Prey Khmau	138	924	543	381
	<i>Prey Yav</i>	232	1,219	643	576
	<i>Damnak Snuol</i>	198	837	443	394
	<i>Tbaeng Pok</i>	203	1,029	543	486
	Total	1,106	5,633	3,031	2,602

Notes: Villages in italics are target villages. Source: Report of Population in Chumkiri District in 2006.

Three villages in the CF area were selected for the study. These included Prey Yav, Tbaeng Pok, and Damnak Snuol (shown in *Italic* in Table 3-4). The total forest area under CF covers 992 ha of forest land. The total population of the three villages is 3,085 including 1,629 females. This population lives in 633 households. (See Table 3-4).

This CF area was named the “Damnak Nak Ta Thmor Poun Community Forestry.” It was established in March 2001 by the Community Forestry Research Project (CFRP). When setting up the CF, the CFRP team conducted several studies and consulted with various stakeholders. The CF members and committee implemented a capacity-building process and found solutions to deal with conflicts and problems in their area.

For the CF study site, the CF forest is located approximately 1 to 3 km away from the village. The respondents reported spending about 0.5 to 2 days in travelling, but majority spent 0.5 day on their trips. However, some villagers reported accessing forest resources outside the CF area, about 10 km away, for which they travelled back and forth for 2 days. Most of them, however, accessed forest resources within the CF boundary.

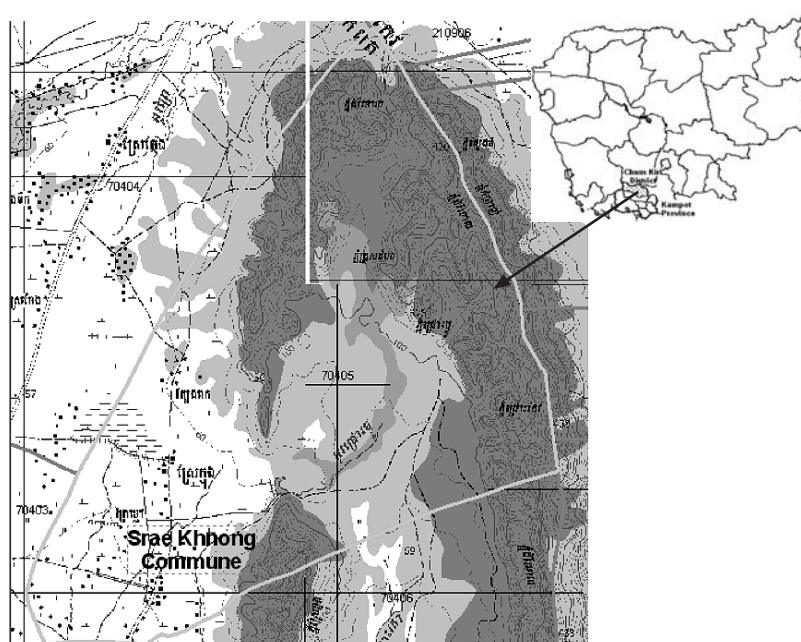


Figure 3-2: Location of the CF Site in the Srae Khnong Commune

3.2.1 Timber Forest Products

Table 3-5: Market Price Value of Timber in the CF Area

Items	HH (%)	Total (m ³)	Price (USD)	Total value (USD)
Log	4	18	39.41	695
Sawn wood	0	0	184.73	0
Small pole	65	223	14.16	3,157
Big pole	22	156	22.41	3,505
Grand Total		397		7,357

Source: Field Survey, 2007.

Respondents reported that only 4% of the households had collected logs, totalling 18 m³ per year. Majority (65%) of the households reported collecting small poles, totalling 223 m³. A total of 22% of the households reported collecting big poles, totalling 156 m³. The total value of the timber products collected was USD 7,357 per year (Table 3-5).

3.2.2 Non-Timber Forest Products

The survey showed that 80% of the households collected fuel wood for their consumption (Table 3-6). This totalled 4,399 m³ per year, so on the average, each household used 6.94 m³ of fuel wood per year. Most of them (81%) also gathered mushrooms totalling 4.229 kg per year.

Majority (58%) of the households collected 41,062 culms of bamboo per year. An almost equal number (59%) collected bamboo shoots that totalled 18,105 kg per year. People dried bamboo shoots for use later in the year or reserved them for other purpose. Many of them (67%) likewise harvested wild vegetables totalling to 14,843 kg per year. Almost half of the households (48%) gathered 2,459 kg of wild fruit per year, while 22 percent collected traditional medicines totalling 587 kg per year. In addition, 9% of households collected vines, totalling 1,312 kg. Six percent of households collected rattan and this added up to 147 kg per year.

NTFPs were collected for household use, sharing with neighbours, or selling at a low price. This meant that there was a limited market for NTFPs in the CF area. The value of NTFPs was USD 23,448 per year.

Table 3-6: Market Price Value of NTFPs in the CF Area

Items	HH (%)	Quantity	Price (USD)	Totalvalue (USD)
Fuel wood (m ³)	80	4,399	3.69	16,252
Bamboo (number of culms)	58	41,062	0.05	2,023
Bamboo shoot (kg)	59	18,105	0.12	2,230
Rattan (kg)	6	147	0.49	72
Mushroom (kg)	81	4,229	0.12	521
Vine (kg)	9	1,312	0.07	97
Wild vegetable (kg)	67	14,843	0.10	1,462
Wild fruit (kg)	48	2,449	0.10	241
Traditional medicine (kg)	22	587	0.94	550

Source: Field Survey, 2007.

3.2.3 Soil Erosion

The results of the FGD indicated that soil erosion was not yet a big problem. The respondents reported that in the past, sandy soil was always a problem for their farms near the mountain because when the rain eroded sandy soil from the mountain top. As a result, their production of rice and other crops was very low. Sometimes, the sand made it difficult for them to cultivate rice and other crops such as corn, beans, watermelons and cucumbers. They believed that CF had helped reduce soil loss and erosion rates.

3.2.4 Perceptions of Non-Use Values of Forestry Resources

In the CF area, the people and community received lessons about natural resources management, and they applied these by establishing the CF. They learned and applied the idea of CF as a common pool resource, the concept of CF, forestry laws, regulations and by-laws of CF, the concept of forest conservation, and the principle of participation in other community development activities. They also learned how to use and manage natural resources more sustainably in CF and how to protect the forest from fire and illegal activities. Moreover, they learned about forest benefit sharing, reforestation, planning for forest benefits for the next generation, and the forest's influence on local weather and flooding. The respondents reported that they gained knowledge and benefited from their participation in trainings, workshops, study tours, and meetings. From meetings, they learned about animal husbandry, new models of agriculture, health issues, gender in society, and CF.

3.3 Stakeholders in the Study Area

Many stakeholders and institutions working in each commune were involved in the development activities of the communities in the study areas. They advised and helped strengthen the capacity of the communities. The main stakeholders for this study were documented below:

- Local community residents (six villages): These people were direct users of the forest resource in the study area.
- Community Forestry Committee: This committee was directly involved in the management of forest resources in the CF study area. This committee was elected by the CF community members. Their main role and responsibility is to make decisions on how to use and manage forest resources within the CF area.
- Businessmen/outside (entrepreneurs): They were involved in buying and selling forest products from the local communities in the study area. They purchased most of the forest products that were being collected legally and illegally within the areas and sold these for profit.
- Commune Council (CC) and Village Headmen: They made all decisions involving the village. They played an important role in assisting other developers and all government sectors in the development of the village and in conflict management.
- District authority: The government staff at a district level oversaw the communes. They had a similar role as the communes but at the district level.
- Development Partnership Agency (DPA): DPA was a local organization from the Co-operation International for Development and Solidarity (CIDSE) organization. The CIDSE supported the project activities of the CF program in the study areas. DPA was a development organization and partner that provided and shared experiences and served as consultant in matters related to CF.
- Triage and other levels of the Forestry Administration: This is the Government professional institution with a mandate over forests. It played a significant role in supporting the CF, in serving as consultant in forest management, in repressing illegal activities, and in resolving problems and/or conflicts.
- Military and police: These institutions and officers intervened to help resolve conflicts.
- Other government departments such as the Department of Agriculture and the Department of Environment. These were involved in the consultation process, and they supported and/or conducted other necessary activities such as agriculture and environmental extension in these areas.

3.4 Environmental Problems in the Study Area

Environmental problems were threatening the livelihoods of local poor people in rural and remote areas. In fact, both target communes in Chumkiri District were constantly facing natural disasters (storms, floods, etc.), temperature changes, irregular rainfall, loss of NTFPs and timber, lack of water, and soil erosion, which affected their livelihoods.

The results of the study indicated many environmental problems in the Non-CF area. These included:

- Loss of forest products, both timber products and NTFPs. This has resulted in loss of jobs or market in the forestry sector.

- Irregular weather. These included inadequate or irregular rain, strong winds, and others.
- Silted soil erosion channels. These have caused some rice fields to no longer yield rice.
- Lack of reliable sources of water. The water here is for household consumption and agricultural use.
- Changing soil quality. The soil has become less fertile and farmers were starting to use chemical fertilizer to increase yields.
- Variable local production. Production relied on the weather and rate of soil erosion.
- Nearly extinct wildlife in the Non-CF area. People reported never seeing wildlife because the latter's habitat had been lost through the clearing forests for/by human activities.

The results of the study in the CF area showed fewer problems, especially on forestry-related offences. These problems included:

- Lack of reliable sources of water. This water was for household consumption and agricultural uses.
- Drought. This has become a critical environmental problem in local communities in the study area. Drought has resulted to low agricultural production.
- Use of chemical fertilizers. Local people complained that some of the community members still used chemical fertilizer and pesticides to gain higher yields and to kill insects next to the CF area.

The well-managed habitat in the CF areas has steadily increased and enhanced wildlife.

4.0 ASSESSMENT OF CF AND NON-CF MANAGEMENT

The report does not feature a full social economic cost-benefit analysis. The analysis undertaken comprised six steps: (1) Evaluating the problem in the base case scenario (Non-CF management of the forest); (2) assessing the potential CF management options; (3) estimating the total annual costs and benefits of each option; (4) calculating the present values of net benefits; (5) comparing the net benefit values of the potential CF management options with the base case scenario; and (6) conducting a sensitivity analysis.

The study assessed a relatively narrow range of CF management schemes that could be applied in the current situation. The management options are described below.

- **Conservation Option:** The forest area is divided into a conservation zone and a multiple use zone. Under this management scheme, only the forest in the multiple use zone would be opened for exploitation. This zone is divided into five parts, and the forest products/resources are collected from each zone in a 5-year rotation.
- **Exploitation Options:** All forest zones are divided into five zones for exploitation in a rotation pattern every five years.

- **Combined Options:** This combines the features of the conservation and exploitation options. The conservation zone represents only one third of the total forest area; the remaining area is fully exploited under a 5-year rotation.

Before assessing the CF management options, the base case scenario was examined. This was to establish the initial situation regarding the livelihood of the population living under the Non-CF management, namely the present values of net returns. The estimation of people's incomes in the base case helped in evaluating the changes in their welfare after introducing the CF management scheme.

4.1 Base Case Scenario (Non-CF Management)

Table 4-1: Timber and Non-Timber Forest Products in Non-CF Scheme

Timber Forest Products	Quantity Collected	Price (USD/m ³)	Non-Timber Forest Products	Quantity Collected	Price (USD per unit)
Log (m ³)	888	39.41	Fuel wood (m ³)	2,269	3.69
Sawn wood (m ³)	685	184.73	Bamboo (trees)	203,130	0.05
Small pole (m ³)	1,806	14.16	Bamboo shoot (kg)	4,024	0.12
Big pole (m ³)	832	22.41	Mushroom (kg)	480	0.12
Total (m³) 4,210 Or 4.24 m ³ /ha/yr			Wild vegetable (kg)	254	0.10
			Wild fruit (kg)	149	0.10
			Traditional medicine (kg)	24	0.94

Source: Field Survey, 2007.

The base case scenario assumed that the local population and people outside the commune under an open access scheme used the forest area of 992 ha located within the commune. The present value of net economic benefits in the Non-CF management was calculated, taking a production time period of 30 years, at a 10% discount rate. The major category of net benefits was net returns accruing to the population that was harvesting timber forest products and non-timber forest products (NTFP) as described in Table 4-1.

4.1.1 Cost of Forest Products Collection

The main assessment methods and data used to estimate the cost of harvesting forest products was separated into three components: capital investment costs, operation and maintenance costs, and ongoing costs. The capital costs of the Non-CF management scheme involved purchasing of materials used for timber and non-timber collection especially ox, oxcart, knife, axe, line, shoe cloth, and mosquito net. These costs would be incurred only once, in year 1. It was assumed that the ox and oxcart would last for the whole project period of 30 years and that the knife, axe, line, shoe cloth, and mosquito net would be replaced every 2 years.

The operational and maintenance costs involved the costs to cover the repair of the materials quoted above. The informal fee paid at the checkpoints was the cost involved in transporting forest products collected across the informal checkpoint kept by the military police or agent of the forest administration. The costs of timber and non-timber product collections were included in the costs of purchasing food for the duration of the journey (to gather materials). The cost of disease was the cost to cover medical expenses to treat any illness incurred during the journey in the forest. Under a Non-CF scenario, forest productivity could be degraded. In addition, if environmental degradation was expected, then the costs of managing and harvesting might well increase over time. Consequently, the study assumed that there was a 5% increase in the cost of illness and in timber and non-timber products collection.

Table 4-2 shows that the present value of the total costs of timber and non-timber (NTFPs) collection was USD 939,727. With 627 households involved in the Non-CF management scheme, these costs would be about USD 1,499 per household.

Table 4-2: Costs incurred in the Non-CF Management Scheme

Items Costs	Yr 1	Yr 2	Yr 3	Yr 30	PV
Capital investment	274,972	0	9,975	0	290,161
O&M (transportation and material)	7,005	7,005	7,005	7,005	66,033
Accessing forest fee or check point	31,720	31,720	31,720	31,720	299,025
Costs of timber product collection	10,120	10,626	11,158	41,656	152,272
Costs of NTFPs collection	5,189	5,448	5,721	21,358	78,074
Diseases	3,600	3,780	3,969	14,817	54,162
Total Costs	332,606	58,579	69,547	116,556	939,727

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

4.1.2 Revenue Under the Non-CF Management Scheme

The revenue under the Non-CF management scheme was divided into two categories: (1) the direct revenue from timber and non-timber collection, and (2) the environmental benefit generated from carbon storage and biodiversity gain. The value of timber and non-timber products was equal to the volume of timber collected multiplied by its financial price as shown in Table 4-1. Therefore, under the open access forest regime, it was expected that the volume of timber and non-timber product would decrease over the period of a year. Table 4-1 shows that the volume of timber harvested would include 4,210 m³ of timber forest products and 2,269 m³ of fuel wood. Over 992 ha of forest area, a harvest rate of 7.33 m³ per ha and per year was implied. Consequently, the study adopted a 3% reduction each year for the whole project period.

The study used existing secondary data sources for the value figures of biodiversity and carbon. The value of biodiversity was USD 300/ha (Bann, 1997). The value of carbon was USD 5 per ton (Top, 2005). The carbon storage calculation used the following formula for forest in a stocked plot (Top, 2005):

$$y = 2.39 * \ln(X) - 7.79$$

This formula can be used when the Above Ground Biomass (AGB) is higher than 40 Mg/ha in a plot. However, when the forest in a stocked plot has an AGB less than 40 Mg/ha, the formula cannot be used. In the latter case, an approximation of AGB was made.

Table 4-3: Benefits in the Non-CF Management Scheme

Benefit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 30	PV
Value of timber products	205,725	199,553	193,566	187,759	85,048	1,546,129
Value of NTFPs	19,100	18,527	17,971	17,432	7,896	143,544
Carbon storage	383,458	345,112	310,601	279,541	18,061	1,912,630
Biodiversity gain	267,840	241,056	216,950	195,255	12,616	1,335,947
Total Benefits	876,122	804,247	739,088	679,987	123,621	4,938,250

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

Table 4-3 shows that the present value of benefits from the collection of timber and NTFPs was about USD 1.69 million, equivalent to 34% of total benefits. With 627 households involved in the Non-CF management scheme, this benefit would be about USD 2,695 per household. The carbon storage and biodiversity benefits under the Non-CF management scheme declined year after year, from USD 651,300 in the initial year to only USD 30,700 in year 30.

4.2 Conservation Option (CF Management)

The Conservation Option assumed that within the forest area of 992 ha located within the commune, only 602 ha would be kept for conservation. The remaining 390 ha would be used by the local population and people outside the commune under a payment fee system of the CF management scheme. The 390 ha of forest was divided into five core zones: 54 ha, 55ha, 56 ha, 60 ha and 51 ha. These zones were used for a 5-year rotation scheme. With better management, a forest growth rate of 3% was used in calculating the benefit gained.

Estimates of the costs and benefits of this option were derived from the CF management of Damnak Neak Ta Thmar Poun community forest, which had similar characteristics to the Non-CF area.

Table 4-4 highlights the timber and NTFPs that could be collected from the CF area under the Conservation Management Option. The price and quantity collected are also shown in Table 4-4. In the CF area, no sawn wood and honey were collected compared to the Non-CF area in this study.

Table 4-4: Timber and Non-Timber Forest Products in the Conservation Option Scenario

Timber Forest Products	Quantity Collected	Price (USD/m³)	Non-timber Forest Products	Quantity Collected	Price (USD per unit)
Log (m ³)	18	39.41	Fuel wood (m ³)	4,399	3.69
Sawn wood (m ³)	0	184.73	Bamboo (trees)	41,062	0.05
Small pole (m ³)	223	14.16	Bamboo shoot (kg)	18,105	0.12
Big pole (m ³)	156	22.41	Rattan (kg)	147	0.49
Total (m³)	397		Mushroom (kg)	4,229	0.12
Or 1.02 m ³ /ha/yr			Honey (litre)	0	9.85
			Vine (kg)	1,312	0.07
			Wild vegetable (kg)	14,843	0.10
			Wild fruit (kg)	2,449	0.10
			Traditional medicine (kg)	587	0.94

Source: Field Survey in 2007.

4.2.1 Cost of Forest Products Collection

As discussed earlier, the analysis of costs can be divided into three components: capital investment costs, operation and maintenance costs, and ongoing costs. The capital costs of the Non-CF management scheme involved:

- Community forest establishment costs that accrued only in the first 6 years.
- The purchase of materials used for timber and non-timber collection, especially ox, oxcart, knife, axe, line, shoe cloth, and mosquito net. These costs would be incurred only once, in year 1. The study assumed that the ox and oxcart would last for the whole project period of 30 years and that the knife, axe, line, shoe cloth, and mosquito net would be replaced every 2 years.

The operational and maintenance costs involved the costs to repair the materials quoted above. The costs of timber and non-timber products collection included the costs of purchasing food during the journey and of incurring any medical expenses.

Under the CF option, the time spent out of the village involved in CF activity was reflected in the labour costs. The CF management contribution was the fee collected from villagers to cover the daily expenses of managing the CF community. The forest plantation costs covered the costs of reforestation after cutting.

Under a CF scenario, forest productivity could be improved. Also, if environmental degradation was reduced or turned around, then the costs of managing and harvesting might well decline over time. Consequently, the study assumed a 5% reduction in the cost of collecting timber and non-timber products.

Table 4-5 shows that the present value of the costs of collecting timber and NTFPs was more than USD 820,678. With 633 households involved in the CF management scheme, these costs would be about USD 1,296 per household. This cost was lower than the costs incurred in the Non-CF management scheme.

Table 4-5: Costs incurred in the Conservation Option

Costs	Yr 1	Yr 2	Yr 3	Yr 30	PV
CF establishment cost	9,465	9,465	9,465	0	41,221
Capital investment	414,029	0	11,552	0	422,931
O&M (Transportation and materials)	5,867	5,867	5867	5867	55,308
Costs of timber product collection	604	574	545	136	3,976
Costs of NTFPs collection	5,915	5,620	5,339	1,336	38,950
Opportunity own labour costs	9,653	9,653	9,653	9,653	90,997
CF management contribution	1,185	1,185	1,185	1,185	11,172
Cost of forest plantation	16,200	16,500	16,800	15,300	156,121
Total Costs	462,918	48,863	60,405	33,478	820,678

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

4.2.2 Revenue under the Conservation Option

The revenue under the CF management scheme was divided into two categories: (1) direct revenue from timber and non-timber collection, and (2) the environmental benefit generated from carbon storage and biodiversity gain. Revenue from timber and non-timber collection was generated for the villagers involved in the collection and from the CF management under the licence form. The revenue from the licensing was set at 50% of the total financial value of timber and non-timber collection.

This study assumed the value of biodiversity to be USD 300/ha (Bann, 1997). The value of carbon was USD 5 per ton (Top, 2005). The carbon storage calculation is shown in Section 4.1.2.

Table 4-6: Benefits in the Conservation Option

Benefit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 30	PV
Value of timber products	7,357	7,578	7,805	8,039	17,338	90,483
Value of NTFPs	23,448	24,151	24,876	25,622	55,256	288,374
Carbon storage	354,102	339,090	325,807	334,351	363,514	3,218,830
Biodiversity gain	247,350	230,850	214,050	196,050	196,950	1,944,938
Value of timber products for CF	74,886	76,273	77,659	83,206	70,727	721,685
Value of NTFPs for CF	2,759	2,841	2,927	3,014	6,501	33,926
Total Benefits	709,902	680,783	653,124	650,284	710,285	6,298,236

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

Table 4-6 shows that the present value of benefits from timber and NTFPs collection for both villagers and CF management was about USD 1.13 million, equivalent to only 18% of the total benefits. With 633 households involved in the CF management scheme, the benefits generated from timber and non-timber products would be about USD 1,792 per household. Majority of the benefits could be attributed to the carbon storage and biodiversity gain from the CF management scheme. This benefit was approximately constant over 30 years of the project return period. Its present value was equal to USD 5.16 million.

4.3 Exploitation Option (CF Management)

The Exploitation Option assumed that all the forest area of 992 ha located within the commune would be used by the local population and by the people outside the commune under a payment fee system of the CF management scheme. The 992 ha of forest was divided into five core zones of equal surface area for exploitation for a rotation period of 5 years.

4.3.1 Cost of Forest Products Collection

The methods and data used to estimate the costs of forest products collection was the same as under the Conservation Option. Under a CF scenario, if forest productivity could improve, and if environmental degradation would be reduced, then the costs of managing and harvesting might well decline over time. Consequently, this study assumed a 5% reduction in the cost of timber and non-timber products collection. Table 4-7 shows that the present value of the costs of timber and NTFPs collection was about USD 1.161,461 million. With 633 households involved in the non-CF management scheme, the costs would be more than USD 1,835 per household.

Table 4-7: Costs in the Exploitation Option

Costs	Yr 1	Yr 2	Yr 3	Yr 30	PV
CF establishment cost	9,465	9,465	9,465	0	41,221
Capital investment	414,029	0	11,552	0	422,931
O&M (Transportation and materials)	5,867	5,867	5,867	5,867	55,308
Costs of timber product collection	604	574	545	136	3,976
Costs of NTFPs collection	5,915	5,620	5,339	1,336	38,950
Opportunity own labour costs	9,653	9,653	9,653	9,653	90,997
CF management contribution	1,185	1,185	1,185	1,185	11,172
Cost of forest plantation	52,350	52,650	52,950	51,450	496,904
Total Costs	499,068	85,013	96,555	69,628	1,161,461

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

4.3.2 Revenue under the Exploitation Option

Table 4-8 shows that the present value of the benefits from timber and NTFPs collection for both villagers and CF management was about USD 2.71 million, equivalent to only 54% of the total benefits. With 633 households involved in the CF management scheme, the benefit generated from timber and non-timber products would be more than USD 4,281 per household. The carbon storage and biodiversity gain from the Exploitation Option would decline year after year from USD 512,675 in the initial year to only USD 148,973 in year 30.

Table 4-8: Benefits in the Exploitation Option

Benefit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 30	PV
Value of timber products	7,357	7,578	7,805	8,039	17,338	90,483
Value of NTFPs	23,448	24,151	24,876	25,622	55,256	288,374
Value of timber products for CF	241,993	243,380	244,765	250,310	237,836	2,296,986
Value of NTFPs for CF	2,759	2,841	2,927	3,014	6,501	33,926
Biodiversity gain	210,840	158,550	105,600	51,450	52,350	766,982
Carbon storage	301,835	232,890	160,734	164,950	96,623	1,536,328
Total Benefits	788,232	669,391	546,707	503,386	465,904	5,013,078

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

4.4 Combined Option (CF Management)

The Combined Option assumed that within the forest area of 992 ha located within the commune, only 300 ha would be kept for conservation purposes. The remaining 692 ha would be used by the local population and by the people outside the commune under a payment fee system of the CF management scheme. That forest area would be placed under a 5-year rotation plan.

4.4.1 Cost of Forest Products Collection

The methods and data used to estimate the costs of forest products collection was the same as under the Conservation Option. Table 4-9 shows that the present value of the costs of timber and NTFPs collection was about USD 0.99 million. With 627 households involved in the non-CF management scheme, the costs would be more than USD 1,610 per household.

Table 4-9: Costs in the Combined Option

Costs	Yr 1	Yr 2	Yr 3	Yr 30	PV
CF establishment cost	9,465	9,465	9,465	0	41,221
Capital investment	414,029	0	11,552	0	422,931
O&M (Transportation and materials)	5,867	5,867	5,867	5,867	55,308
Costs of timber product collection	604	574	545	136	3,976
Costs of NTFPs collection	5,915	5,620	5,339	1,336	38,950
Opportunity own labour costs	34,275	34,575	34,875	33,375	326,513
CF management contribution	9,653	9,653	9,653	9,653	90,997
Cost of forest plantation	1,185	1,185	1,185	1,185	11,172
Total Costs	480,993	66,938	78,480	51,553	991,069

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD

4.4.2 Revenue under the Combined Option

Table 4-10 below shows that the present value of the benefits from timber and NTFPs collection for both villagers and under the CF management was about USD 1.91 million, equivalent to about 32% of the total benefits. With 633 households involved in the CF management scheme, the benefit generated from timber and non-timber products would be more than USD 3,020 per household. The carbon storage and biodiversity gain from the Combined Option would decline year after year from USD 557,000 in the initial year to only USD 355,000 in year 30.

Table 4-10: Benefits in the Combined Option

Benefit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 30	PV
Value of timber products	7,357	7,578	7,805	8,039	17,338	90,483
Value of NTFPs	23,448	24,151	24,876	25,622	55,256	288,374
Value of timber products for CF	158,439	159,827	161,212	166,756	154,283	1,509,335
Value of NTFPs for CF	2,759	2,759	1,379	2,759	2,759	23,428
Carbon storage	327,711	285,990	243,270	249,651	230,068	2,387,986
Biodiversity gain	228,915	194,700	159,825	123,750	124,650	1,618,937
Total Benefits	748,629	675,005	598,368	576,577	584,354	5,918,543

Note: PV value was calculated over a 30-year period with a 10% discount rate. All values are in USD.

5.0 COSTS-BENEFITS ANALYSIS

The cost-benefit analysis of alternative options within the CF management scheme is a method that compares the net benefit of the three alternative options within the CF management scheme to the base case situation, namely Non-CF management of the forest area. Such comparisons are useful for ascertaining whether a new alternative is better than the status quo or not.

5.1 Incremental Net Benefits

In the cost-benefit analysis, net benefits were the difference between total economic benefits and total direct costs in each CF management option. If net benefits were positive with higher values, this meant that the option would provide more benefits directly to the villagers involved and to their community than the current Non-CF management option.

The incremental net benefits were the difference between the net benefits of each option of CF management and the net benefits accruing in the base case (Non-CF management). The present values of net costs and incremental net costs were estimated over a 30-year period, with a discount rate of 10%. The higher the incremental net benefits, the more economically viable was the option. Positive incremental net benefits would mean that the alternative option would yield greater economic benefits to the villagers and to their community compared to the base case scenario.

Table 5-1 below shows that the Conservation Option and the Combined Option were the most preferred options based on economic efficiency grounds. The incremental net benefits of the two Options were positive. Carbon storage and biodiversity gain represented a large share in the Conservation Option, while revenue for the community generated from timber and non-timber products were the main elements of benefit for each of the two options. The incremental net benefit of the Exploitation Option had a negative value of USD 0.15 million.

Table 5-1: Present Value (PV) of Incremental Net Benefit, Ranked by Most Benefit

	NPV Net Benefit (USD million)	Incremental Net Benefit (USD million)	Benefit Cost Ratio
Conservation Option: CF management scheme	5.48	1.48	7.67
Combined Option: CF management scheme	4.93	0.93	5.97
Base case (Non-CF management scheme)	4.00	0.00	5.25
Exploitation Option: CF management scheme	3.85	-0.15	4.32

Source: Field Survey in 2007.

5.2 Sensitivity Analysis

A sensitivity analysis was conducted to investigate the effects of varying key assumptions (costs, revenues, and discount rate) on the present values of incremental net benefits.

The analysis provided a measure of the degree to which these variables could deviate from their estimated values before the preferred options ceased to be economically viable. Three scenarios were tested.

5.2.1 Scenario 1 - Change the Discount Rate

For all options, the discount rate was increased from 10% to 15%. Table 5-2 shows that the Conservation Option and Combined Option were still economically viable. The incremental net benefit of the Exploitation Option was negative.

Table 5-2: Incremental Net Benefit in Scenario 1, Ranked by Most Benefit

	NPV Net Benefit (USD million)	Incremental Net Benefit (USD million)	Benefit Cost Ratio
Conservation Option: CF management scheme	3.70	0.56	6.47
Combined Option: CF management scheme	3.35	0.21	5.21
Base case (Non-CF management scheme)	3.15	0.00	5.52
Exploitation Option: CF management scheme	2.67	-0.48	3.92

Source: Field Survey in 2007.

5.2.2 Scenario 2 - Increase of 10% in Price of Timber and Non-Timber Products

For all options, the price of timber and non-timber products was assumed to increase by 10%. Table 5-3 shows that the Conservation Option and Combined Option were still economically viable. The incremental net benefit of Exploitation Option was negative. The ranking was identical to that of Scenario 1.

Table 5-3: Incremental Net Benefit in Scenario 2, Ranked by Most Benefit

	NPV Net Benefit (USD million)	Incremental Net Benefit (USD million)	Benefit Cost Ratio
Conservation Option: CF management scheme	5.68	1.51	7.92
Combined Option: CF management scheme	5.13	0.96	6.18
Base case (Non-CF management scheme)	4.17	0.00	5.43
Exploitation Option: CF management scheme	4.12	0.04	4.55

Source: Field Survey in 2007.

5.2.3 Scenario 3 – Project Duration is 20 years

Table 5-4: Incremental Net Benefit in Scenario 3, Ranked by Most Benefit

	NPV Net Benefit (USD million)	Incremental Net Benefit (USD million)	Benefit Cost Ratio
Conservation Option: CF management scheme	4.89	0.94	7.24
Combined Option: CF management scheme	4.40	0.45	5.69
Base case (Non-CF management scheme)	3.94	0.00	5.67
Exploitation Option: CF management scheme	3.46	0.48	4.17

Source: Field Survey in 2007.

If a project return period of 10 years shorter than the initial 30 years was assumed, the Conservation Option was the most economically viable, and it ranked highest of all alternative options. With only a 20-year return period, Table 5-4 shows that the Conservation Option and Combined Option were still economically viable. The incremental net benefit of the Exploitation Option was negative. The ranking was identical to Scenario 1.

The three sensitivity analysis options above illustrate that with each variation of the basic assumptions, the ranking of the options remained the same: the Conservation Option was always the most economically viable, with the Combined Option still being viable. The Exploitation Option, in all scenarios tested, was negative, thus proving that this option would bring very little benefit to the communities.

6.0 CONCLUSION

The principal objective of this study was to identify the best practical options for preserving the forest cover from degradation. Three CF management options were assessed, and their incremental net benefits were calculated. These options as well as the base case scenario (Non-CF management) are described below:

Base Case (Non-CF Management): A total of 627 households were involved in the non-CF management scheme of the Chumpouvoan commune. This commune extracted annually from open access forest a total of 4,210 m³ of timber and 2,269 m³ of firewood or 6.53 m³/ha/yr. Over a 30-year period, at a 10% discount rate, the PV of total benefits including the carbon sequestration value and biodiversity gain, would be about USD 7,876 per household.

Conservation Option: A total of 633 households were involved in the CF management scheme of the Chumpouvoan commune. The commune extracted annually from the CF a total of 397 m³ of timber and 4,399 m³ of firewood or 12.3 m³/ha/yr. The present value of revenue received by the CF management team from sales of forest products, over a 30-year period, at a 10% discount rate, would be USD 0.76 million. Over a 30-year period, at a 10% discount rate, the PV of total benefits including the carbon sequestration value and biodiversity gain would be about USD 9,950 per household.

Exploitation Options: A total of 633 households were involved in the CF management scheme of the Chumpouvoan commune. The commune extracted from the CF a total of 397 m³ of timber and 4,399 m³ of firewood or 12.3 m³/ha/yr. The revenue received by the CF management team from sales of forest products, over a 30-year period, at a 10% discount rate, would be USD 2.33 million. Over a 30-year period, at a 10% discount rate, the PV of total benefits including the carbon sequestration value and biodiversity gain would be about USD 7,920 per household.

Combined Options: A total of 633 households were involved in the CF management scheme of the Chumpouvoan commune. The commune extracted from the CF a total of 397 m³ of timber and 4,399 m³ of firewood or 12.3 m³/ha/yr. The revenue received by the CF management team from sales of forest products, over a 30-year period, at a 10% discount rate, would be USD 1.53 million. Over a 30-year period, at a 10% discount rate, the PV of total benefits including the carbon sequestration value and biodiversity gain would be about USD 9,350 per household.

In conclusion, the results of the sensitivity analysis suggest that the Conservation Option always ranked first, and the incremental net benefit was always a positive value even when the input variable was altered. This proved that the Conservation Option in a CF area offers advantages compared with that in a non CF-managed area. Hence, Cambodia should strengthen plans for CF in the future as the benefits and costs were evident in this study.

Further research could be done on this subject to help implement the concept and management practices, rules, and regulations of CF. Communities were shown to benefit from CF in the long-term. Through the CF, they learned that it was vital to encourage biodiversity, to increase the community's wealth, and to prevent the forest from being degraded. Most importantly, they learned that the key rule in sustainability is to preserve the forest cover for future generations.

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APPENDIX A

Table A-1: Cost-Benefit Analysis of Base Case Scenario (Non-CF Management)

CBA OF NON-CF AND CF MANAGEMENT - CHUMKIRI COMMUNE - KAMPOT PROVINCE					
NB: Variables that can be changed for sensitivity analyses are marked in BOLD					
Select Discount Rate		10%			
Base case (Non-CF management scheme)					
Households involved in Non-CF case		627 HH			
Number accessing forest for timber		12,910 Days			
Number accessing forest for NTFPs		6,619 Days			
Total forest area		992 Ha			
Timber Forest Products		Market Price		Total Value	
	Log (m³)	888	39.41 USD/m³	34,975	
	Sawn Wood (m³)	685	184.73 USD/m³	126,527	
	Small Pole (m³)	1,806	14.16 USD/m³	25,573	
	Big Pole (m³)	832	22.41 USD/m³	18,649	
	Total	4,210		205,725	
Non-Timber Forest Products					
	Fuel wood (m³)	2,269	3.69 USD/m³	8,382	
	Bamboo (trees)	203,130	0.05 USD/tree	10,006	
	Bamboo shoot (kg)	4,024	0.12 USD/kg	496	
	Mushroom (kg)	480	0.12 USD/kg	59	
	Wild Vegetable (kg)	254	0.10 USD/kg	25	
	Honey (litre)	10	9.85 USD/litre	95	
	Wild fruit (kg)	149	0.10 USD/kg	15	
	Traditional medicine (kg)	24	0.94 USD/kg	22	
	Rate of Growth of Forest Products (%)	3		19,100	
COSTS - NON-CF MANAGEMENT SCHEME					
	PV	Yr 1	Yr 2	Yr 29	Yr 30
Capital investment	290,161	274,972	0	9,975	0
O&M (transportation and material)	66,033	7,005	7,005	7,005	7,005
Forest fee products collection	299,025	31,720	31,720	31,720	31,720
Costs of timber	152,272	10,120	10,626	39,673	41,656
Costs of NTFPs collection	78,074	5,189	5,448	20,341	21,358
Diseases	54,162	3,600	3,780	14,111	14,817
Total Costs	939,727	332,606	58,579	122,825	116,556
BENEFITS					
Value of timber products	1,546,129	205,725	199,553	87,679	85,048
Value of NTFPs	143,544	19,100	18,527	8,140	7,896
Carbon storage	1,912,630	383,458	345,112	20,068	18,061
Biodiversity gain	1,335,947	267,840	241,056	14,017	12,616
Total Benefits	4,938,250	876,122	804,247	129,905	123,621
TOTAL COSTS	939,727	332,606	58,579	122,825	116,556
TOTAL BENEFITS	4,938,250	876,122	804,247	129,905	123,621
NET BENEFITS (NPV)	3,998,523	543,516	745,668	7,080	7,065

Table A-2: Cost-Benefit Analysis of Conservation Option (CF Management)

CBA OF NON-CF AND CF MANAGEMENT - CHUMKIRI COMMUNE - KAMPOT PROVINCE					
NB: Variables that can be changed for sensitivity analyses are marked in BOLD.					
Select Discount Rate		10%			
Conservation Option: CF management scheme					
Households involved in Non-CF		633 HH			
Duration of accessing forest-timber		1032 Days			
Duration of accessing forest-NTFPs		10,110 Days			
Total forest area		389.5 Ha			
Timber Forest Products		Market Price		Total Value	
Log (m³)	18	39.41	USD/m³	695	
Sawn wood (m³)	0	184.73	USD/m³	0	
Small pole (m³)	223	14.16	USD/m³	3,157	
Big pole (m³)	156	22.41	USD/m³	3,505	
Total	397			7,357	
Non Timber Forest Products					
Fuel wood (m³)	4,399	3.69	USD/m³	16,252	
Bamboo (trees)	41,062	0.05	USD/tree	2,023	
Bamboo shoot (kg)	18,105	0.12	USD/kg	2,230	
Rattan (kg)	147	0.49	USD/kg	72	
Mushroom (kg)	4,229	0.12	USD/kg	521	
Honey (litre)	0	9.85	USD/litre	0	
Vine (kg)	1,312	0.07	USD/kg	97	
Wild vegetable (kg)	14,843	0.10	USD/kg	1,462	
Wild fruit (kg)	2,449	0.10	USD/kg	241	
Traditional medicine (kg)	587	0.94	USD/kg	550	
Total				23,448	
COSTS - NON-CF MANAGEMENT SCHEME					
	PV	Yr 1	Yr 2	Yr 29	Yr 30
CF establishment cost	41,221	9,465	9,465	0	0
Capital investment	422,931	414,029	0	11,552	0
O&M (Transportation and material)	55,308	5,867	5,867	5867	5867
Costs of timber product collection	3,976	604	574	144	136
Costs of NTFPs collection	38,950	5,915	5,620	1,407	1,336
Opportunity own labour cost	90,997	9,653	9,653	9,653	9,653
CF management contribution	11,172	1,185	1,185	1,185	1,185
Cost of forest plantation	156,121	16,200	16,500	18,000	15,300
Total Costs	820,678	462,918	48,863	47,808	33,478
BENEFITS					
Value of timber products	90,483	7,357	7,578	16,833	17,338
Value of NTFPs	288,374	23,448	24,151	53,647	55,256
Carbon storage	3,218,830	354,102	339,090	352,624	363,514
Biodiversity gain	1,944,938	247,350	230850	196,050	196,950
Value Value of timber products for CF	721,685	74,886	76,273	83,206	70,727
Value of NTFPs for CF	33,926	2,759	2,841	6,311	6,501
Total Benefits	6,298,236	709,902	680,783	708,671	710,285
TOTAL COSTS	820,678	462,918	48,863	47,808	33,478
TOTAL BENEFITS	6,298,236	709,902	680,783	708,671	710,285
NET BENEFITS (NPV)	5,477,558	246,984	631,920	660,864	676,807

Table A-3: Cost-Benefit Analysis of Exploitation Option (CF Management)

CBA OF NON-CF AND CF MANAGEMENT - CHUMKIRI COMMUNE - KAMPOT PROVINCE					
NB: Variables that can be changed for sensitivity analyses are marked in BOLD.					
Select Discount Rate	10%				
Conservation Option: CF management scheme					
Households involved in Non-CF	633 HH				
Duration of accessing forest-timber	1032 Days				
Duration of accessing forest-NTFPs	10,110 Days				
Total forest area	992 Ha				
Timber Forest Products		Market Price		Total Value	
Log (m³)	18	39.41	USD/m³	695	
Sawn wood (m³)	0	184.73	USD/m³	0	
Small pole (m³)	223	14.16	USD/m³	3,157	
Big pole (m³)	156	22.41	USD/m³	3,505	
Total	397			7,357	
Non Timber Forest Products					
Fuel wood (m³)	4,399	3.69	USD/m³	16,252	
Bamboo (trees)	41,062	0.05	USD/tree	2,023	
Bamboo shoot (kg)	18,105	0.12	USD/kg	2,230	
Rattan (kg)	147	0.49	USD/kg	72	
Mushroom (kg)	4,229	0.12	USD/kg	521	
Honey (litre)	0	9.85	USD/litre	0	
Vine (kg)	1,312	0.07	USD/kg	97	
Wild vegetable (kg)	14,843	0.10	USD/kg	1,462	
Wild fruit (kg)	2,449	0.10	USD/kg	241	
Traditional medicine (kg)	587	0.94	USD/kg	550	
Total				23,448	
COSTS - NON-CF MANAGEMENT SCHEME					
	PV	Yr 1	Yr 2	Yr 29	Yr 30
CF establishment cost	41,221	9,465	9,465	0	0
Capital investment	422,931	414,029	0	11,552	0
O&M (Transportation and material)	55,308	5,867	5,867	5,867	5,867
Costs of timber product collection	3,976	604	574	144	136
Costs of NTFPs collection	38,950	5,915	5,620	1,407	1,336
Opportunity own labour cost	90,997	9,653	9,653	9,653	9,653
CF management contribution	11,172	1,185	1,185	1,185	1,185
Cost of forest plantation	496,904	52,350	52,650	54,150	51,450
Total Costs	1,161,461	499,068	85,013	83,958	69,628
BENEFITS					
Value of timber products	90,483	7,357	7,578	16,833	17,338
Value of NTFPs	288,374	23,448	24,151	53,647	55,256
Value of timber products for CF	2,296,986	241,993	243,380	250,310	237,836
Value of NTFPs for CF	33,926	2,759	2,841	6,311	6,501
Biodiversity gain	766,982	210,840	158,550	51,450	52,350
Carbon storage	1,536,328	301,835	232,890	352,624	96,623
Total Benefits	5,013,078	788,232	669,391	731,175	465,904
TOTAL COSTS	1,161,461	499,068	85,013	83,958	69,628
TOTAL BENEFITS	5,013,078	788,232	669,391	731,175	465,904
NET BENEFITS (NPV)	3,851,617	289,164	584,378	647,217	396,276

Table A-4: Cost-Benefit Analysis of Combined Option (CF Management)

CBA OF NON-CF AND CF MANAGEMENT - CHUMKIRI COMMUNE - KAMPOT PROVINCE					
NB: Variables that can be changed for sensitivity analyses are marked in BOLD.					
Select Discount Rate	10%				
Conservation Option: CF management scheme					
Households involved in Non-CF	633 HH				
Duration of accessing forest-timber	1032 Days				
Duration of accessing forest-NTFPs	10,110 Days				
Total forest area	992 Ha				
Timber Forest Products		Market Price		Total Value	
Log (m³)	18	39.41	USD/m³	695	
Sawn wood (m³)	0	184.73	USD/m³	0	
Small pole (m³)	223	14.16	USD/m³	3,157	
Big pole (m³)	156	22.41	USD/m³	3,505	
Total	397			7,357	
Non Timber Forest Products					
Fuel wood (m³)	4,399	3.69	USD/m³	16,252	
Bamboo (trees)	41,062	0.05	USD/tree	2,023	
Bamboo shoot (kg)	18,105	0.12	USD/kg	2,230	
Rattan (kg)	147	0.49	USD/kg	72	
Mushroom (kg)	4,229	0.12	USD/kg	521	
Honey (litre)	0	9.85	USD/litre	0	
Vine (kg)	1,312	0.07	USD/kg	97	
Wild vegetable (kg)	14,843	0.10	USD/kg	1,462	
Wild fruit (kg)	2,449	0.10	USD/kg	241	
Traditional medicine (kg)	587	0.94	USD/kg	550	
Total				23,448	
COSTS - NON-CF MANAGEMENT SCHEME					
	PV	Yr 1	Yr 2	Yr 29	Yr 30
CF establishment cost	41,221	9,465	9,465	0	0
Capital investment	422,931	414,029	0	11,552	0
O&M (Transportation and material)	55,308	5,867	5,867	5,867	5,867
Costs of timber product collection	3,976	604	574	144	136
Costs of NTFPs collection	38,950	5,915	5,620	1,407	1,336
Opportunity own labour cost	326,513	34,275	34,575	36,075	33,375
CF management contribution	90,997	9,653	9,653	9,653	9,653
Cost of forest plantation	11,172	1,185	1,185	1,185	1,185
Total Costs	991,069	480,993	66,938	65,883	51,553
BENEFITS					
Value of timber products	90,483	7,357	7,578	,833	,338
Value of NTFPs	288,374	23,448	24,151	53,647	55,256
Value of timber products for CF	1,509,335	158,439	159,827	166,756	154,283
Value of NTFPs for CF	23,428	2,759	2,759	2,759	2,759
Biodiversity gain	2,387,986	327,711	285,990	222,582	230,068
Carbon storage	1,618,937	228,915	194,700	123,750	124,650
Total Benefits	5,918,543	748,629	675,005	586,327	584,354
TOTAL COSTS	991,069	480,993	66,938	65,883	51,553
TOTAL BENEFITS	5,918,543	748,629	675,005	586,327	584,354
NET BENEFITS (NPV)	4,927,474	267,636	608,067	520,444	532,801

No.....

Questionnaires of Household Survey for Cost Benefit Analysis of CF

Name of interviewer _____			
Date _____	Time start _____	Time end _____	
Name of respondent _____			
Sex	☐ male	☐ female	Age _____ years Ethnic _____
Education level _____	HH number _____	Male _____	
Village _____	Commune _____	Chumkiri District Kampot Province	

My name is _____ working for EVNRM project, CBNRM Learning Institute. We have funding from EEPSEA, Canada to conduct a Benefit-Cost analysis of the Community Forestry Project. The objective of this study is to assess the costs and benefits of the on-going CF project in Chumkiri and identify factors influencing the outcomes of CF implementation. We know that your commune has a CF management, we are conducting this survey among 137 people, and we would like to ask you some questions. Your reply is confidential and only the overall result of this survey will be published.

Q1: Do you or your family get benefits from the CF management?

If YES: list all potential benefits, If NO end the questionnaire.

Q2: Do you or your family go into the forest to collect NTFPs or Forest products?

Q3: For what purpose do you and your family collect forest product, NTFPs and wildlife?

☐ Sale ☐ Consumption ☐ Sale and Consumption

What type of forest products do you collect?

Types	Where collected	Distance from village	Number of trip per			No. of day / trip	Quantity / Trip		Price / unit	% of increase or decrease*
			month	Season	Year		Amount	Unit		
Wooden										
Log										
Small pole										
Medium pole										
Big pole										
Other (specify)										
Fuel wood										
Bamboo										
Bamboo shoot										
Small rattan										
Rattan										
Mushroom										
Honey										
Wild vegetable										
Vine										
Wild fruit										
Medicine herb										
Other(specify)										
Sambar										
Red Muntjac										
Wild pig										
Wild chicken										
Snake										
Other(specify)										

* The interviewer must explain well that the reference year for comparing the increase or decrease is 2001.

Q4: From what else do you or your family get benefits from the CF management?
List all and monetize them with specific units.

Q5: Did you pay for accessing the forest fee or check point? ☐ Yes ☐ No
If yes, please answer the following:

Type	How much per time?	Pay to whom?	Others
Forest fee (CF management)			
Check point (Military police)			
Check point (police)			
Check point (military)			
Check point (forestry administration)			
Check point (others)			

Q6: What are the main materials that you need to go to collect forest product, NTFPs, and wildlife?

Types	Expenditure			
	Unit	Cost/Unit	Total Cost	Replace (Frequency to replace)
	Capital investment cost			
Ox-cart				
Ox				
Axe				
Knife				
Mosquito net				
Shoe/slipper				
Cloth				
Other items (specify?)				

Q7: How often do you need to repair those materials?

Types	Expenditure			
	Frequency	Unit	Cost/Unit	Total Cost
	O&M (Transportation, maintenance and material)			
Ox-cart				
Ox				

Q8: Do you pay for the CF management? How much per year?

Q9: In the CF management schemes, do you have any obligation to fulfill?
List all and monetize them with specific units if possible.

	Month		Semester		Year		Incentive*
Activities	Number	Period (day/time)	Number	Period (day/time)	Number	Period (day/time)	
Contribution							
Meeting							
Patrol group							
Repression illegal							
Activities							
Protect forest fire							
Reforestation							
Training course/ workshop							
Management plan							
By-law							
Dissemination							
Boundary demarcation							
M&E							
Study tour							
Other (specify?)							

* refer to per diem received by participant, gift

Q10: Have you received lessons on NRM from your village? ☐ Yes ☐ No

If yes, please describe? _____

If no, why? _____

Q11: In terms of cropping, how is the soil quality changing?

Why? _____

Q12: In terms of natural resources management, do you have the right to manage (use) the natural resources (land, forest, fisheries, wildlife, water...) in your area?

☐ Yes ☐ No

Why? _____

Q13: Do you think your environment around the village has been improved?

☐ Yes ☐ No

Why? (If FDG provides enough information on the benefit there is no need to ask)

Q14: If you don't access the forest area, where do you get forest products?

☐ Buy from market

☐ Collect from outside of your target area

Q15: If you buy from the market, how much do you pay per amount?

Type	How much per time?	Pay to whom?	Others
Forest fee (CF management)			
Check point (Military police)			
Check point (police)			
Check point (military)			
Check point (forestry administration)			
Check point (others)			

Q16: If you collect from other forest areas, please answer the following question

Type of forest	Where?	How often?		How long?	How many per time?	Size (tree)	Remark
		Week	Month				

Q17: If the forest becomes completely degraded, how will it affect your family?

Q18: From your point of view, the forest and forest products will be changeable in the year off?

From this year to next 5 years is increasing or decreasing? How many percentages?

From this year to next 10 years is increasing or decreasing? How many percentages?

From this year to next 15 years is increasing or decreasing? How many percentages?

Year	Forest cover	Forest product	NTFPs	Wildlife
	% increase (+) or decrease (-)			
Next 1-5 year				
Next 6-10 year				
Next 11-15 year				
Next 15-30 year				
Q19: Land holding				

Q19: Land holding

Type of land	Size of land	When you get it?	Tenure of Certificate?	Conflicted?
Home land			☐ Yes ☐ No	☐ Yes ☐ No
Rice field			☐ Yes ☐ No	☐ Yes ☐ No
Farm/crop land			☐ Yes ☐ No	☐ Yes ☐ No
Bare land			☐ Yes ☐ No	☐ Yes ☐ No
Others			☐ Yes ☐ No	☐ Yes ☐ No

Q20: Beside the accessing forest, do you have other jobs?

The last question: are the livelihoods of you and your family better or worse now compared with the situation of Non-CF management schemes? (For communes with Non-CF management the question refers to the previous year if possible to baseline of 2001.)

Thank you for your patience.

Questionnaires of Household Survey for Cost-Benefit Analysis of Non-CF

Name of interviewer _____		
Date _____	Time start _____	Time end _____
Name of respondent _____		
Sex	☐ male	☐ female
Age _____	years	Ethnic _____
Education level _____	HH number _____	Male _____
Village _____	Commune _____	Chumkiri District Kampot Province

My name is _____ working for EVNRM project, CBNRM Learning Institute. We are receiving funding from EEPSEA, Canada to conduct a Benefit-Cost analysis of the Community Forestry Project in Chumkiri District, Kampot Province. The objective of this study is to assess the costs and benefits of the on-going CF project in Chumkiri and identify factors influencing the outcomes of CF implementation. We know that your commune has a CF management, we are conducting this survey among 137 people, and we would like to ask you some questions. Your reply is confidential and only the overall result of this survey will be published.

Q1: Do you or your family go into the forest to collect NTFPs or Forest products?

Q2: For what purpose do you and your family collect forest products, NTFPs and wildlife?

☐ Sale ☐ Consumption ☐ Sale and Consumption

What type of forest products do you collect?

Types	Where collected	Distance from village	Number of trip per			No. of day / trip	Quantity / Trip		Price / unit	% of increase or decrease*
			month	Season	Year		Amount	Unit		
Wooden										
Log										
Small pole										
Medium pole										
Big pole										
Others (specify)										
Fuel wood										
Bamboo										
Bamboo shoot										
Small rattan										
Rattan										
Mushroom										
Honey										
Wild vegetable										
Vine										
Wild fruit										
Medicine herb										
Others (specify)										
Sambar										
Red Muntjac										
Wild pig										
Wild chicken										
Snake										
Others (specify)										

Q3: To be able to go to collect forest products, NTFPs and wildlife, do you have to pay anything? Before and after collecting those things?

If YES, list all and monetize them with specific unit.

Q4: Did you pay for accessing the forest fee or check point? ☐ Yes ☐ No

If yes, please answer the following:

Type	How much per time?	Pay to whom?	Others
Forest fee (CF management)			
Check point (Military police)			
Check point (police)			
Check point (military)			
Check point (forestry administration)			
Check point (others)			

Q5: What major materials do you need to collect forest products, NTFPs and wildlife?

Types	Expenditure			
	Unit	Cost/Unit	Total Cost	Replace (Frequency to replace)
	Capital investment Cost (1-Sunk cost, 2-Periodic cost)			
Ox-cart				
Ox				
Axe				
Knife				
Mosquito net				
Shoe/slipper				
Cloth				

Q6: How often do you need to repair those materials?

Types	Expenditure			
	Frequency	Unit	Cost/Unit	Total Cost
	O&M (Transportation, maintenance and material)			
Ox-cart				
Ox				

Q7: How many days do you spend for one trip on average?

Do you pack food before going to collect forest product, NTFPs, and wildlife?
List all in this table.

Types	Expenditure			
	Amount/Unit	Cost/Unit	Total Cost	Note
	Daily expense on food			
Rice				
Chicken				
Fish				
Meat				
Vegetable				
Salt				
Concentrated milk				
Coffee				
Candy				
Sugar				
Others				

Q8: Do you ever attend training/meetings/workshops/study tours? ☐ Yes ☐ No
If yes, what subjects? _____

How often? _____

Q9: Have you received lessons on NRM from your village? ☐ Yes ☐ No
If yes, please describe? _____

If no, why? _____

Q10: In terms of cropping, how is the soil quality changing?
Why? _____

Q11: In terms of natural resources management, do you have the right to manage (use)
the natural resources (land, forest, fisheries, wildlife, water...) in your area?
☐ Yes ☐ No

Why? _____

Q12: Is your timber products collection increasing or decreasing? (Compare with 2001)
☐ Increase ☐ Decrease ☐ Stable

Percentage and when? _____

Species _____

Why? _____

Q13: Is your NTFPs collection increasing or decreasing? (Compare with 2001)
☐ Increase ☐ Decrease ☐ Stable

Percentage and when? _____

Species _____

Why? _____

Q14: Is your wildlife collection increasing or decreasing? (Compare with 2001)

☐ Increase ☐ Decrease ☐ Stable

Percentage and when? _____

Species _____

Why? _____

Q15: Do you think your environment around the village has improved?

☐ Yes ☐ No

Why? _____

Q16: If you don't access the forest area, where do you get forest products?

☐ Buy from market

☐ Collect from outside of your target area

Q17: If you buy from the market, how much do you pay per amount?

Type	Size	No. of buying	Price	How many time?	Remark

Q18: If you collect from other forest areas, please answer the following question

Type of forest	Where?	How often?		How long?	How many per time?	Size (tree)	Remark
		Week	Month				

Q19: If the forest becomes completely degraded, how will it affect your family?

Q20: From your point of view, the forest and forest products will be changeable in the year off.

Year	Forest cover	Forest product	NTFPs	Wildlife
	% increase (+) or decrease (-)			
Next 1-5 year				
Next 6-10 year				
Next 11-15 year				
Next 15-30 year				

Q21: Land holding

Type of land	Size of land	When you get it?	Tenure of Certificate?	Conflicted?
Home land			☐ Yes ☐ No	☐ Yes ☐ No
Rice field			☐ Yes ☐ No	☐ Yes ☐ No
Farm/crop land			☐ Yes ☐ No	☐ Yes ☐ No
Bare land			☐ Yes ☐ No	☐ Yes ☐ No
Others			☐ Yes ☐ No	☐ Yes ☐ No

Q22: Besides accessing the forest, do you have other jobs?

The last question: Is the livelihood of you and your family better or worse now compared with the situation of Non CF management schemes? (For commune with Non-CF management the question referred to the previous year if possible to base line of 2001.)

Thank you for your patience.



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