VALUATION OF FISHERY AND NON TIMBER FOREST PRODUCTS OF SEASONALLY FLOODED FOREST IN THE LOWER SONGKHRAM RIVER BASIN, NAKHON PHANOM

YONGYUT KHONCHANTET

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
(TECHNOLOGY OF ENVIRONMENTAL MANAGEMENT)
FACULTY OF GRADUTE STUDIES
MAHIDOL UNIVERSITY
2007

โครงการพัฒนาองค์ความรู้และศึกษานโยบายการจัดการทรัพยากรชีวภาพในประเทศไทย
c/o ศูนย์พันธุวิศวกรรมและเทคโนโลยีชีวภาพแห่งชาติ
อาคารสำนักงานพัฒนาวิทยาศาสตร์และเทคโนโลยีแห่งชาติ
73/1 ถนนพระรามที่ 6 เขตราชเทวี
กรุงเทพฯ 10400

1380/50

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VALUATION OF FISHERY AND NON TIMBER FOREST PRODUCTS OF SEASONALLY FLOODED FOREST IN THE LOWER SONGKHRAM RIVER BASIN, NAKHON PHANOM

was submitted to the Faculty of Graduate Studies, Mahidol University
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ACKNOWLEDGEMENT

The success of this thesis can be attributed to the extensive support and assistance from my major advisor, Asst. Prof. Patompong Saguanwong, my co-advisors, Assoc. Prof. Sansanee Choowaew and Asst. Prof. Raywadee Roachanakanan, of the Faculty of Environment and Resource Studies, Mahidol University for all steps of this thesis including the valuable suggestions, patience, helpful and encouragement.

I am equally pleased to acknowledge the valuable kindness and suggestion received from the external examiner, Asst. Prof. Suwanna Praneetvatakul of the Faculty of Economics, Kasetsart University. I am extremely appreciated to all the lecturers who educated me.

I would like to thank Mr. Rattaphon Pitaktapsombut, Mr. David J.H. Blake and all staff of MWBP for their valuable guidance and all of their appreciatively helps. Furthermore, I would like to convey my thanks to villagers on my study area for their take care and support.

My special thanks to all my friends especially ET 30 for encouragement helpful and friendship, my brothers and sisters from ENMU for their mind and spirit.

This research work is supported by the grant from the Post-Graduate Education, Training and Research Program in Environmental Science, Technology and Management under Higher Education Development Project of the Commission on Higher Education, Ministry of Education and this work was supported by the TRF/BIOTEC Special Program for Biodiversity Research and Training grant BRT T_449003.

Finally, most of all, I deeply appreciated my mother, my father who passed away and my sister for their love and support and entirely care which made this thesis possible and enabled me to undertake this thesis successfully until I could finish my master's degree.

Yongyut Khonchantet

VALUATION OF FISHERY AND NON TIMBER FOREST PRODUCTS OF SEASONALLY FLOODED FOREST IN THE LOWER SONGKHRAM RIVER BASIN, NAKHON PHANOM

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ABSTRACT

The objective of the study "Valuation of fishery and non timber forest products of seasonally flooded forest in the Songkhram River Basin, Nakhon Phanom," was to estimate the direct use value of fishery and non timber forest products from seasonally flooded forest in the Lower Songkhram River Basin, Nakhon Phanom by the market price method. A questionnaire was used to collect data by interviewing the respondents who were randomly selected from local villages in the studied area. The sample size was calculated by quota sampling method at 20 percent of households in each village. Total sample size was 261 selected from 10 villages in Sri Songkhram District, Nakhon Phanom.

Value of non timber forest products from seasonally flooded forest in the Lower Songkhram River Basin, Nakhon Phanom was comprised of 7 groups as follows: value of wild vegetable plants was 354,540 baht/year, value of edible mushrooms was 1,820,600 baht/year, value of bamboo shoots was 421,560 baht/year, value of firewood was 523,473 baht/year, value of fodder was 1,915,204 baht/year, value of edible insects and ant eggs was 355,228 baht/year and the value of medicinal plants is disregarded because the volume of medicinal plants which villagers utilize are relatively small. The total value of non timber forest products of seasonally flooded forest in the Songkhram River Basin, Nakhon Phanom was 5,390,606 baht/year. Value of fishery products was 4,632,670 baht/year.

Total value of fishery and non timber forest products of seasonally flooded forest in the Songkhram River Basin, Nakhon Phanom for 261 households was thus equal to 10,023,276 baht/year. The average value of fishery and non timber forest products of seasonally flooded forest in the Songkhram River Basin, Nakhon Phanom was 38,403 baht/household/year.

The results clearly show how important seasonally flooded forest is to the local people's livelihood.

KEY WORDS: SEASONALLY FLOODED FOREST/ NON TIMBER FOREST PRODUCTS / FISHERY PRODUCTS/ VALUATION / SONGKHRAM RIVER

128 P.

การประเมินมูลค่าผลผลิตประมงและผลผลิตจากป่าที่ไม่ใช่เนื้อไม้จากป่าบุ่งป่าทาม พื้นที่ลุ่มน้ำสงครามตอนล่าง จ.นครพนม (VALUATION OF FISHERY AND NON TIMBER FOREST PRODUCTS OF SEASONALLY FLOODED FOREST IN THE LOWER SONGKHRAM RIVER BASIN, NAKHON PHANOM)

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บทคัดย่อ

การประเมินมูลค่าผลผลิตประมงและผลผลิตจากป่าที่ไม่ใช่เนื้อไม้ของป่าบุ่งป่าทามในพื้นที่ลุ่มแม่น้ำสงครามตอนล่าง จ.นครพนม มีวัตถุประสงค์ เพื่อประเมินมูลค่าการใช้ประโยชน์ทางตรงของผลผลิตประมงและผลผลิตจากป่าที่ไม่ใช่เนื้อไม้จากป่าบุ่งป่าทาม พื้นที่ลุ่มแม่น้ำสงครามตอนล่าง จ.นครพนม โดยใช้วิธีการประเมินราคาตลาด ในการศึกษาครั้งนี้เป็นการวิจัยเชิงสำรวจโดยใช้แบบสอบถามเป็นเครื่องมือในการเก็บรวบรวมข้อมูล โดยทำการสุ่มตัวอย่างแบบกำหนดโควตาของกลุ่มประชากรที่ทำการศึกษาเท่ากับร้อยละ 20 ของจำนวนครัวเรือนของแต่ละหมู่บ้านที่ทำการศึกษา โดยจำนวนตัวอย่างทั้งหมด 261 ตัวอย่างจาก 10 หมู่บ้าน ในพื้นที่อำเภอศรีสงคราม จ.นครพนม

ในการศึกษาครั้งนี้มูลค่าของผลผลิตจากป่าที่ไม่ใช่เนื้อไม้จากป่าบุ่งป่าทาม ในพื้นที่ลุ่มแม่น้ำสงครามตอนล่าง จ.นครพนม จะแบ่งเป็น 7 กลุ่มดังนี้ มูลค่าของพืชอาหารมีมูลค่าเท่ากับ 354,540 บาทต่อปี มูลค่าของเห็ดที่กินได้มีมูลค่าเท่ากับ 1,820,600 บาทต่อปี มูลค่าของหน่อไม้มีมูลค่าเท่ากับ 421,560 บาทต่อปี มูลค่าของไม้ฟืนมีมูลค่าเท่ากับ 523,473 บาทต่อปี มูลค่าของพืชที่เป็นอาหารสัตว์มีมูลค่าเท่ากับ 1,915,204 บาทต่อปี มูลค่าของแมลงกินได้และไข่มดแดงมีมูลค่าเท่ากับ 355,228 บาทต่อปี และมูลค่าของพืชสมุนไพรซึ่งจะไม่ทำการประเมินในการศึกษาครั้งนี้ เนื่องจากมีการปริมาณการใช้ประโยชน์น้อยมาก จึงทำให้ไม่สามารถประเมินมูลค่า โดยมูลค่าทั้งหมดของผลผลิตจากป่าที่ไม่ใช่เนื้อไม้จากป่าบุ่งป่าทาม ในพื้นที่ลุ่มแม่น้ำสงครามตอนล่าง จ.นครพนม มีมูลค่าเท่ากับ 5,390,606 บาทต่อปีโดยในส่วนของมูลค่าการใช้ประโยชน์ทางตรงของผลผลิตประมงในการศึกษาครั้งนี้จะคำนึงถึงเฉพาะมูลค่าจากการประมงพื้นบ้านเท่านั้น ซึ่งมีมูลค่าเท่ากับ 4,632,670 บาทต่อปี

จากผลการศึกษาดังกล่าวพบว่ามูลค่าการใช้ประโยชน์ทางตรงของผลผลิตประมงและผลผลิตจากป่าที่ไม่ใช่เนื้อไม้ของป่าบุ่งป่าทามในพื้นที่ลุ่มแม่น้ำสงครามตอนล่าง จ.นครพนมจาก 261 ครัวเรือนมีมูลค่าเท่ากับ 10,023,276 บาทต่อปี โดยคิดเป็นมูลค่าเฉลี่ยต่อครัวเรือนของหมู่บ้านในพื้นที่ศึกษาได้เท่ากับ 38,403 บาทต่อครัวเรือนต่อปี ซึ่งแสดงให้เห็นถึงความสำคัญของป่าบุ่งป่าทามที่มีต่อการดำรงชีวิตของชุมชน

128 หน้า.

CONTENTS

CONTENTS (Cont.)

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

CHAPTER I
INTRODUCTION

1.1 State of Problem

Wetlands are generally highly productive ecosystems, providing many important benefits. They perform ecology function such as flood protection, nutrient retention, and provide a wide range of natural resources. There are many definitions of wetlands in current usage. The definition of wetlands by the Ramsar Convention is internationally accepted. In the text of the convention, wetlands are defined as: "Area of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static, flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres." As a result of these provisions, the coverage of the Convention extends to a wide variety of habitat types, including rivers, shallow coastal waters and even coral reefs, but not deep sea (Barbier, 1997).

Seasonally flooded forest (known in Thai as pa bung pa thaam) is one kind of wetlands that exists in northeastern Thailand. This is a forest which has its characteristic as inundated forest in the rainy season, where is present on the river banks in the rainy season and inundated upon flood plain about three to four months every year and becomes dry in the summer. The characteristics of plants in seasonally flooded forest are small shrub and perennial that are suppressed from inundation. These wetlands support a wealth of biodiversity and natural resources and subject to dramatic seasonal changes of flood and recession.

The Songkhram River originates from Phuphan Mountain Range with altitude of 300 m above MSL. The river passes north crossing Udorn Thani Province and diverts southeasterly to Sakon Nakhon and Nong Khai Provinces and drain into Sri Songkhram area of Nakhon Phanom Province and confluent with the Khong River in Chaiburi Sub-district with total distance of 420 km (Thai Baan Research, 2005). The Songkhram River has a catchment area of 12,367 km^2 and is the only major Mekong tributary without a large dam.

In the lower reaches, stretching up to 200 kilometers from the mouth of the river, there is seasonally flooded forest where annual floods cover an area of approximately 500,000 – 600,000 rai for three to four months during the rainy season. Very similar to the Tonle Sap of Cambodia, in the rainy season the Lower Songkhram River Basin receives floods derived from upstream runoff and backflow from the Mekong River, which is characteristic of forest in Northeastern Thailand River Basin. The tide of current in the Songkhram River was related with the migration of many fish species from the Mekong River, including the Mekong giant catfish. When the Songkhram River overflowed its banks, fertile silts was deposited on the land, and hundreds of fish species swam up tributaries to feed and breed.

In summer many plants in seasonally flood forest recover and resume growing. Villagers get food from inundated forests such as wild bamboo shoots and wild mushrooms. The local economy is still dependent heavily on products originating from the seasonally flooded forest. The importance of the Songkhram River is not only for livelihood and local economy but also the wetlands of the Lower Songkhram River Basin identified as an important one in the Wetland Inventory of Thailand.(Office of natural resources and environmental policy and planning, 1999) The Lower Songkhram River Basin is important vitlly as a store of aquatic biodiversity and as a fish breeding and nursery ground for at least 17 species including the Red list species Giant Catfish (*Pangasianodon gigas)*, *Tenualosa thibodeaui*, Blanc's striped Featherback *(Chitala blanci)*, Jullien's Barb (*Probarbus jullieni)* and Thin-lip Barb (*Probarbus labeaminor*) (Thai Baan Research, 2005).

According to these importances of seasonally flooded forest as wetlands, however, it is not well known as other wetlands such as mangrove forest in South and East of Thailand, swamps forest in South of Thailand and freshwater marshes forest in middle of Thailand, those are interested for education and management as wetlands. Regarding the seasonally flooded forest the importance of ecosystems and livelihood in Northeastern Thailand may be different. However, it has not been recognized by any government organization. Currently some development projects in Northeast are being undertaken in the area of seasonally flood forest. Consequently these projects have degraded the seasonally flooded forest and have affected a number of local fish species, migratory fish and biodiversity of plants in seasonally flooded forest.

Precisely the above mentioned problems should be solved by involving all organizations both local administrative organizations, local and central government agencies including related non government offices. It cannot be denied that the approach is required the correct and clear information about the value and importance of seasonally flooded forest. Furthermore, the evaluation of value of seasonally flooded forest is crucial to provide information for the management of seasonally flooded forest in the area of the Songkhram River. This study applies economic approach in the valuation of seasonally flooded forest in terms of Thai currency. The result will show the significance of seasonally flooded forest for local people in terms of direct use value as fishery products and non timber forest products. More importantly the result of this study will be applied for the more effective strategy focusing on seasonally flooded forest management particularly as comprehensive information.

1.2 Objectives

1. To estimate the direct use value of fishery products from seasonally flooded forest.
2. To estimate the direct use value of non timber forest products from seasonally flooded forest.

1.3 Scope of Study

1. Seasonally flooded forest on the Lower Songkhram River Basin is the study area due to their importance for local villager's livelihoods and their richness.
2. The population samples as respondents are selected randomly from villagers in ten villages from five sub-districts that located closed to the Songkhram River and seasonally flooded forests in Sri Songkhram District.
3. Sri Songkhram district is selected for this study because it has previously research as Thai Baan Research which studied about the ecology and local history of the seasonally flooded forest in the Lower Songkhram River Basin and the access to the district is relatively without much differents.
4. Market price method is used for evaluate the direct use value of seasonally flooded forest from fishery and non timber forest products.

5. The direct use value of fishery products from seasonally flooded forest on this studied is not included such as the bidding of community's swamp and some fishing which use the commercial fishing gear. The scope of fishery products of this study is especially the value of fishery products that earn from local people utilization

6. The direct use value of non timber foreset products from seasonally flooded forest on this studied is compose of the value of products from wild vegetable plants, edible mushrooms, bamboo shoots, firewood, fodder medicinal plants, edible insects and ant eggs.

1.4 Conceptual Framework

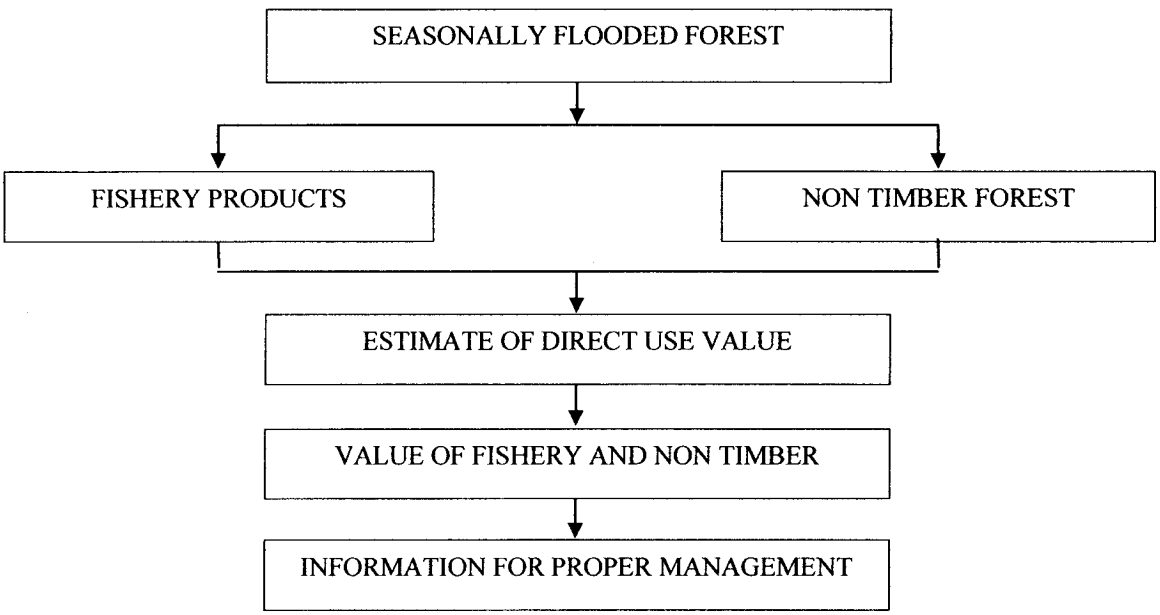


Figure 1-1 Conceptual framework

1.5 Operational Definition

1.5.1 Non timber forest products: means "non-wood forest products which include all goods of biological origin, as well as services derived from forest or any land under similar use, and exclude wood all its forms" (FAO, 1992). The non timber forest products which are mentioned on this studied compose of the products from wild vegetable plants, edible mushrooms, bamboo shoots, firewood, fodder medicinal plants, edible insects and ant eggs.

1.5.2 Fishery products: this study estimates net benefit of fishery products from local people utilization. Therefore, commercial fishing such as the bidding of community's swamp and some fishing which use the commercial fishing gear is not considered accordingly.

1.6 Expected Result

To be able to quantify direct use value of fishery and non timber forest products of seasonally flooded forests in form of money. The result of this study could be used as information to establish some optional strategies of sustainable seasonally flooded forests usage and management.

CHAPTER II
LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Seasonally flooded forest

Seasonally flooded forest is the plant communities which have been related to Northeast communities for a long time. The word of "Bung" is a local dialect of Northeast communities with a meaning of marsh or an area of big swamp which is flooded all year and "Thaam" means an area on river banks that is flooded in some periods of a year. Hence seasonally flooded forest is the riparian forest which is flooded in the rainy season and is dry in the summer. Presently, there are some floodplains on river banks of Northeast Thailand such as the Mun River and the Songkhram River on Sakon Nakhon Basin. The structure of seasonally flooded forest is divided into 3 groups as follows: The first ecosystems is riparian forest flooded at the time of high tides and prominent species of plant are *Symplocos racemosa* Roxb., *Albizia lebbeck* (L.) Benth. and *Barringtonia acutangula* (L.) Gaertn. The second ecosystems is highland or hillock that is not inundated. The third and last ecosystem is seasonally flooded forest where is flooded all year. The prominent species in this forest have to adjust to the influence of tides, i.e., reed, water lettuce, water chestnut, nymphaea, and seaweed (Thai Baan research, 2005).

1. Important of seasonally flooded forest

Seasonally flooded forests are likely to have numerous important functions in natural ecosystems as wetlands function. Wetlands have been described both as "*the kidneys of the landscape*", according to their functions that they can perform in the hydrological and chemical cycles, and as "*biological supermarkets*" acordjng to the extensive food webs and rich biodiversity that they support for local people livelihoods (Mitsch and Gosselink, 1993). The importance and roles of seasonally flooded forest have been divided into two parts as follows:

1) The importance for local livelihoods

Seasonally flooded forest is a colorful forest for local community in the Northeast of Thailand. It is related with its life as routine activity, i.e., an area for rice fields, farm crops, vegetables and fruit farm and seasonally flooded forest playing roles as a nursery ground that is a place for both food and shelter, for juveniles of many organisms and they serve as sources of food and livestock. The major roles and importances of seasonally flooded forest are as follows (Department of environmental quality promotion, n.d.):

- **Agricultural resources:** Local community has been using the area of seasonally flooded forest for agriculture for a long time. An annual crop is rotated in a period of one year or few years in the same area. They change kinds of plant to revive their area and keep them into the wealthy condition. Organic agriculture is the method of planting in the area of seasonally flooded forest, and chemical usage is unnecessary. There are various types of agriculture in seasonally flooded forest, i.e., rice field on flood plain, rice crops and other farm crops such as fiber plants, corns, beans and cucumber in some areas.
- **Fishery resources:** Seasonally flooded forest is an area of rich mineral resources, serving as source of foods and fish breeding, which local people can catch all year round for their consumption and revenue. Other fishery resources that present on seasonally flooded forest area such as snails are abundant all year.
- **Wildlife resources:** Wildlife resources from seasonally flooded forest include plants and animals needed by local people. There are various utilizations from this forest, i.e., fruit products from perennial plant, fuel woods from shrubbery, herbs that used medicinally, forage plant and other kinds of floating plant such as lotus, water chestnut and water mimosa. Moreover the seasonally flooded forest serves as shelter for some animals. i.e., jungle fowls, rabbits, birds, rats, frogs, small frogs, bullfrogs, freshwater snails, apple snails, snakes and various kind of insect. In other words they are major sources of protein for local people in the area.
- **Forage resources:** Considering physical characteristics of seasonally flooded forest, it is an appropriate area for domestic animals. There are various kinds of plants for cattle's nutrition. In addition, the villagers feed ducks in flooded forest, due to the abundance of water, vegetables, insects and snails. In some

areas they use seasonally flooded forest for elephant self-feeding such as Tha Toom District, Surin Province.

- **Forest Resources:** Seasonally flooded forest is a rich biodiversity forest in the Northeast of Thailand. Some areas are profitable for agriculture area. Their native species have been utilized by local people for a long time. For example, *Albizia lebbeck* (L.) Benth., *Barringtonia acutangula* (L.) Gaertn. and various edible mushrooms which serve as daily food. Some plants are used for fuel, i.e., *Mallotus thorelii* Gagnep, *Hymenocardia wallichii* Tul., *Phyllanthus collinsae* Craib and other are used for fishing gears, i.e., *Cyperrus corymbosus* Rottb., *Parameria barbata* Schum..var.Pierra Kerr and Herb such as *Artabotrys spinsus* Craib.
- **Household utilization:** Seasonally flooded forest is a major source for household utilization such as; the major source of firewood and charcoal. The plant in seasonally flooded forest is easy lighting wood which proper for fuel wood accordingly.

2) The importances of ecosystem

Obviously the ecosystem is considered as benefit or indirect benefit of seasonally flooded forest as good as wetland which is summarized as follow (Department of environmental quality promotion, n.d.).

- **Groundwater recharge and discharge:** This occurs when water moves from the body of the wetland area into the underlying aquifer system. However, it must be borne in mind that not all wetlands are recharge areas for groundwater; some may be discharge areas where groundwater flows into wetland to be source of water for consume in dry season.
- **Flood control:** Seasonally flooded forest can act as storage for excess amounts of water (which may occur during times of heavy rainfall or high flows in rivers). The water can come from rain, run-off, and rivers or from underground sources. Wetland vegetation slows down the flow of the flood water, so that not all of water arrives downstream at the same time.
- **Shoreline stabilization and erosion control:** The physical characteristics of seasonally flooded forest vegetation could prevent and retard the scour of flooded and the root of vegetation could arrest the river bank for the erosion.

- **Sediment retention:** The physical properties of some wetlands (e.g. vegetation, size, water depth) tend to slow down the flow of water. This is especially true of swamps, marshes and floodplains. This facilitates the deposition, and therefore the removal, of sediment. The deposition is closely linked to the beneficial removal of toxicants and nutrients since these substances are often bound to sediment particles.

- **Toxicant removal:** Many toxicants entering aquatic ecosystems are bound to the surface of fine sediments or within the molecular lattice of clay particles. The slower flow rates in seasonally flooded forest facilitate dropping of sediment loads, and the storage and transformation of sediment-bound toxicants. In some cases, certain plant species actively take up toxicants. This process may benefit communities and development downstream by maintaining or even enhancing water quality. Since many toxicants enter aquatic systems bound to sediments, the process of removal is similar to that of sediment trapping.

- **Nutrient retention**: The physical properties of some seasonally flooded forests tend to slow down the flow of water facilitating the deposition of sediments. Nutrients are often associated with and can therefore be deposited at the same time. Nutrients may be form a wide variety of sources, but are commonly run-off of fertilizer from agricultural areas, human wastes and industrial discharges.

When the sediment is deposited, the nutrients may be stored with it, taken up by wetland vegetation or transformed by chemical and biological processes. Uptake by wetland vegetation does not ensure the nutrient's removal from the water since the nutrients can be released again through decay of the plant. However, harvesting biomass from the wetland such as grasses and sedges for thatch and fishes for food means that nutrients are taken out of the system in a useable form. Inorganic phosphorus and nitrogen are the most significant nutrients which are removed, stored or transformed by chemical process in wetlands. Nitrates can be removed by the process of denitrification in which bacteria found in oxygen-poor wetland soils convert nitrates and nitrites into molecular nitrogen which diffuses into the atmosphere. Phosphates can be bound to inorganic ions in mineral soils of wetlands. If these soils become saturated with phosphates, however, they may actually export phosphorus. Moreover, under reducing conditions (where there is a lack of oxygen),

nutrients such as phosphates may actually be released into the overlying water and be exported out of the wetland. Many wetlands are more efficient at transforming and removing nutrients than terrestrial habitats.

- **Biodiversity:** Seasonally flooded forest compose with too many ecosystems which cause the diversity of plants and animals follow the particularities of ecosystem. The biodiversity of seasonally flooded forest is valuable for ecosystems and local people utilizations.

2. Flora of seasonally flooded forest

Owing to a rich of natural resources, seasonally flooded forest serves as supermarket's community all year. Moreover, some native species are endemic only in the forest type such as Pai ga sa. Thai Baan research (2005) reports that about 208 species which are known species, are utilized. They are divided into 7 groups as follows:

- **Perennial plants:** Plant species in this group presented on upland area, highland, jungle and hillock. These species are as follows: *Hopea odorata* Roxb., *Ficus racemosa* L., *Combretum trifoliatum* Vent., *Syzygium polyanthum* (Wight) Walp., *Lagerstroemia macrocarpa* Wall., *Shorea guiso* (Blanco) Blume, *Dipterocarpus tuberculatus* Roxb., *Dipterocarpus intricatus* Dyer, *Elaeocarpus stipularis* Blume.
- **Shrubbery plants:** Plant species in this group presented along the river banks, flood plain and brook for example: *Phyllanthus taxodiifolius* Beille, *Barringtonia acutangula* (Linn.) Gaertn., *Bambusa arundinacea*, *Hiptage triacantha* Pierre, *Hymenocardia wallichii* Tul., Pai gasa.
- **Climbing plants and clinging vines:** Plant species in this group are as follows: *Willughbeia edulis* Roxb., *Dioscorea pseudotomentosa* Prain & Burkill, *Tiliacora triandra* (Colebr.) Diels, *Xenostegia tridentata* (L.) D. F. Austin & Staples, *Calamus godefroyi* Becc., *Garcinia schomburgkiana* Pierre.
- **Vegetable plants:** Plant species in this group presented on floodplain, hillock, jungle, highland, paddy field, the Songkhram River banks and backwaters. These species are as follows: *Limnocharis flava* Buch., *Barringtonia*

acutangula (Linn.) Gaertn., *Crateva addansonii* D. C. subsp. trifoliata jacojobs, *Centella asaitica* (L.) Urban.

- **Mushrooms:** Mushroom species presented along bung areas, floodplain, the Songkhram River banks and backwaters. There are various species of mushroom as follows: *Boletus colossus* Heim, *Lentinus polychrous* Lev., *Russula Luteotacta* Rea, *Russula nigricans* (Bull.) Fr., *Russula sp.*
- **Water plants:** There are various kinds of water plants on the Songkhram River such as: *Nymphaea lotus* L. var. pubescens (Wild.) Hook.f & Thomson, *Colona flagrocarpa* (C. B. Clarke) Craib, *Sphenoclea zeylanica* Gaertn.

Grasses: In seasonally there are various kinds of grass in the seasonally flooded forest which present on every sub-ecosystem .

2.1.2 The Songkhram River Basin

Thai Baan research (2005) reported ecology and local history of seasonally flooded forest in the Lower Songkhram River Basin as follows:

1. History of the Lower Songkhram River Basin

The research has found that the Lower Songkhram area has been the home of many different ethnic groups for long time, as a consequence of the rich natural resources and the location has been a transport route between the extensive Sakon Nakhon Basin and the Mekong River.

The researchers reported that the first groups that traveled to the area were the Khmer (called by the local as Khom) and the Lao. The Khmer traveled by Kra Saeng boat along the Mekong River and its tributaries for trading items of silverware, goldware, knives and swords, while the Lao from Savannaket and Khammuan traded their rice in exchange for salt from the Songkhram valley.

During World War II, Vietnamese people moved to some of the large towns along the Mekong River in Thailand. Some of them worked as laborers with trading boats traveling along the Mekong River and its tributaries, including the Songkhram River. A number of them, after seeing the rich natural resources of the area, permanently settled in the area for fishing.

There have been many other ethnic groups from Northeast Thailand and Lao who have relocated to the area such as the So, Lao, Nyaw, and Chinese. These groups moved either to the existing communities or established new communities. They fished, farmed in the flooded forest, traded and worked on commercial boats.

The Thai Baan research illustrates that the economy of communities in the Songkhram basin has been connected to communities in other areas for a long time, through merchants who traveled along the Mekong River and its tributaries. Local Songkhram villagers in the seasonally flooded forest have traded their products such as fermented fish and dried fish with rice, salt and chili from upland communities. They also sold dried fish at some festivals and ceremonies such as the annual That Phanom pagoda festival.

In the early 1940s, there were Chinese sailing ships plying the river selling rice and chili, and purchasing fermented fish from the area to sell in communities along the Mekong River in Nong Khai, Mukda Han, Ubon Provinces, and on the Lao banks and even as far as Si Sa Ket Province on the Mun River.

In 1950 a new road was built connecting Sri Songkhram and Tha Utane Districts, minimizing the role of river navigation. More and more merchants started using the road for their trading activities. Later, as road improved and trucks were introduced, it became possible for merchants to buy fresh fish, vegetables, bamboo shoots, and mushrooms from the Songkhram River Basin for selling in many other areas.

Apart from fish, cattle and buffalo have long been important for the local economy. The seasonally flooded forest and surrounds of the Lower Songkhram River has served as the largest grazing plains in Sakon Nakhon Basin. Villagers in the Lower Songkhram Basin have traded cattle with Thai people in Central and Eastern Thailand for over a century. Presently, they trade cattle and buffalo in the local livestock markets only, but large livestock remains a vital possession for the villagers.

2. Ecology of the Lower Songkhram River Basin

The research finds that the 420 km Songkhram River is a most fertile river basin. In the lower reaches, stretching up to 200 km from the mouth of the river, there is seasonally flooded forest where annual floods cover an area of approximately

500,000 – 600,000 rai for three to four months during the rainy season. Very similar to the Tonle Sap of Cambodia, in the rainy season the Lower Songkhram River receives floods derived from upstream runoff and backflow from the Mekong River.

Part of the unique nature of the Lower Songkhram River Basin is the flood resistant forest (known in Thai as pa bung pa thaam) comprising many tree and shrub species, including a dominant pioneer bamboo species called pai gasa, in the flooded area and on the banks.

The researchers find that the complex wetland ecosystem of the Lower Songkhram River Basin consists of 28 different sub-ecosystems, hosting diverse plants and aquatic organisms. The Thai Baan researchers identify 208 kinds of plants and fungi, 124 fish species, five turtle species, four shrimp species, 10 mollusk species, four crab species, and six aquatic insects.

Out of 124 fish species, 115 species are native fish. There are 58 fish species that can be found in the Songkhram River all year round. There are an additional 57 species of migratory fish that migrate from the Mekong River, including the Mekong Giant Catfish. The Giant Catfish migrated to the Songkhram River during the flood season to feed on aquatic weeds, invertebrates and saline clay soil (Din euad) in the flooded forest. According to a community note, a number of Mekong Giant Catfish were caught at Kud Takla on the Songkhram River in 1952 and 1953, with a maximum weight of 270 kilograms and have been caught in decreasing numbers ever since. The last Giant Catfish caught was recorded in 2003.

3. The current situation of the Lower Songkhram River Basin

The local economy is still heavily dependent on products originating from the seasonally flooded forest including fresh and fermented fish, wild plants and cultivated vegetables and large livestock. The number of families who own cattle or buffalo has increased; while the number of animals per household has decreased because communal grazing plains have often been occupied by agribusiness ventures. In the last three decades several large agribusiness ventures have established in the area, buying up large amounts of land at cheap prices and occasionally encroaching on common land, which has led to many instances of conflicts between local communities and the companies, some of which have ended up in the courts.

The research finds that there are 79 kinds of traditional fishing gears, but eight of them are no longer in use. A number of large scale commercial fishing gears were introduced by the newcomers to the communities and widely adopted over the last 40 years or more.

For agriculture in the seasonally flooded forest and surrounds, there are various kinds of rice cultivation including lowland paddy fields and terraced rice fields. The rice is produced mainly for household consumption. In some years if conditions are right, high yields are possible and villagers can get a reasonably high income from selling rice.

The researchers found that there were once 47 different varieties of rice grown by villagers. Following introduction and promotion of commercial high yielding rice varieties by state agencies the number of varieties has fallen. Currently there are only seven varieties of native rice grown in the area. The villagers also grow various kinds of vegetables for household consumption in the upland fields and along the river banks during the dry season.

An important concern coming out of the Thai Baan research is the decline in productivity of the seasonally flooded forest as a result of the use of destructive commercial fishing gears, charcoal making, and commercial farming operations owned by agribusiness companies. The companies use significant amounts of chemical fertilizers and pesticides in their farming practices leading to instances of fish kills around the intensive farming operations. Also the researchers concern about human health risks from chemical fertilizers and pesticides.

At sub-district level a fishing auction system run by local administrative organizations (TAOs) to raise funds for community development reflects insufficient funds provided by the state. This may lead to over-fishing in the area. The productivity of the Lower Songkhram River has been further impacted by dam construction at the upstream. The reservoir of the dam has raised water tables that may cause salinisation around the surrounding areas and destroied riparian vegetation.

Importantly for the last three years unusual water fluctuation has been observed in the Songkhram River Basin. Such unusual water fluctuation had only ever been observed within 3 years, and had been reported in many parts of the Mekong River. While the real causes may be in some doubt, such unusual water fluctuations are

consistent with the development and operation of the dams in the upper reaches. When the river ecosystem is affected by unusual water fluctuations, migration pattern of fish may also be affected. There are widespread invasions of aquatic weeds such as mai arab (Giant Mimosa). The villagers complained they could not organize a ceremony on the river banks due to the unusual water fluctuations at Ban Pak Yam, Sam Pong Sub-district, Sri Songkhram District, Nakhon Phanom Province.

The degradation of seasonally flooded forest is affirmed by the decreasing number of local fish species, or even being extinct. There are 14 fish species that are nowadays considered to be rare, and 11 fish species that appear to be extinct locally as they have not be found in the Songkhram River for over 50 years. These extinct species are migratory fish that migrate between the Songkhram and Mekong Rivers.

Amidst the environmental crisis in the Songkhram River Basin, the villagers have tried to solve the problems that have arisen. For instance, they have set up many fish conservation zones, establishing community rules prohibiting destructive fishing gears, and building habitats for fish. Local communities have taken on these management responsibilities by themselves. These activities have been supported by district state agencies and temples.

Local community management activities have ensured equity with poorer people being allowed to fish in conservation zones on some occasions. Importantly, it was found that a type of fish conservation area by the community has been practiced for a long time in the form of "sacred areas" where access to fishing is restricted, but is still respected by villagers.

The Songkhram River has long been a rich and productive resource but is increasingly under threat. The Thai Baan research provides a mechanism for local people to present their insights and values to ensure the long term sustainability of their river (Thai Baan research, 2005).

2.1.3 Environmental valuation

Currently most planning and development decisions are made on economic grounds, moreover, on the basis of the free-market system. While this new paradigm has its own limitations and dangers, it would be unrealistic to ignore and to base our quest for the conservation and wise use of wetlands on a completely different set of

values. Hence, wetland goods and services must be given a quantitative value if their conservation is to be chosen over alternative uses of the land itself or the water which feeds the wetlands (Pearce and Moran, 1994).

For many products, such as fish or timber, there is a world market which allows easy calculation of the worth of the wetlands. The value of wetland functions, such as water quality improvement, may be calculated from the cost of building a treatment works to perform the same processes. It is much more difficult, however, to value biodiversity or the aesthetic beauty of wetlands, as the market for such "products" is much more elusive and their economic valuation much more difficult to achieve with traditional methods. Another major hurdle is that developing countries face significant problems in appropriating the global benefits of wetland conservation, such as their biological diversity (Pearce and Moran, 1994).

Throughout human history, the term wetlands conjured up for many people a swamp full of slimy creatures, harboring diseases such as malaria and schistosomiasis. Indeed it is this view of wetlands as wastelands that has led to extensive drainage and conversion of wetlands for intensive agriculture, fish ponds, industrial or residential land or to improve public health. However, in recent years there has been increasing awareness of the fact that natural wetlands provide free of charge many valuable functions (e.g., flood alleviation, groundwater recharge, retention of pollutants), products (e.g., fish, fuel wood, timber, rich sediments used for agriculture in the floodplains, tourist attractions), and attributes (biodiversity, aesthetic beauty, cultural heritage and archaeology).

The trend towards wetland conservation is exemplified by the many countries that have adopted the policy that there should be no further wetland loss or degradation, that wetlands must be used in a sustainable way and research should be undertaken on quantifying wetland values. The trend towards wetland conservation is exemplified by the many countries that have adopted the policy that there should be no further wetland loss or degradation, that wetlands must be used in a sustainable way and research should be undertaken on quantifying wetland values.

If researchers are to value wetland uses and decision-makers are to take these into account when making policies that affect wetlands, then a framework for distinguishing and grouping these values is required. The concept of ***total economic***

value* (TEV)** provides such a framework and there is an increasing consensus that it is the most appropriate one to use. Simply put, total economic valuation distinguishes between ***use values and ***non-use values***, the latter referring to those current or future (potential) values associated with an environmental resource which rely merely on its continued existence and are unrelated to use (Pearce and Warford, 1993).

Typically, use values involve some human 'interaction' with the resource whereas non-use values do not. The total economic valuation framework, as applied to wetlands, is illustrated in Table 2.1

Table 2-1 Classification of total economic value for wetlands.

TOTAL ECONOMIC VALUE				
USE VALUES			NON-USE VALUES	
Direct use value	Indirect use value	Option value	Existence value	Bequest value
• Fish • Agriculture • Timber forest product • Transport • Wildlife harvesting • Peat/Energy • Non timber forest products	• Nutrient retention • Flood control • Storm protection • Groundwater recharge • External ecosystem support • Micro-climatic stabilization • Shoreline stabilization	• Potential future uses(as per direct and indirect uses) • Future value of information	• Biodiversity • Ecosystem • Plant genetic	• Habitats • Prevention of irreversible change • Culture , heritage

Source: adapted from Barbier, et al. (1997) and Pearce and Moran (1994)

Definitions of various types of environmental value are as follows: (Barbier et al., 1997; Moran and Bann, 2000)

1. Use Values

The framework commonly used for valuing natural resources is known as the TEV. This comprises use values (direct, indirect and option values) and non-use values are as follows:

- **Direct use values** are values derived from direct use or interaction with environmental resources and services (e.g., timber, fuel wood, tourism are direct use values of a tropical forest). Direct uses of wetlands could involve both commercial and non-commercial activities, with some of the latter activities often being important for the subsistence needs of local populations in developing countries or for sport and recreation in developed countries. Commercial uses may be important for both domestic and international markets. In general, the value of marketed products (and services) of wetlands is easier to measure than the value of non commercial and subsistence direct uses.
- **Indirect use values** relates to the indirect support and protection provided to economic activity and property by the ecosystem's natural functions, or regulatory 'environmental' services. For example, the storm protection and shoreline stabilizations functions of a wetland may have indirect use value through reducing property damages, yet often coastal or riverine wetland systems are drained in order to build still more waterfront property. Mangrove systems are known to be breeding grounds and nurseries for shrimp and fish that are essential for coastal and marine fisheries, yet these important habitats are currently being converted rapidly in many regions for aquaculture, particularly shrimp ponds. Natural floodplains may recharge groundwater used for dry land agriculture, grazing livestock and domestic or even industrial use, yet many of these floodplains are threatened by dams and other barrages diverting water for upstream irrigation and water supply.
- **Option values** are a type of use value in that it relates to the future use of the environment. Option value arises because individuals may value the option to be able to use the environment sometimes in the future. For example, there may be an additional "premium" placed on preserving a forest system and its resources and functions for future use, particularly if one is uncertain about the future

value but believe it may be high and if current exploitation or conversion may be irreversible.

2. Non-use Values

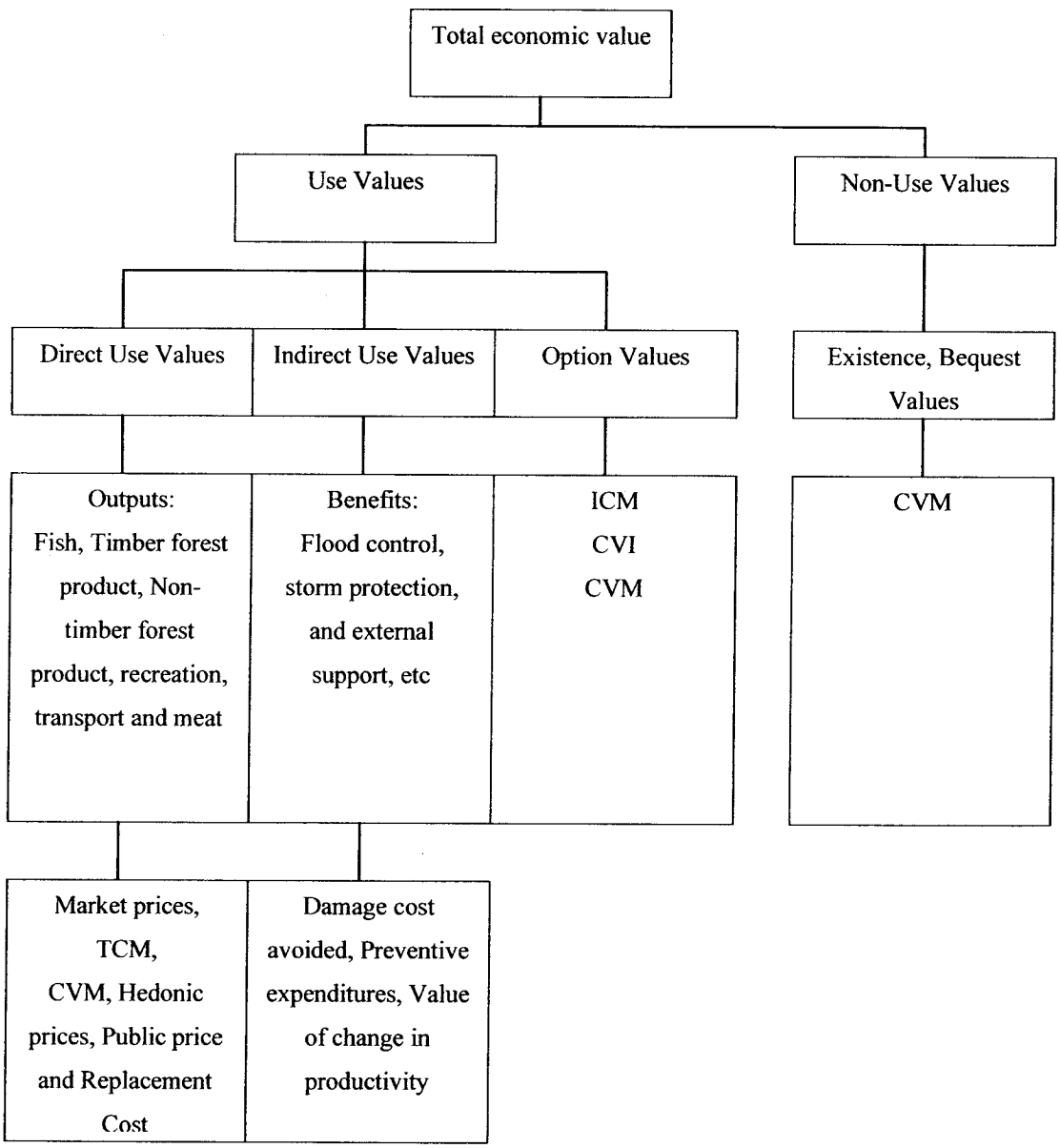
Non-use values are derived neither from current direct or indirect use of the environment. As for these values, it is tied to perception and feeling. People feel good when they learn that environment is in good condition. Feeling good is a benefit people receive from knowing the good condition of the environment. For example, there are individuals who do not use the tropical forest but nevertheless wish to see them preserved 'in their own right'. Non-use value can be divided into two types as follows;

- **Existence Values** was value of people's feeling. People thought that thing or that place still exist in original condition although they did not know condition of that area and they might not have an opportunity to visit that area. But if that area or that environment was destroyed and irreversible, this value would be disappearing. People regret when they learn about disaster such as the extinction of a rare animal or plant specie, the destruction of wildlife's habitats, etc.

Bequest Values, as for this value people in the present time is willing to preserve an environment or natural resources for future generation. This value is the value that people place on knowing that future generations will have the option to enjoy something. Thus, bequest value is measured by peoples' willingness to pay to preserve the natural environment for future generations. Bequest values may be particularly high among the local populations currently using a wetland, in that they would like to see the wetland and their way of life that has evolved in conjunction with it passed on to their heirs and future generations in general. For example, a person may be willing to pay to protect the Alaskan wilderness area so that future generations will have the opportunity to enjoy it. Another case of bequest value was present in Northern Nigeria; about several years ago the UK's Royal Society for the Protection of Birds (RSPB) collected £500,000 (US$ 800,000) from a one-off membership mailing campaign to help save the Hadejia-Nguru wetlands of Northern Nigeria in West Africa. It is clear that a single person may benefit in more than one way from the same ecosystem. Thus, total economic value is the sum of all the relevant use and non-use values for a good or service.

2.1.4 Wetland Valuation Techniques

There are various economic methods of evaluating wetlands which are shown in Figure 2-1. There are three generally accepted approaches to estimating dollar values of ecosystem services. Each approach includes several methods. They are as follows (Dennis and Marisa, 2002).



Sourçe: adapted from Barbier et al., (1989a) referenced on Barbier et al., 1997

Figure 2-1 Wetland Valuation Techniques

1. Market Prices

The values of some ecosystem goods or services can be measured using market prices. Some ecosystem products, such as fish or wood, are traded in markets. Thus, their values can be estimated by estimating consumer and producer surplus, as with any other market good. Other ecosystem services, such as clean water, are used as inputs in production, and their value may be measured by their contribution to the profits made from the final good.

Some ecosystem or environmental services, like aesthetic views or many recreational experiences may not be directly bought and sold in markets. However, the prices people are willing to pay in markets for related goods can be used to estimate their values. For example, people often pay a higher price for a home with a view of the ocean, or will take the time to travel to a special spot for fishing or bird watching. These kinds of expenditures can be used to place a lower bound on the value of the view or the recreational experience. These methods are as follows(Dennis and Marisa, 2002):

1) Market Price Method

The market price method estimates the economic value of ecosystem products or services that are bought and sold in commercial markets. The market price method can be used to value changes in either the quantity or quality of a good or service. It uses standard economic techniques for measuring the economic benefits from marketed goods, based on the quantity people purchase at different prices, and the quantity supplied at different prices.

Summary of the Market Price Method

The market price method estimates the economic value of ecosystem products or services that are bought and sold in markets. The market price method can be used to value changes in either the quantity or quality of a good or service. It uses standard economic techniques for measuring the economic benefits from marketed goods, based on the quantity people purchase at different prices, and the quantity supplied at different prices.

Applying the Market Price Method

The market price method uses prevailing prices for goods and services traded in markets, such as timber or fish sold commercially. Market price represents

the value of an additional unit of that good or service, assuming the good is sold through a perfectly competitive market (that is, a market where there is full information, identical products being sold and no taxes or subsidies).

Advantages of the Market Price Method

The market price method reflects an individual's willingness to pay for costs and benefits of goods that are bought and sold in markets, such as fish, timber, or fuel wood. Thus, people's values are likely to be well-defined.

- Price, quantity and cost data are relatively easy to obtain for established markets.
- The method uses observed data of actual consumer preferences.
- The method uses standard, accepted economic techniques.

Issues and Limitations of the Market Price Method

- Market data may only be available for a limited number of goods and services provided by an ecological resource and may not reflect the value of all productive uses of a resource.
- The true economic value of goods or services may not be fully reflected in market transactions, due to market imperfections and/or policy failures.
- Seasonal variations and other effects on price must be considered .

2) Travel Cost Method

The travel cost method is used to estimate economic use values associated with ecosystems or sites that are used for recreation.The method can be used to estimate the economic benefits or costs resulting from:

- changes in access costs for a recreational site,
- elimination of an existing recreational site,
- addition of a new recreational site,
- changes in environmental quality at a recreational site.

The basic premise of the travel cost method is that the time and travel cost expenses that people incur to visit a site represent the "price" of access to the site. Thus, peoples' willingness to pay to visit the site can be estimated based on the number of trips that they make at different travel costs. This is analogous to estimating people's willingness to pay for a marketed good based on the quantity demanded at different price (Dennis and Marisa, 2002).

2. Surveys-expressed Willingness to Pay

Many ecosystem services are not traded in markets, and are not closely related to any marketed goods. Thus, people cannot "reveal" what they are willing to pay for them through their market purchases or actions. In these cases, surveys can be used to ask people directly what they are willing to pay based on a hypothetical scenario. Alternatively, people can be asked to make tradeoffs among different alternatives, from which their willingness to pay can be estimated. These methods include: the Contingent Valuation Method (CVM) and Contingent Choice Method(Dennis and Marisa, 2002).

1) The Contingent Valuation Method (CVM)

The Contingent Valuation Method (CVM) is used to estimate economic values for all kinds of ecosystem and environmental services. It can be used to estimate both use and non use values, and it is the most widely used method for estimating non-use values. It is also the most controversial of the non-market valuation methods.

The CVM involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service.

The contingent valuation method is referred to as a "stated preference" method, because it asks people to directly state their values, rather than inferring values from actual choices, as the "revealed preference" methods do. The fact that contingent valuation (CV) is based on what people say they would do, as opposed to what people are observed to do, and is the source of its greatest strengths and its greatest weaknesses.

Contingent valuation is one of the only ways to assign dollar values to non-use values of the environment-values that do not involve market purchases and may not involve direct participation. These values are sometimes referred to as "passive use" values. They include everything from the basic life support functions

associated with ecosystem health or biodiversity, to the enjoyment of a scenic vista or a wilderness experience, to appreciating the option to fish or bird watch in the future, or the right to bequest those options to your grandchildren. It also includes the value people place on simply knowing that giant pandas or whales exist.

It is clear that people are willing to pay for non-use, or passive use, environmental benefits. However, these benefits are likely to be implicitly treated as zero unless their dollar value is somehow estimated. So, how much are they worth? Since people do not reveal their willingness to pay for them through their purchases or by their behavior, the only option for estimating a value is by asking them questions.

However, the fact that the contingent valuation method is based on asking people questions, as opposed to observing their actual behavior, is the source of enormous controversy. The conceptual, empirical, and practical problems associated with developing dollar estimates of economic value on the basis of how people respond to hypothetical questions about hypothetical market situations are debated constantly in the economics literature. CV researchers are attempting to address these problems, but they are far from finished. Meanwhile, many economists, as well as many psychologists and sociologists, for many different reasons, do not believe the dollar estimates that result from CV are valid. More importantly, many jurists and policy-makers will not accept the results of CV. Because of its controversial nature, users must be extremely cautious about spending money on CV studies and about using the results of CV studies.

2) The Contingent Choice Method

The contingent choice method is similar to contingent valuation, in that it can be used to estimate economic values for virtually any ecosystem or environmental service, and can be used to estimate non-use as well as use values. Like contingent valuation, it is a hypothetical method – it asks people to make choices based on a hypothetical scenario. However, it differs from contingent valuation because it does not directly ask people to state their values in dollars. Instead, values are inferred from the hypothetical choices or tradeoffs that people make.

The contingent choice method asks the respondent to state a preference between one group of environmental services or characteristics, at a given price or cost to the individual, and another group of environmental characteristics at a different

price or cost. Because it focuses on tradeoffs among scenarios with different characteristics, contingent choice is especially suited to policy decisions where a set of possible actions might result in different impacts on natural resources or environmental services. For example, improved water quality in a lake will improve the quality of several services provided by the lake, such as drinking water supply, fishing, swimming, and biodiversity. In addition, while contingent choice can be used to estimate dollar values, the results may also be used to simply rank options, without focusing on dollar values(Dennis and Marisa, 2002).

2.2 Related Researches

2.2.1 Economic valuation

Barbier, et al. (1997) evaluated economic benefit of wetland "Hadejia-Jama" (floodplain in Northern Nigeria) by calculating opportunity cost of the area, which is being threatened by upstream water developments. The analysis shows that the floodplain agricultural, fishing and fuel wood net benefits are much more substantial than the net benefits of an upstream irrigation project, which is diverting water from the wetlands. For example, the authors estimated the net present value of agricultural, fishing and fuel wood benefits from the wetlands. The study found that value of Net Economic Benefit of flood plain was 253 to 381 ($US 34 to 51) per hectare (in 1989/90 prices), while the net present value of benefits from diverting stream flow to the irrigation project were only 153 to 233 ($US 20 to 31) per hectare. An even more pronounced divergence was noted when benefits were calculated on the basis of water use (e.g., per thousand cubic meters) rather than land area.

Charoenporn (2003) estimated the environmental economic value in direct and indirect use, as well as a non-use value or existence value of Thongphaphum Teak Plantation (TTP). The non-use value is assessed by applying a CVM with closed-end questions. The willingness to pay (WTP) is estimated to support Thongphaphum plantation for conservation and reforestation activities to be continued in the future.

The results of TTP valuation showed the direct use value included the value of timber forest product at 396.21×10^6 baht and the value of non-timber forest product at 1.15×10^6 baht/year. In the case of the indirect use value, carbon sequestration of teak tree was valued at 132.01×10^6 baht. The non-use value as an existence value of TTP by

CVM method is $10,951x10^6$ baht. The environmental economic value of TTP is estimated as $11,480.74x10^6$ baht.

The key factor significantly influencing the environmental economic value of TTP ($p=0.05$) was age for people in municipal area. In case of local people, age and marital status are statistically different at $p=0.1$. These variables affected the WTP for TTP.

Costanza, et al. (1989) evaluated all system of mangrove forest in Louisiana, USA by calculating direct use value and indirect use value of fishery, hunting, recreation, preventing storm by using various evaluation techniques. For example , a model of marginal productivity was used to calculate value of fishery resources such as crab and fish. Value deriving from being recreational place use CVM by questioning about value of WTP for visiting area, playing sport, hunting, fishery photographing together with TCM and preventing storm which calculate from damage cost. A result appeared that value of total benefits was 2,429 $US/hectare/year (considering interest rate at 8%). Value deriving from fishery was 317 $US/hectare/year (13.05% of total value). Value deriving from hunting was 151 $US/hectare/year (6.21% of total value). Value deriving from recreational place was 1,915 $US/hectare/year (78.84% of total value).

Prapamontol (2001) studied the CVM applied to conservation of fishery resources in Bung Lahan wetland, Chaiyaphum Province used the CVM and dichotomous choice question. The result indicated that the mean and median value which fishery households revealed their willingness to pay for conservation of fishery resources in Bung Lahan were 417.16 and 259.04 bath/household/year, respectively. The total value, which the totals of 4,035 households were willingness to pay for conservation of fishery resources in Bung Lahan, was 1,683,240.60 bath/year. In comparison, fishery resources households benefited 20,349.20 bath/household/year on average from capture fisheries in Bung Lahan. The total benefit which 4,035 households altogether derived from this wetland was 82,109,022 bath/year.

The key factors significantly determining the economic value for conservation of fishery resources in Bung Lahan ($P<0.05$) were housing location, the importance of fishery resources to the household, and the source of information about conservation of fishery resource.

TDRI (1995) evaluated Khao Yai National Park by measuring use value of tourism and various recreational activities by TCM and CVM. And TDRI measured option value and existence value by dividing sample groups into two groups comprising users and non-users and used open-ended and closed-end interactive technique for questioning. The study result found that Thai tourists were willing to pay 22 baht/person/time and 730 baht/person/year for conserving a National Park. While people who thinks that they will tour in the future are willing to pay 196 baht/year. Total economic value of Khao Yai National Park was approximate 3,080 million baht/year or 35,000 million baht/year in the present value at the discount rate of 10 percent.

Vithayaveroj (2003) evaluated use value (value of fishery resource), non-use value (existence value), a comparison average and factors that affect the WTP for seagrass beds survey research method. The study sample comprised of 70 fishermen on Pha Ngan Island, 163 people who have other occupations on Island and 161 people from Surat Thani Province (80 people in Muang municipality and 81 people in Khirirat district). Survey research method was to assess use value by considering the net benefit of fishery from seagrass beds for use value and existence value was to combine with the CVM. The comparison of the average and factors that affect the WTP of seagrass beds were analyzed by using multiple regression analysis.

The net benefit of fishery from seagrass beds was 2,179,150.07 to 6,346,090.72 baht/year and WTP for existence value was 325,866,873.16 baht/year. The WTP's averages for users were higher than those for non-users and WTP's averages for non-users on Pha Ngan Island was higher than those for non-users in Surat Thani Province. Attitude had a significant positive effect on WTP of users. The WTP of non-uses on Pha Ngan Island had significantly positive relationships with monthly income, government official and attitude, but a significantly negative relationship with age. And information cognizance had a significantly positive relationship on WTP of non-users in Surat Thani Province. All variables were evaluated at $p=0.05$.

2.2.2 Seasonally flooded forest

Department of Environmental Quality Promotion (n.d.) evaluated the economical value of seasonally flooded forest in Dan and Nong Khae Sub-districts, Rasi Salai District, Si Saket Province and Don Rad Sub-district, Rattana Buri District, Surin Province. Total sample size is about 366 households from 11 villages of study area. This study evaluated all of products which were produced, harvested and utilized from seasonally flooded forest in the Mun River Basin by villagers. Researchers of Thaam Mun Project spent about one year for collecting data in cooperate with the leader of local organization in the name of Mun River Conservation Committee. The period for data collection was begun in January, 1995.

The result of this study is divided into three types as folllows; the economical value of agriculture products such as rice, corn, peanut, jute and others is about 6,445,477 baht per year. The economical value of plant products (as foods and utensils) such as firewood, charcoal, edible mushrooms, bamboo shoots, wild vegetable plants, fruits, sedge and rattan is about 3,033,815 baht per year. The economical value of wild animals and other products (such as soil) from seasonally flooded forest such as fish, shell, frog, ant eggs, dung and rock salt is about 4,760,285 baht per year. The total economic value of seasonally flooded forest in the Mun River Basin is 14,239,637 baht per year. An average of economic value of seasonally flooded forest in the Mun River Basin is about 38,906 baht per household per year (366 households).

Kunurat, et al. (1993) studied environmental condition and utilization on flood plain vegetation in the middle of the Mun River. This research is a preliminary study of geomorphology, botany, zoology, settlement, land use and covers the area about 180 km^2 from Lam Phub Phra to Lam Siao in Northeast Thailand. It was conducted by the use of surveying method and community studies within 12 months.

The study area is floodplain with meander stream and oxbow-lake with more than 150 lakes. The flora is discovered to exist more than 100 species. Fauna are only small animals, many kinds of birds, insect and also lot of fishes. The area was settled down for 250 years ago but the community is as small as the former time. Most of the area is covered with the secondary forest. The villagers exploit the gallery forest for multi-purposes such as: firewood, construction materials, medicinal plant, food,

agricultural products. In the present time a lot of people have moved in to occupy the land. The result of the study suggests that the immediate phase to develop this area is to divide the land into zones of various objectives; public land use, agriculture, forest and conserved area as well as to improve the agricultural and farming systems.

2.2.3 The Songkhram River Basin

Thai Baan research (2005) studied ecology and local history of the seasonally flooded forest in the Lower Songkhram River Basin. This research illustrates that rural livelihoods are based on the combined use of a wide range of resources adapted to seasonal changes. The Thai Baan research's methodology which is based on indigenous knowledge of local communities on ecology, management of natural resources, local history, socio-economy and livelihoods was used in this study. The study was carried out by 240 villagers from 4 villages of Baan Tha Bor, Baan Pak Yaam, Baan Uan and Baan Yang Ngoy in Sri Songkhram District, Nakhon Phanom Province in Northeast Thailand.

The village researchers found that the complex wetland ecosystem of the Lower Songkhram River Basin consists of 28 different sub-ecosystems, hosting diverse plants and aquatic organisms. The Thai Baan researchers identified 208 kinds of plants and fungi, 124 fish species. 5 turtle species, 4 shrimp species, 10 mollusk species, 4 crab species, and 6 aquatic insects. Out of 124 species are native fish. There are 58 fish species that can be found in the Songkhram River all year round. There are an additional 57 species of migratory fish that migrate from the Mekong River.

CHAPTER III
METHODOLOGY

The field data collection is based on a survey method in 10 villages of Sri Songkhram District, Nakhon Phanom Province. Market price method is used to evaluate the value of fishery and non timber forest products from seasonally flooded forest at Sri Songkhram District. The methodology is described as follows.

3.1 Data collection

- 3.1.1 Primary data
- 3.1.2 Secondary data
- 3.1.3 Design of questionnaire structure
- 3.1.4 Population and sampling design

3.2 Data analysis

- 3.2.1 Non timber forest products value
- 3.2.2 Fishery products value

3.1 Data Collection

The necessary data used in this study are compiled from both primary and secondary data as described as follows.

3.1.1 Primary data were mainly collected through the questionnaires by interviewing the respondents who were randomly selected in local villages in Sri Songkhram District, Nakhon Phanom Province. The questions were conducted carefully to reduce biases that might be occurred.

3.1.2 Secondary data were mainly collected from publications and documents of Mekong River Basin Wetland Biodiversity for Sustainable Used Programme, Thai Baan research and other related sources.

3.1.3 Design of questionnaire structure

A tool for primary data collection is by using the questionnaire. The data is collected from villagers in the study area. The questionnaire structure is divided into 2 parts.

1) **First part of the questionnaire**, which is for probing the villagers about non timber forest products, is composed of 2 parts:

Part I : Questions about personal information

Part II : Questions about non-timber forest products utilizations

2) **Second part of the questionnaire**, which is for probing the villagers about fishery products, is composed of 2 parts:

Part I : Questions about general information of fishing method

Part II : Questions about fishery utilizations

3.1.4 Population and sampling design

The population in this study is total households of 10 villages which are located on the Songkhram River banks of Sri Songkhram District, Nakhon Phanom Province. The sample size is calculated by the quota sampling method that is the summation of 20 percent of household of each village of the population as shown in equation 3-1.

$$N = \frac{20*M}{100} \qquad \text{eq 3-1}$$

Where; N = Number of the sample size

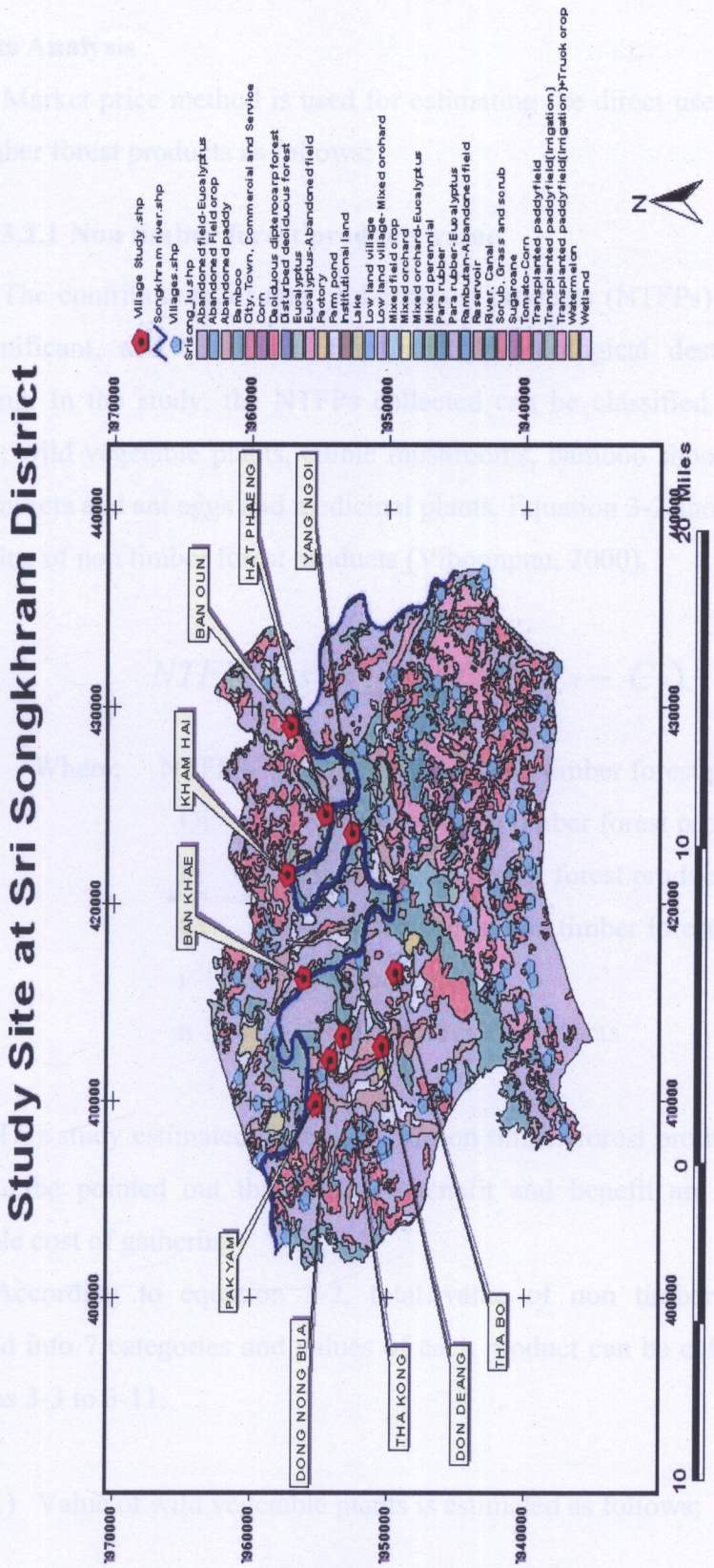
M = Total households of 10 villages

In case of the calculated sample size of a village is less than 20 households then the sample size of 20 households is assigned to the certain village. The total sample size is the summation of each sample size of 10 villages.

Table 3-1 Population and sample size in the study area

	Name of village	Name of sub-district	Total households	Sample size
1	Moo 4 Ban Tha Bo Songkram	Tha Bo Songkram	130	26
2	Moo 3 Ban Don Dang	Tha Bo Songkram	226	45
3	Moo 2 Ban Khae	Sam Pong	137	28
4	Moo 4 Ban Pak Yam	Sam Pong	131	26
5	Moo 3 Ban Yang Ngoi	Sri Songkhram	117	24
6	Moo 6 Ban Dong Nong Bua	Ban Ka	95	20*
7	Moo 8 Ban Tha Kong	Ban Ka	65	20*
8	Moo 1 Ban Had Pang	Had Pang	117	24
9	Moo 2 Ban Kham Hai	Had Pang	117	24
10	Moo 4 Ban Oun	Had Pang	119	24
Grand total			1254	261

Remark: * assigned to 20 samples



Source: Department of Environmental Quality Promotion (2000)

Figure 3-1 Study site at Sri Songkhram District

3.2 Data Analysis

Market price method is used for estimating the direct use value of fishery and non timber forest products as follows;

3.2.1 Non timber forest products value

The contributions of non timber forest products (NTFPs) for rural livelihoods are significant, and their use is in fact less ecological destructive than timber collecting. In the study, the NTFPs collected can be classified into 7 categories as follows; wild vegetable plants, edible mushrooms, bamboo shoots, firewood, fodder, edible insects and ant eggs and medicinal plants. Equation 3-2 shows the calculation of total value of non timber forest products (Viboonpun, 2000).

$$NTFP\ 's = \sum_{i=1}^{n} (Q_i * P_i - C_i) \qquad \text{eq 3-2}$$

Where; NTFP's = Total value of non timber forest products (baht)

Qi = Quantity of non timber forest products (quantity)

Pi = Price of non timber forest products (baht/quantity)

Ci = Cost for collect non timber forest products (baht)

i = Product type

n = Total number of products

This study estimated net benefit of non timber forest products from direct use. It should be pointed out that, the net benefit and benefit are fairly close due to negligible cost of gathering.

According to equation 3-2, total value of non timber forest products is classified into 7 categories and values of each product can be calculated as shown in equations 3-3 to 3-11.

1) Value of wild vegetable plants is estimated as follows;

$$\text{Value of wild vegetable plants} = \sum_{i=1}^{n} (Q_i.P_i - C_i) \qquad \text{eq 3-3}$$

Where; Qi = Quantity of wild vegetable plants (handful)
Pi = Price of wild vegetable plants (baht/handful)
Ci = Cost of collecting wild vegetable plants (baht)
i = Wild vegetable plants species
n = Total species of wild vegetable plants

2) Value of edible mushrooms is estimated as follows;

$$\text{Value of edible mushrooms} = \sum_{i=1}^{n} (Q_i.P_i - C_i) \quad \text{.....eq. 3-4}$$

Where; Qi = Quantity of edible mushrooms (kg.)
Pi = Price of edible mushrooms (baht/kg.)
Ci = Cost of collecting edible mushrooms (baht)
i = Edible mushrooms species
n = Total species of edible mushrooms

3) Value of bamboo shoots is estimated as follows;

$$\text{Value of bamboo shoots} = \sum_{i=1}^{n} (Q_i.P_i - C_i) \quad \text{.....eq.3-6}$$

Where; Qi = Quantity of bamboo shoots (kg.)
Pi = Price of bamboo shoots (baht/kg.)
Ci = Cost of collecting bamboo shoots (baht)
i = bamboo shoots species
n = Total species of bamboo shoots

4) Value of firewood

Firewood is divided into dead twigs and small branches collected from seasonally flooded forest that are used directly for burning and dead branches and small stems collected from seasonally flooded forest that are collected for processing charcoal. Total value of firewood is estimated on both categories as shown in equation 3-7.

$$\text{Value of firewood} = (Q_aP_a - C_a) + (Q_bP_b - C_b) \text{.....eq.3-7}$$

Where; Q_a = Quantity of firewood which collected from seasonally flooded forest (m^3)

P_a = Price of firewood (baht/ m^3)

C_a = Cost of collecting firewood (baht)

Q_b = Quantity of firewood for charcoal which collected from seasonally flooded forest (m^3)

P_b = Price of firewood for charcoal (baht/ m^3)

C_b = Cost of collecting firewood (baht)

5) Value of fodder

Value of fodder is estimated from the net benefit of livestock, that calculated by the present value of livestock selling income, which is to find the present value of revenue per year at 3% discount rate and minus with the cost for feeding the livestock each year such as cost of injection and other food for their livestock. There are two methods for calculating the present value of fodder both the calculation by using equation and calculation by with the coefficient according to the table in Appendix D that shown as the example follows;

Example A : There are 250 cows and 80 buffalos in Had Pang. The average price of a cow is about 12,000 baht after 3 years of feeding and average price of a buffalos is about 12,000 baht after 4 years of feeding. Cost of injection per animal is 100 baht per year. Cost of other food for one cow or buffalo is 360 baht per animal per year. Discount rate of this study is 3%. The present value of money 12,000 baht due at the end of 'n' periods (3 years) was calculated as follows;

$$PV = FV/(1+i)^N \text{.....eq.3-8}$$

Where; PV = Present value of I baht due at the end of 'n' periods

FV = Amount of money at the end of 'n' period (baht)

N = Number of period (year)

I = Discount rate

The present value of 12,000 baht due at the end of 3 year is:

$$PV = 12,000/(1+0.03)^3$$

$$= 10,981.2 \text{ baht}$$

After obtain the present value, find the annuity of that amount over n period with the same discount rate as follows;

$$PV = \sum_{i=1}^{n} \left(\frac{A}{1+i}_N\right) \quad \text{.....eq.3-9}$$

Where; PV = Present value of annuity for n periods (baht)

N = Number of period (year)

A = Annuity over n period

The coeffinicient for present value of an annuity calculation at 3% discount rate is 2.8286 then the annuity of money 10,981.2 baht for 3 year is

$$10,981.2 = 2.8286A$$

$$A = 10,981.2/2.8286$$

$$= 3,882.2 \text{ baht}$$

The value of 3,882.20 baht is thus more or less the revenue which earn from livestock per year. The value of fodder would take the value of 3,882.20 baht minus cost of injection and other foods for the livestock.

Net benefit of livestock for a cow is calculated as follows;

$$\text{Net benefit per 1 livestock} = A - (C_i + C_f) \text{.....eq.3-10}$$

Where; A = Present value of an annuity for n periods of 1 livestock (baht)

Ci = Cost of injection (baht)

Cf = Cost of other foods (baht)

According to the annuity of cow at 3,882.20 baht per cow per year, net benefit per a cow is as follows;

Net benefit per 1 livestock = 3,882.20 – (100 + 360)

= 3,422.20 baht

As a result of the calculation the net benefit per cow is 3,422.20 baht per year. This net benefit can be viewed as the value of fodder provided by the seasonally flooded forest. The net benefit of fodder in form of cow was calculated by take the value of 3,422.20 multiply with total number of cow in the studied area that is 250. The net benefit of fodder in form of cow on Don Dang village is 855,550 baht.

6) Value of edible insects and ant eggs is estimated as follows;

$$\text{Value of bamboo shoots} = \sum_{i=1}^{n} (Q_i.P_i - C_i) \quad \text{.....eq.3-11}$$

Where;Qi = Quantity of edible insects and ant eggs (kg.),(baht/unit)

Pi = Price of edible insects and ant eggs (baht/kg.) ,(baht/unit)

Ci = Cost of collecting edible insects and ant eggs (baht)

I = Edible insects and ant eggs species

N = Total species of edible insects and ant eggs

7) Value of medicinal plants is estimated as follows;

$$\text{Value of medicinal plants} = \sum_{i=1}^{n} (Q_i.P_i - C_i) \quad \text{.....eq.3-12}$$

Where;Qi = Quantity of medicinal plants (kg.)

Pi = Price of medicinal plants (baht/kg)

Ci = Cost of collecting medicinal plants (baht)

I = Medicinal plants species

N = Total species of medicinal plants

3.2.2 Fishery products value

The fishery products from villagers in the lower Songkhram river basins are well known in the region, including fresh, fermented fish and freshwater snail. This study evaluated the fishery resource products by Market Price method. The equation is modified from Economic Valuation of Wetlands by Barbier et al. (1997) as follows;

$$NB_i^d = B_i^d - C_i^d \qquad \text{.....eq.3-13}$$

Where ;i = Number of sample groups

NB^D = Net benefit. For this research, it was benefit of collecting fishery products such as fish and freshwater animals (baht/household/year)

B^D = Direct benefit of fishery products (baht/household/year)

C^D = Direct cost of fishing (baht/household/year). Cost used in calculation for this research were depreciation of fishing gears and boat(baht/household/year), fuel cost (baht/household/year), and maintenance cost of fishing gears and boats (baht/household/year)

According to the equation, direct cost of fishing comprises of fixed cost and variable cost.

1. Fixed Cost

There are incured from using fixed factor and unchanged over any fishing period. Fixed costs are factor input that are useful for more than one fishing season, which comprises of boat and equipment. The fixed cost of this research would

calculated from non-cash cost which comprises of depreiation of boat and equipment while the salvage value equal zero is assumed to be zero at the end of service life.

2. Variable Cost

There are incurred from using variable factor input. Variable cost would change according to fishery yields. Cash variable cost for this research is fuel cost and maintainance cost for fishing gears and boats

CHAPTER IV
RESULTS AND DISCUSSIONS

This chapter presents the result of the study on "The valuation of fishery products and non timber forest products of seasonally flooded forest: A case study of Lower Songkhram River Basin, Nakhon Phanom", which shall be introduced separately into 3 parts as follows:

4.1 Study area

The Songkhram River is the one of tributaries of the Mekong River. It originates in the hills between Nong Han district, Udon Thani Province and Sawang Daen Din district, Sakon Nakhon Province. Outing there, it flows through Seka district (Nong Khai Province), Wanon Niwat (Sakon Nakhon Province), Si Songkhram district and mouths to the Mekong River in Chai Buri Sub-district, Tha Uthen district, Nakhon Phanom Province.

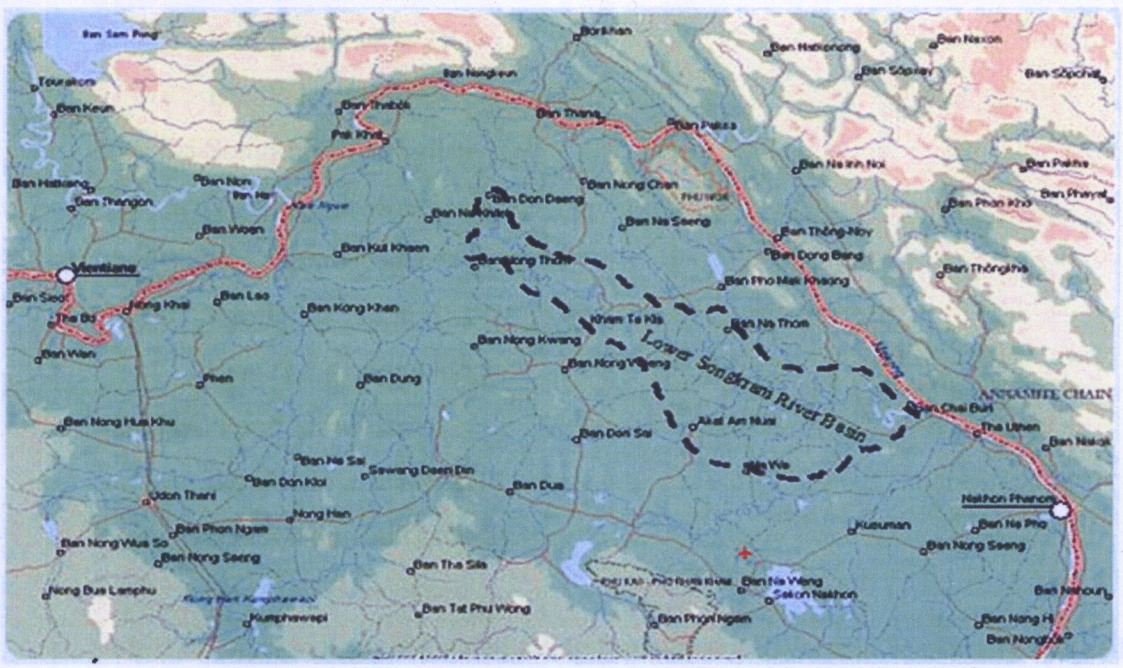


Figure 4-1 Map of Songkhram River

Source: Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme, 2007

The Lower Songkhram River is the part of 220 km northwest up the mount of Songkhram River from Mekong River. (Mekong Wetland Biodiversity Conservation and Sustainable Use Programme, 2007). The Lower Songkhram River Basin is contained within the area from the confluence of the Mekong and Songkhram Rivers and extends 60 km northwest up the Songkhram River, including Nam Mao and Boeng Khong Long. This area covers almost the entire Songkhram River floodplain. During the peak of the wet season between June and August, the river swells to inundate marshes, ox-bow lakes, natural ponds, a number of streams and forest. The inundation lasts for a period of 3-4 months, followed by a slow discharge into the Mekong River.

The study area is located in the Lower Songkhram River Basin, Nakhon Phanom. The study villages are 10 villages which selected from 5 Sub-district of Sri Songkhram District, Nakhon Phanom as follows;

1. Tha Bo Songkhram Sub-district
   - Ban Don Dang (Moo.3)
   - Ban Tha Bo Songkhram (Moo.4)
2. Sam Pong Sub-district
   - Ban Khae (Moo.2)
   - Ban Pak Yam (Moo.4)
3. Sri Songkhram Sub-district
   - Yang ngoi (Moo.3)
4. Ban Ka Sub-district
   - Ban Dong Nong Bua (Moo.6)
   - Ban Tha Kong (Moo.8)
5. Had Pang Sub-district
   - Ban Had Pang (Moo.1)
   - Ban Kham Hai (Moo.2)
   - Ban Oun (Moo.4)

Most of study village is located along Songkhram River and seasonally flooded forest.

4.2 Wetland livelihoods in the Lower Songkhram River Basin

Communities located on or near the Songkhram floodplain exhibit a high deree of reliance on wetland derived products of their livelihoods. Villagers generally are engaged in multi-component livelihoods, which vary by season and availability of particular wetland products. Agriculture is of less importance locally than is generally assumed by outside agencies, thus leading to inappropriate development priorities and mis-allocation of resources. In particular, local people are engaged in a mix of the following wetland dependent activities:

1) Fisheries: large numbers of families are dependent on fishing for both subsistence and income. Up to 90% of households in some villages have members who are involved in fishing to a greater or lesser extent, with most being part-time or seasonal fishermen. At certain time of year, when fish are migrating upstream or downstream off the floodplain following the rainy season, a significant artisinal fishery exists which generates significant local wealth. Up to 85 different fishing gears were use in the past, many of which were made locally, supporting a secondary industry. High value fish are sold fresh, while lower value are processed.

2) Fish processing: because of the surplus of fish at certain seasons and the difficulties with transporting fresh fish to market, there is a healthy fish processing industry developed in riverside villages, although not all of the raw materials is derived from the Songkhram River these days, with much of the fish being used in *pla som* (fermented sour fish) being derived from the Central Plains. Some villagers of Songkhram communities process large amounts of salted fermented fish in clay jars (*pla daek*) or dried fish (*pla haeng*), both of which have a reputation for both quality and taste.

3) Harvesting wetland products: a vast range of wetland products, both terrestrial and aquatic, are harvested on a seasonal basis by local villagers and people from outside the basin who travel in to take advantage of the abundance of natural resources. Villagers from as far away as Khon Kaen and Kalasin are reported to come and gather mushrooms and bamboo shoots from the paa boong paa thaam during the early rainy season for sale in their home provinces. Other commonly harvested products include wild vegetables, red ants eggs, tubers, fuel wood, wood or vines for

making household implements or fish traps, medicinal herbs and reeds for making mats.

4) Agriculture: Traditional forms of agriculture are now increasingly scarce, as more intensive forms oriented towards external markets have taken over from subsistence farming. Wet paddy rice is the most commonly grown crop (principally glutinous rice varieties), plus smaller areas of cash crops such as sugar cane, tomato, melon and maize. Rice is mostly grown in the wet season without irrigation, but significant areas may be lost due to flooding when grown on the floodplain or lower terraces. Dry season rice cultivation has long been promoted by the government using centralised irrigation systems, but the majority have failed and are now abandoned. However, small scale systems using farmers own pumps or flood recession trap ponds, have proven sustainable over the last 20 years. There are still instances of traditional mixed crop farming systems using terraces on riverbanks or small cleared areas in the paa boong paa thaam, but they are increasingly rare.

5) Livestock raising: This is a livelihood activity of great importance to households in the Lower Songkhram Basin, especially raising cattle and buffalo. In the dry season the livestock are driven into the flooded forest or areas of open grassland to graze, while in the rainy season when these areas are inundated, the livestock are taken to higher areas of dipterocarp forest known as "dawn" to feed. The buffalo are superbly adapted to the wetland conditions, having splayed hooves for walking on marshy land and being good swimmers. In the past they were used as draft animals, but nowadays are used as a source of animal manure and sold for ready cash when the family is in need e.g. a member requires medical treatment. In this sense, they are a form of insurance and social security for local villagers, who are less likely to fall into debt than villagers who depend solely on livestock.

4.3 Valuation of non timber forest products

4.3.1 Wild vegetable plants

Different kinds of wild vegetables are available all year round in the study area. Various kinds of vegetables are available throughout the year both in "Thaam" area, swamp and upland forest. Villagers utilize 25 types of wild vegetables mostly for their own consumption. However, some of them collect these vegetables and sell them

to local merchants or customers in the same village. In some case, the middlepersons would ask a villager to collect and sell specific vegetable for them to feed a market in Sri Songkhram.

Figure 4-2 Wild vegetable plants that collected from seasonally flooded forest

The seasonal calendar for harvest the wild vegetable plants from seasonally flooded forest in the study area is shown in Table 4-1.

Table 4-1 Seasonal calendar for harvest the wild vegetable plants from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Time to harvest												Price (baht/handful)
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
1	กระโดนน้ำ	*Barringtonia acutangula* (Linn.) Gaertn.	←	—	—	—	—	—	—	—	—	—	—	→	5
2	กระโดนโคก	*Careya sphaerica* Roxb.	←	—	—	—	—	—	—	—	—	—	—	→	5
3	เหมือดคน	*Helicia javanica* Bl.	←	—	—	—	—	—	—	—	—	—	—	→	5
4	ผักกะแยง	*Limnophila aromotica* Merr.	←	—	—	→							←	→	2
5	กะเม็ก	*Agapetes lobbii* CB Clarke.	←	—	—	→							←	→	5
6	ผักหนอก	*Centella asaitica* (L.) Urban.	←	—	—	→						←	—	→	3
7	ผักไคร้หางนาค	*Phyllanthus taxodiifolius* Beille.	←	—	—	→						←	—	→	1
8	ผักกูด	*Diplazium esculentum* (Retz.) swartz.	←	—	—	—	—	—	—	—	—	—	—	→	5
9	ผักติ้ว	*Cratoxylum formosum.*	←	—	—	—	—	—	—	—	—	—	—	→	5
10	ผักอีฮีน	*Monochoria vaginalis* Presl vn.plantaginea					←	—	—	—	→				1
11	ผักกะน่องม้า	*Sagittalia guayanensis* Humb.					←	—	—	—	→				2
12	ผักเบ็น	*Flacourtia indica* (Burm.P.) Merr.	←	—	—	→								↔	5
13	ผักผีพวย	*Jussiaea repens* Linn.							←	—	—	—	—	→	2
14	ผักแว่น	*Marsilea crenata* Presl.						←	—	—	→				5
15	ผักพาย	*Limnocharis flava* Buch.							←	—	—	—	→		5
16	ผักหวาน	*Melientha suavis* Pierre.				←	—	→							10
17	สะเดา	*Azadirachta indica* var. siamensis Valeton	←	—	→									↔	10
18	ผักไฮไก่	X	←	—	—	→								↔	5
19	ผักเหมือดเมี่ยง	X	←	—	—	—	—	→			←	—	—	→	5
20	ผักเหมือดกุ้ง	X	←	—	→								←	→	5
21	ผักขี้ปลา	X	←	—	→								←	→	3

Table 4-1 Seasonal calendar for harvest the wild vegetable plants from seasonally flooded forest in the study area (Continued)

No.	Local Name	Scientific Name	Time to harvest												Price (baht/handful)
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
22	ผักขี้ส้ม	X		←	→										5
23	ผักขี้หมู	X	←	→	→	→								↔	5
24	ผักก่าม	*Crateva addansonii* DC. subsp. trifoliata jacojobs	←	→	→	→									5
25	ผักขี้บ่อ	X	←	→	→	→								↔	5

Remark: X = Scientific name is not known.

According to Table 4-1, wild vegetable plants could be divided into 3 groups by season that they are available as follows:

1) Wild vegetable plants are available throughout the year compose of *Barringtonia acutangula* (Linn.) Gaertn., *Careya sphaerica* Roxb., *Helicia javanica* Bl. and *Cratoxylum formosum.*

2) Wild vegetable plants which available after rainy season from October to April such as *Limnophila aromotica* Merr., *Agapetes lobbii* CB Clarke., *Centella asaitica* (L.) Urban., *Phyllanthus taxodiifolius* Beille., *Flacourtia indica* (Burm.P.) Merr., *Azadirachta indica* var. siamensis Valeton., *Crateva addansonii* DC. subsp. trifoliata jacojobs. and other.

3) Wild vegetable plants which are available on rainy season since May until October as follow; *Monochoria vaginalis* Presl vn.plantaginea., *Sagittalia guayanensis* Humb., *Jussiaea repens* Linn., *Marsilea crenata* Presl., *Limnocharis flava* Buch. and *Melientha suavis* Pierre.

Most wild vegetable plants which collected from seasonally flooded forest would have the price about 5 baht per handful. Volume of wild vegetable plants about 1 handful is adequate for the 1 meal consumption. The example of wild vegetable plants in this group is as follow; *Barringtonia acutangula* (Linn.) Gaertn., *Helicia javanica* Bl., *Limnocharis flava* Buch., *Cratoxylum formosum.*, *Agapetes lobbii* CB Clarke. and *Limnophila aromotica* Merr.. However, some wild vegetable plants which are on demand in the market such as *Melientha suavis* Pierre. and *Azadirachta indica* var. siamensis Valeton, can be sold at 10 baht per handful. Other kind of wild vegetable plants fall into the third group. The price of wild vegetable plants in this group is not over 3 baht per handful; e.g. *Phyllanthus taxodiifolius* Beille., *Monochoria vaginalis* Presl vn.plantaginea, *Sagittalia guayanensis* Humb. and *Jussiaea repens* Linn.

The total collections of wild vegetable plants from 10 villages are shown in Table 4-2 and the total values of wild vegetable plants are shown in Table 4-3.

Table 4-2 Total volume collected of wild vegetable plants from seasonally flooded forest in the study area

No.	Local Name	Total collected (handful/year)										Total (handful)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	กระโดนน้ำ	2,699	2,155	1,328	1,248	576	4,062	1,374	214	520	434	14,610
2	กระโดนโคก	-	-	20	-	2,178	-	537	-	-	810	3,553
3	เหมือดคน	-	112	54	-	1,773	-	-	-	6	236	2,181
4	ผักกะแยง	-	88	-	-	120	60	-	-	40	-	308
5	กะเม็ก	165	1,306	849	-	2,142	2,018	1,054	216	266	1,742	9,758
6	ผักหนอก	-	136	60	-	150	-	-	-	138	148	632
7	ผักไคร้หางนาค	816	644	288	48	-	4,808	-	-	-	-	6,604
8	ผักกูด	120	924	660	-	-	-	-	-	124	-	1,828
9	ผักติ้ว	-	122	384	-	300	-	472	80	360	84	1,802
10	ผักอีฮีน	284	156	100	-	82	1,940	-	-	60	804	3,426
11	ผักกะน่องม้า	144	140	193	-	202	-	-	-	160	422	1,261
12	ผักเบ็น	144	56	288	-	12	320	70	-	-	60	950
13	ผักผีพวย	108	160	40	-	170	-	-	-	-	584	1,062
14	ผักแว่น	216	634	272	-	202	-	-	-	174	900	2,398
15	ผักพาย	1,240	98	250	-	-	216	-	-	850	1,425	4,079
16	ผักหวาน	-	-	-	-	-	-	-	70	30	90	190
17	สะเดา	-	-	-	-	144	24	-	-	-	120	288
18	ผักไฮไก่	592	120	96	-	35	318	564	150	-	72	1,947
19	ผักเหมือดเมี่ยง	-	487	-	-	-	208	1,030	-	-	352	2,077
20	ผักเหมือดกุ้ง	-	-	170	-	125	-	-	-	-	-	295
21	ผักขี้ปลา	448	-	-	-	180	628	336	-	-	732	2,324

Remark: Total value per 261 households of 10 villages.

Table 4-2 Total volume collected of wild vegetable plants from seasonally flooded forest in the study area (Continued)

No.	Local Name	Total collected (handful/year)										Total(handful)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
22	ผักขี้ส้ม	340	-	320	-	-	-	-	-	-	-	660
23	ผักขี้ขม	798	208	120	3,000	280	1,168	1,439	300	80	168	7,561
24	ผักก่าม	160	572	96	-	-	-	-	-	-	-	828
25	ผักขี้บ่อ	2,752	4,204	471	-	167	1,104	475	124	570	726	10,593
TOTAL		11,026	12,322	6,059	4,296	8,838	16,874	7,351	1,162	3,378	9,909	**81,215**

Remark: Total value per 261 households of 10 villages.

Table 4-3 Total value of wild vegetable plants that collected from seasonally flooded forest in the study area

No.	Local Name	Total value (baht/year)										Total (baht)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	กระโดนน้ำ	13,495	10,775	6,640	6,240	2,880	20,310	6,870	1,070	2,600	2,170	73,050
2	กระโดนโคก	-	-	100	-	10,890	-	2,685	40	-	4,050	17,765
3	เหมือดคน	-	560	270	-	8,865	-	-	-	30	1,180	10,905
4	ผักกะแยง	-	176	-	-	240	120	-	-	80	-	616
5	กะเม็ก	825	6,530	4,245	-	10,710	10,090	5,270	1,080	1,330	8,710	48,790
6	ผักหนอก	-	408	180	-	450	-	-	-	414	444	1,896
7	ผักไคร้หางนาค	816	644	288	48	-	4,808	-	-	-	-	6,604
8	ผักกูด	600	4,620	3,300	-	-	-	-	-	620	-	9,140
9	ผักติ้ว	-	610	1,920	-	1,500	-	2,360	400	1,800	420	9,010
10	ผักอีฮีน	284	156	100	-	82	1,940	-	-	60	804	3,426
11	ผักกะน่องม้า	288	280	386	-	404	-	-	-	320	844	2,522
12	ผักเบ็น	720	280	1,440	-	60	1,600	350	-	-	300	4,750

Table 4-3 Total value of wild vegetable plants that collected from seasonally flooded forest in the study area (Continued)

No.	Local Name	Total value (baht/year)										Total (baht)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
13	ผักผีพวย	216	320	80	-	340	-	-	-	-	1,168	2,124
14	ผักแว่น	1,080	3,170	1,360	-	1,010	-	-	-	870	4,500	11,990
15	ผักพาย	6,200	490	1,250	-	-	1,080	-	-	4,250	7,125	20,395
16	ผักหวาน	-	-	-	-	-	-	-	700	300	900	1,900
17	สะเดา	-	-	-	-	1,440	240	-	-	-	1,200	2,880
18	ผักไฮไก่	2,960	600	480	-	175	1,590	2,820	750	-	360	9,735
19	ผักเหมือดเมี่ยง	-	2,435	-	-	-	1,040	5,150	-	-	1,760	10,385
20	ผักเหมือดกุ้ง	-	-	850	-	625	-	-	-	-	-	1,475
21	ผักขี้ปลา	1,344	-	-	-	540	1,884	1,008	-	-	2,196	6,972
22	ผักขี้ส้ม	1,700	-	1,600	-	1,400	-	-	-	-	840	5,540
23	ผักขี้ขม	3,990	1,040	600	15,000	-	5,840	7,195	1,500	400	-	35,565
24	ผักก่าม	800	2,860	480	-	-	-	-	-	-	-	4,140
25	ผักขี้บ่อ	13,760	21,020	2,355	-	835	5,520	2,375	620	2,850	3,630	52,965
TOTAL		49,078	56,974	27,924	21,288	42,446	56,062	36,083	6,160	15,924	42,601	**354,540**

Remark: Total value per 261 households of 10 villages.

Tables 4-2 shows the variety and amount of wild vegetable plants which collected from seasonally flooded forest in the study area. Most of villages in the study area harvest the wild vegetable plants for their daily consumption except for Pak Yam, Had Pang and Tha Kong which has the variety of wild vegetable plants collected less than other village in the study area.

According to Table 4-2, total volume of wild vegetable plants which harvested from seasonally flooded forest in the study area are divided into 4 groups as follow;

1) Had Pang and Kham Hai fall into the first group which harvested wild vegetable plants lower than 4,000 handfuls per year.

2) Pak Yam, Tha Kong and Ban Khae fall into the group of village which harvested wild vegetable plants range between 4,000 – 8,000 handfuls per year.

3) Ban oun and Tha Bo fall into the group of village which harvested wild vegetable plants range between 8,001 – 12,000 handfuls per year.

4) Dong Nong Bua and Don Dang fall into the group of village which harvested wild vegetable plants more than 12,000 handfuls per year.

Dong Nong Bua has number of samples less than other villages but the total volume collected of wild vegetable plants from seasonally flooded forest is more than other villages. When compared total volume of wild vegetable plants of Dong Nong Bua and Tha Kong with Tha Kong, it was found that total volume of wild vegetable plants of Dong Nong Bua is more than in Tha Kong although the number of samples are equal. This indicated that the livelihoods of Dong Nong Bua's villagers depend on natural products from seasonally flooded forest.

According to Table 4-2 amount of wild vegetable plants by their species which harvested from seasonally flooded forest in the study area can be ranked as follows; the first is *Barringtonia acutangula* (Linn.) Gaertn. that is collected about 14,610 handfuls per year, the second is Pak Kee Bo that is about 10,593 handfuls per year and the third is *Limnophila aromotica* Merr. that is collected about 9,758 handfuls per year. Amount of *Melientha suavis* Pierre. Which is the lowest in the study area that is about 190 handfuls per year.

Table 4-3 show total value of wild vegetable plants that collected from seasonally flooded forest in the study area. The total value of wild vegetable plants that collected from seasonally flooded forest of Don Dang village is the highest value

that is about 56,974 baht per year. The total value of wild vegetable plants that collected from seasonally flooded forest of Had Pang village is the lowest value at about 6,160 baht per year. The total value of wild vegetable plants from seasonally flooded forest could be divided into 3 groups as follow;

1) Had Pang and Kham Hai which has total value of wild vegetable plants lower than 20,000 baht per year.

2) Pak Yam, Ban Khae and Tha Kong which has total value of wild vegetable plants between 20,000 – 40,000 baht per year.

3) Ban Oun, Yang ngoi, Don Dang, Tha Bo and Dong Nong Bua which has total value of wild vegetable plants more than 40,000 baht per year.

From Table 4-3, the wild vegetable plants can be ranked by total value as follows; the first is *Barringtonia acutangula* (Linn.) Gaertn. that is about 73,050 baht per year, the second is Pak Kee Bo that is about 52,965 baht per year and the third is *Agapetes lobbii* CB Clarke. that is about 48,790 baht per year. Total value of *Limnophila aromotica* Merr. is the lowest value of wild vegetable plants which harvested in the study area about 616 baht per year because the price and total volume of *Limnophila aromotica* Merr. is lower than other wild vegetables plants which is collected in the study area.

4.3.2 Edible mushrooms

There are about 18 different kinds of wild mushroom available in the study area. Wild mushrooms would appear in the largest number during rainy season. Sizeable amounts are available almost towards the end of season. In other words, different kinds of wild mushrooms are available throughout the year depends on rainfall and weather. Villagers would collect mushrooms mainly for their own consumption as well as other products from forest. However, there are 6-7 kinds of mushroom that are on demand in the market so they are collected to sale to a local woman monger or a middlepersons from larger markets in Sri Songkhram district. The prices of these mushrooms range between 60-180 baht per kilogram, depending on type, amount, and their availability.

Wild mushrooms are available both in mound forest or upland and "Thaam" area. Each year, a villager or a group of villager will go to the same areas in the forest

to collect mushrooms. They have the specific area to collect wild mushroom especially Hed Pueng Thaam (*Boletus colossus Heim)* that found in "Thaam" area only. The appropriate period to collect wild mushrooms depends on climate condition. Villagers understand the period of mushrooms blossom. Some villagers go to collect wild mushrooms since 4 o'clock with their flashlight. It takes about 3-4 hours to collect mushrooms per trip. Some people may collect wild mushrooms 2 or 3 trips per day. Amount of mushrooms that they can collect is about 2-3 kilogram per trip depends on type of the mushrooms and experience of villagers. Almost of full-blown wild mushrooms could take for sell. The remainder mushroom could keep for their consumption. The collector would access forest area for mushrooms depending on familiarity to that area.

Figure 4-3 Edible mushroom which harvested from seasonally flooded forest

Seasonal calendar for harvest the edible mushrooms from seasonally flooded forest in the study area is shown in Table 4-4.

Figure 4-4 *Termitomyces furtiginosus*

Figure 4-5 Various kinds of edible mushroom that sell in Sri Songkhram market

Table 4-4 Seasonal calendar for harvest the edible mushrooms from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Time to harvest												Price (Baht/kg)
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
1	เห็ดผึ้งทาม	*Boletus colossus* Heim.					←	—	—	—	→				80
2	เห็ดขาวดิน	X					←	—	→						30
3	เห็ดข่า	X					←	—	→						50
4	เห็ดถ่าน	*Russula nigricans* (Bull.) Fr.					←	—	—	→					20
5	เห็ดน้ำหมาก	*Russula Luteotacta* Rea.					←	—	→						20
6	เห็ดหน้าหมอง	X					←	—	→						20
7	เห็ดผึ้งโคก	X					←	—	→						50
8	เห็ดระโงก	*Amanita princes* Corner and Bas.					←	—	—	—	→				70
9	เห็ดผึ้งแย้	X					←	—	—	—	→				50
10	เห็ดก่อ	*Russula sp.*					←	—	—	—	→				30
11	เห็ดเผาะหนัง	*Geastrum saccatum* Fr.						←	—	—	→				150
12	เห็ดเผาะฝ้าย	*Astraeus hygrometricus* (Pers.) Morgan.					←	—	—	—	→				50
13	เห็ดไค	X					←	—	→						70
14	เห็ดบด	*Lentinus polychrous* Lev.									←	—	→		70
15	เห็ดผึ้งนกยูง	X					←	—	—	→					50
16	เห็ดแทด	X					←	—	→						50
17	เห็ดทา	X					←	—	→						50
18	เห็ดปลวก	*Termitomyces furtiginosus.*						←	—	—	—	→			100

X = Scientific name is not known.

According to Table 4-4, all kind of mushrooms are available in rainy season from May to October. The mushroom which harvested in the study area is divided into 3 groups by their price as follows;

The first group is comprised of *Russula nigricans* (Bull.) Fr., *Russula Luteotacta* Rea., *Russula sp.* and other with low price. The price of mushroom in this group is under 50 baht per kilogram. The next group has the price about 50 to 100 baht; e.g. *Lentinus polychrous* Lev., *Amanita princes* Corner and Bas. and *Boletus colossus* Heim.. The third group has the price over 100 baht per kilogram such as *Termitomyces furtiginosus.* and *Geastrum saccatum* Fr..

The mushroom with the price not over 50 baht per kilogram is available in large amount for 2 or 3 months throughout the rainy season. Most mushroom in this group is harvested for household consumption. In case of mushroom which has the price more than 100 baht per kilogram, it is available about 3-4 days per one period but it is available 2 or 3 times per season.

Figure 4-6 Hed Pueng Thaam (*Boletus colossus Heim)*

The total collection of edible mushrooms from 10 villages is shown in Table 4-5 and the total values of edible mushrooms is shown in Table 4-6.

Table 4-5 Total volume collected of edible mushrooms from seasonally flooded forest in the study area

No.	Local Name	Total collected (kg/year)										Total (kg)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	เห็ดผึ้งทาม	638	241	246	1,158	332	314	267	1,237	163	599	5,195
2	เห็ดขาวดิน	64	500	219	367	204	360	212	86	410	1,685	4,107
3	เห็ดข่า	-	-	-	-	20	-	-	-	-	10	30
4	เห็ดถ่าน	51	136	167	-	469	173	6	-	-	213	1,215
5	เห็ดน้ำหมาก	36	80	-	-	21	92	6	-	-	-	235
6	เห็ดหน้าหมอง	373	1,674	268	81	1,265	839	502	480	517	2,113	8,112
7	เห็ดผึ้งโคก	-	-	30	-	9	264	-	40	64	538	945
8	เห็ดระโงก	60	1,508	129	76	312	501	288	547	524	194	4,139
9	เห็ดผึ้งแย้	-	-	22	-	436	-	60	20	232	-	770
10	เห็ดก่อ	12	394	-	-	14	134	240	20	-	431	1,245
11	เห็ดเผาะหนัง	14	120	-	-	1	18	3	450	273	321	1,200
12	เห็ดเผาะฝ้าย	-	-	-	40	144	-	-	30	300	146	660
13	เห็ดไค	201	500	63	-	416	36	336	54	8	78	1,692
14	เห็ดบด	6	60	42	-	24	58	83	156	23	170	622
15	เห็ดผึ้งนกยูง	-	-	92	93	60	-	-	-	-	6	251
16	เห็ดแทด	162	-	6	-	-	-	-	60	-	-	228
17	เห็ดทา	72	-	6	-	-	-	-	80	-	-	158
18	เห็ดปลวก	288	806	210	120	68	150	48	338	102	566	2,696
TOTAL		1,977	6,019	1,500	1,935	3,795	2,939	2,051	3,598	2,616	7,070	**33,500**

Remark: Total value per 261 households of 10 villages.

Table 4-6 Total value of edible mushrooms which harvested from seasonally flooded forest in the study area

No.	Local Name	Total value (baht/year)										Total (baht)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	เห็ดผึ้งทาม	51,040	19,260	19,680	92,640	26,520	25,120	21,360	98,960	13,040	47,920	415,540
2	เห็ดขาวดิน	1,920	15,000	6,570	11,010	6,120	10,800	6,360	2,580	12,300	50,550	123,210
3	เห็ดข่า	-	-	-	-	1,000	-	-	-	-	500	1,500
4	เห็ดถ่าน	1,020	2,720	3,340	-	9,380	3,460	120	-	-	4,260	24,300
5	เห็ดน้ำหมาก	720	1,600	--	-	420	1,840	120	-	-	-	4,700
6	เห็ดหน้าหมอง	7,460	33,480	5,360	1,620	25,300	16,780	10,040	9,600	10,340	42,260	162,240
7	เห็ดผึ้งโคก	-	-	1,500	-	450	13,200	-	2,000	3,200	26,900	47,250
8	เห็ดระโงก	4,200	105,560	9,030	5,285	21,840	35,070	20,160	38,290	36,680	13,580	289,695
9	เห็ดผึ้งแย้	-	-	1,100	-	21,800	-	3,000	1,000	11,600	-	38,500
10	เห็ดก่อ	360	11,820	-	-	420	4,020	7,200	600	-	12,930	37,350
11	เห็ดเผาะหนัง	2,100	18,000	-	-	150	2,700	450	67,500	40,950	48,150	180,000
12	เห็ดเผาะฝ้าย	-	-	-	2,000	7,220	-	-	1,500	15,000	7,300	33,020
13	เห็ดไค	14,070	35,000	4,410		29,120	2,520	23,520	3,780	560	5,460	118,440
14	เห็ดบด	420	4,200	2,940		1,680	4,060	5,810	10,885	1,610	11,900	43,505
15	เห็ดผึ้งนกยูง	-	-	4,600	4,650	3,000	-	-	-	-	300	12,550
16	เห็ดแทด	8,100	-	300	-	-	-	-	3,000	-	-	11,400
17	เห็ดทา	3,600	-	300	-	-	-	-	4,000	-	-	7,900
18	เห็ดปลวก	28,800	80,600	21,000	12,000	6,800	14,950	4,800	33,800	10,200	56,550	269,500
TOTAL		123,810	327,240	80,130	129,205	161,220	134,520	102,940	277,495	155,480	328,560	**1,820,600**

Remark: Total value per 261 households of 10 villages.

Total volume collected of edible mushrooms from seasonally flooded forest in the study area is 33,500 kilogram per year. From Table 4-5, it can be ranked by the volume as follows; the first is Hed Na Mong that is collected about 8,112 kilogram per year, the second is *Boletus colossus* Heim. about 5,195 kilogram per year and the third is *Amanita princes* Corner and Bas. that is collected about 4,107 kilogram per year. Amount of Hed Ka is the lowest of edible mushrooms from seasonally flooded forest in the study area at 30 kilogram per year which collected by villagers in Yang Ngoi and Ban Oun.

According to Table 4-5, it can be ranked by total volume of edible mushroom as follows; the first is Ban Oun at 7,070 kilogram per year, the second is Don Dang at 6,019 kilogram per year and the third is Yang Ngoi at 3,795 kilogram per year. Amount of mushrooms which harvested by Ban Khae's villagers is the lowest in the study area at 1,500 kilogram per year.

Total value of edible mushrooms which harvested from seasonally flooded forest in the study area is 1,820,600 baht per year. The highest value is *Boletus colossus* Heim. at 415,540 baht per year, the second is *Amanita princes* Corner and Bas. at 289,695 baht per year and the third is *Termitomyces furtiginosus.* at 269,500 baht per year. The lowest in the study area is Hed Ka at 1,500 baht per year.

According to Table 4-5 and 4-6 that show the total volume collected and total value of edible mushrooms from seasonally flooded forest in the study area, they indicated that total value of edible mushrooms is influenced by the price.

4.3.3 Bamboo shoots

Each year, a few kinds of edible bamboo shoots take time to grow and be ready for picking starting from April to December. A species of bamboo called "Pai gasa" (*Bambusa arundinacea* Willd.) which presented on river banks, flood plain and brook. Pai gasa is available throughout the year. They are particularly abundant between May to June. Bamboo shoots are collected both for household consumption and commercial purpose. Villagers can collect bamboo shoots about 60 kilogram per day in rainy season. Bamboo shoots are boiled or grilled in order to preserve for later consumption. The prices of bamboo shoots depends on their availability which is highest (20 baht) in dry season and decrease gradually in rainy season and reaches the trough at 3 baht per kilogram. The outer skin will generally be removed before selling to a middleperson to

distribute to markets in Sri Songkhram district. In some cases, the villagers will take bamboo for their own consumption or sell directly to a market for higher price.

Figure 4-7 Bamboo shoots which collected from seasonally flooded forest

Seasonal calendar for harvest the bamboo shoots from seasonally flooded forest in the study area is shown in Table 4-7 and the total collections of bamboo shoots from 10 villages are shown in Table 4-8 and the total values of bamboo shoots are shown in Table 4-9.

Table 4-7 Seasonal calendar for harvest the bamboo shoots from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Time to harvest											Price (baht/kg)
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
1	ไผ่กะซะ	*Bambusa arundinacea* Willd.	←	—	—	—	—	—	—	—	—	—	—	→	5
2	ไผ่ป่า	*Bambusa arundinacea*					←	—	→						5

Table 4-8 Total volume collected of bamboo shoots from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Total collected (kg/year)										Total (kg)
			Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	ไผ่กะซะ	*Bambusa arundinacea* Willd.	9,222	3,341	7,528	25,912	360	6,570	2,374	4,328	8,797	3,107	71,539
2	ไผ่ป่า	*Bambusa arundinacea*	74	52	481	-	1,248	660	514	3,728	556	2,200	9,513
TOTAL			9,296	3,393	8,009	25,912	1,608	7,230	2,888	8,056	9,353	5,307	**81,052**

Table 4-9 Total value of bamboo shoots which collected from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Total value (baht/year)										Total (baht)
			Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	ไผ่กะซะ	*Bambusa arundinacea* Willd.	46,110	16,705	37,640	129,560	1,800	32,850	11,870	21,640	43,985	15,535	373,995
2	ไผ่ป่า	*Bambusa arundinacea*	370	260	2,405	-	6,240	3,300	2,570	18,640	2,780	11,000	47,565
TOTAL			46,480	16,965	40,045	129,560	8,040	36,150	14,440	40,280	46,765	26,535	**421,560**

Remark: Total value per 261 households of 10 villages.

X = Scientific name is not known

From Table 4-7, *Bambusa arundinacea* Willd. was collected in every village in the study area because it is available throughout the year but *Bambusa arundinacea* is available only in the rainy season. In rainy season, villagers harvest especially the shoot of bamboo because it is abundant. After the rainy season, there is a lack of bamboo shoot but villager can harvest the small branch of *Bambusa arundinacea* Willd. Villagers collect bamboo shoot for household consumption because these can cook various kinds of food and it can be processed into various forms.

Total volume of bamboo shoots which collected from seasonally flooded forest in the study area is 81,052 kilogram per year. From Table 4-6, it can be ranked by the volume as follows; the first is Pak Yam that is collected about 25,912 kilogram per year, the second is Kham Hai about 9,353 kilogram per year and the third is Tha Bo that is collected about 9,296 kilogram per year. The total volume of bamboo shoots which collected from seasonally flooded forest of Yang Ngoi village is the lowest at 1,608 kilogram per year.

As a result on Table 4-8, amount of bamboo shoots which harvested could be divided into 3 groups as follow; Yang Ngoi, Tha Kong and Don Dang are in the first group which harvested bamboo shoots lower than 5,000 kilogram per year. Village in second group is harvested bamboo shoots range between 5,000 – 10,000 kilogram per year such as Ban Oun, Dong Nong Bua, Ban Khae, Had Pang, Tha Bo and Kham Hai. Pak Yam is in the last group which harvest bamboo shoots more than 10,000 kilogram per year. The total volume of bamboo shoots which collected from seasonally flooded forest of Pak Yam village is 25,912 kilogram per year and is the highest in the study area. Pak Yam's villagers like to harvest the bamboo shoots more than other non timber forest products because it take less time to harvest than other non timber forest products and they spend most of time fishing.

Table 4-9 shown total value of bamboo shoots which collected from seasonally flooded forest in the study area at 421,560 baht per year. It is calculated from total volume of bamboo shoots which harvested for household consumption and sale. The total value of bamboo shoots which collected from seasonally flooded forest of Pak Yam village is 129,560 baht per year and it is the highest in the study area and the total value of bamboo shoots which collected from seasonally flooded forest of Yang Ngoi village is the lowest value at 8,040 baht per year.

Total value of bamboo shoots can be divided into 4 groups as follow; Yang Ngoi, Tha Kong and Don Dang are form into the first group which has total value of bamboo shoots less than 20,000 baht per year. Village in second group has total value of bamboo shoots range between 20,000 – 40,000 baht per year such as Ban Oun and Dong Nong Bua. The third group is comprised of Ban Khae, Had Pang, Tha Bo and Kham Hai which has total value of bamboo shoots range between 40,001 – 60,000 baht. Pak Yam is in the last group which has total value of bamboo shoots more than 60,000 baht per year.

4.3.4 Firewood

Firewood gathered from the seasonally flooded forest provides an essential source of energy for villagers, either directly as fuel wood, or after processing to charcoal. Some firewood is harvested in own agriculture area but this study would consider only firewood that harvested from seasonally flooded forest. The villagers would process firewood into charcoal for use in rainy season. Harvesting timber for firewood is normally carried out by pushcart. Amount of firewood which villagers usually harvest is about 3 pushcarts per year per household. Volumes of firewood are about 1.5 m^3 per 1 pushcart. Deadfalls that do not start to rot is preferred. Standing dead timber is considered better still, as it is both seasoned, and rot less. Some households prefer to buy charcoal from merchant in the same village more than making the charcoal by themselves. The price of charcoal ranges between 150-180 baht per sack. Rate of charcoal consumption is about 1 sack per month. Agriculture area is the major source of firewood that takes for processing into charcoal. Some village could harvest from seasonally flooded forest.

Figure 4-8 Firewood which collected from seasonally flooded forest

The total collection of firewood from 10 villages and the total value of firewood are shown in Table 4-10.

Table 4-10 Amount of firewood which harvested from seasonally flooded forest in the study area

No.	Name of village	Amount of firewood (m^3/year)	Value of firewood (baht/year)
1	Tha bo song khram	96	76,800
2	Don dang	72	57,600
3	Ban khae	72	57,600
4	Pak yam	99	79,200
5	Yang ngoi	56	44,400
6	Dong nong bua	23	18,000
7	Tha kong	17	13,200
8	Had pang	90	72,000
9	Kham hai	30	24,000
10	Ban oun	48	38,400
	TOTAL	**602**	**481,200**

Remark: Total value per 261 households of 10 villages.

According to Table 4-10, the total volume of firewood which villagers in the study area collected from seasonally flooded forest are 602 cubic meter per year. The total value of firewood which collected from seasonally flooded forest of 10 villages in the study area is about 481,200 baht per year. Amount of firewood which harvested from seasonally flooded forest for processing to charcoal is shown Table 4-11.

Table 4-11 Amount of firewood which harvested from seasonally flooded forest for processing to charcoal in the study area

No.	Name of village	Amount of firewood for charcoal (m^3/year)	Value of firewood for charcoal (baht/year)
1	Tha bo song khram	9	3,843
2	Don dang	38	16,013
3	Ban khae	0	0
4	Pak yam	0	0
5	Yang ngoi	24	10,248
6	Dong nong bua	9	3,843
7	Tha kong	0	0
8	Had pang	15	6,405
9	Kham hai	0	0
10	Ban oun	5	1,922
TOTAL		**99**	**42,273**

Remark: Total value per 261 households of 10 villages.

Table 4-11 shows amount of firewood which harvested from seasonally flooded forest for processing to charcoal in the study area. Total volume of firewood is 99 m^3 per year for 10 villages and the total value of firewood in form of charcoal is 42,273 baht per year. Some village on the study area do not use wood from seasonally flooded forest for processing to charcoal because they harvest firewood from their garden or they would like to buy charcoal from merchant in their village.

Table 4-12 Total value of firewood that harvest from seasonally flooded forest in the study area

No.	Name of village	Total value of firewood (baht/year)
1	Tha bo song khram	48,243
2	Don dang	54,413
3	Ban khae	76,800
4	Pak yam	24,000
5	Yang ngoi	67,848
6	Dong nong bua	17,043
7	Tha kong	79,200
8	Had pang	78,405
9	Kham hai	57,600
10	Ban oun	19,922
TOTAL		**523,473**

Remark: Total value per 261 households of 10 villages.

Total value of firewood harvested from seasonally flooded forest in the study area is about 523,473 baht per year. Total value of firewood of Tha Kong village is 79,200 baht per year that is the highest value of firewood in the study area. Total value of firewood of Dong Nong Bua village was 17,043 baht per year that is the lowest value of firewood in the study area. As a result on Table 4-12, total value of firewood that harvest from seasonally flooded forest in the study area could be divided into 4 groups as follow; Dong Nong Bua and Ban Oun are form into the first group which has total value of firewood not over 20,000 baht per year. Pak Yam falls into the second group which has total value of firewood range between 20,000 – 40,000 baht per year. The third group is comprised of Tha Bo, Don Dang and Kham Hai which has total value of firewood range between 40,001 – 60,000 baht per year. The last group which has total value of bamboo shoots more than 60,000 baht per year is comprised of Yang Ngoi, Ban Khae, Had Pang and Tha Kong.

4.3.5 Fodder

Normally, livestock are often herd to graze on the grasses of seasonally flooded forest throughout a year except for rainy season about August to October. In the rainy season, they have to herd their livestock to graze on upland area. However, villagers have to reap the grass from the agriculture area as rubber plantation or buy straw for feeding their livestock during rainy season when they can not lead their livestock to graze on upland area. An average amount of straw for their livestock is about 3 pushcarts per one per year. The price of straw is about 120 baht per pushcart. The villager would take straw for feed their livestock especially emergency case.

Livestock is like a saving. They would sell their livestock in emergency case. The price of cow is about 12,000 baht for 3 years and the price of buffalo is about 12,000 baht for 4 years. The villager would take their livestock to graze in the area around "Thaam" and upland or feed in own house by reaping grass for them.

Figure 4-9 The villager takes their livestock to graze in seasonally flooded forest

The total harvest of fodder for cattle of 10 villages and the total value of fodder are shown in Table 4-13.

The total volume of fodder is calculated from total number of cattle of each village which actually interviewed from villagers in the study area. The methodology for the calculation has been presented in Chapter 3. The net benefit per cow is 3,422.20 baht per year and the net benefit of buffalo is 2,408.37 baht per year. Total value of fodder is shown in Table 4-13 as follow;

Table 4-13 Total value of fodder that harvested from seasonally flooded forest in the study area

No.	Village	Number of cow	Number of buffalo	Value of fodder (baht/year)
1	Tha bo song khram	27	0	92,939
2	Don dang	136	27	533,165
3	Ban khae	4	159	396,700
4	Pak yam	16	24	112,876
5	Yang ngoi	0	10	24,084
6	Dong nong bua	21	10	96,370
7	Tha kong	14	52	173,426
8	Had pang	28	6	110,832
9	Kham hai	0	14	33,717
10	Ban oun	83	23	341,095
TOTAL		329	325	**1,915,204**

Remark: Total value per 261 households of 10 villages

As a result, total value of fodder that harvested from seasonally flooded forest in the study area is 1,915,204 baht per year. The value of fodder of Don Dang village is the highest at 533,165 baht per year because the total number of cow and buffalo is the highest and the lowest value is Yang Ngoi village at about 24,084 baht per year.

From Table 4-13, it can be ranked by the total value of fodder that harvested from seasonally flooded forest as follows; the first is Don Dang that is 533,165 baht per year, the second is Ban Khae that is 396,700 baht per year and the third is Ban Oun that is 341,095 baht per year. The total value of fodder that harvested from seasonally flooded forest in the study area depends on number of livestock of each village.

4.3.6 Edible insects and ant eggs

Edible insects and ant eggs are a major source of income for villagers from seasonally flooded forest. In this group, ant eggs generate the highest income for villagers. The eggs are most abundant during the short period from February to April. The price of ant eggs ranges between 80-100 baht per kilogram. Other edible insects are cricket that is found in harvest season and cicadas that is found in summer. For a cricket, villagers would take a spade in order to dig for catching them. Most of these crickets harvested are for household consumption. In case of cicadas, villagers would use electric lights in order to attract them at night. Most of these cicadas harvested for sell in own village or middlepersons from district. The prices of these edible insects are about 30 baht for 100 crickets and 60-80 baht per kilogram for cicadas.

Figure 4-10 Edible insects that harvested from seasonally flooded forest

Seasonal calendar for harvest the edible insects and ant eggs from seasonally flooded forest in the study area is shown in table 4-14 and the total harvest of edible insects and ant eggs of 10 villages are shown in Table 4-15 and the total value of edible insects and ant eggs are shown in Table 4-16.

Table 4-14 Seasonal calendar for harvest the edible insects and ant eggs from seasonally flooded forest in the study area

No.	Local Name	Common name	Scientific Name	Time to harvest												Price (baht/unit)
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
1	กี่นูน[1]	-	*Holotrichia sp.*			←	—	→								30
2	จี้ล่อ[1]	Cricket	*Acheta testacea* Walker										←	—	→	30
3	จักจั่น[1]	Cicada	*Meimuna opalifera* Walker, *Pompania sp.*			←	—	→								30
4	แมงดานา[2]	Giant Water bug	*Lethocerus indicus* Lep.-Serv.			←	—	→								2
5	ไข่มดแดง[3]	-	X		←	—	—	→								100

Table 4-15 Total volume collected of edible insects and ant eggs from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Total collected (unit/year)										Total (unit)
			Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	กี่นูน[1]	*Holotrichia sp.*	600	3,900	3,800	57,200	2,650	3,900	1,200	14,300	6,300	7,360	98,560
2	จี้ล่อ[1]	*Acheta testacea* Walker	5,200	7,000	12,800	-	8,120	11,600	1,800	16,000	500	4,,950	67,970
3	จักจั่น[1]	*Meimuna opalifera* Walker, *Pompania sp.*	-	-	-	-	-	-	-	13700	3,600	5,600	22,900
4	แมงดานา[2]	*Lethocerus indicus* Lep.-Serv.	600	-	-	-	-	-	-	-	-	150	750
5	ไข่มดแดง[3]	X	6,400	10,900	16,600	57,200	10,770	15,500	3,000	44,000	10,400	18,060	**192,830**

Remark: Total value per 261 households of 10 villages

X = Scientific name is not known.
[1] = Unit is 100 animal
[2] = Unit is 1 animal
[3] = Unit is kg

Table 4-16 Total value of edible insects and ant eggs from seasonally flooded forest in the study area

No.	Local Name	Scientific Name	Total value (baht/year)										Total(baht)
			Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	กี่นูน	*Holotrichia sp.*	240	1,170	1,140	17,160	795	1,170	360	4,290	1,890	2,208	30,423
2	จี้ล่อ	*Acheta testacea* Walker	2,600	3,500	6,400	-	4,060	5,800	900	8,000	250	2,475	33,985
3	จักจั่น	*Meimuna opalifera* Walker, *Pompania sp.*	-	-	-	-	-	-	-	4,110	1,080	1,680	6,870
4	แมงดานา	*Lethocerus indicus* Lep.-Serv.	1,200	-	-	-	-	-	-	-	-	300	1,500
5	ไข่มดแดง[1]	X	7,550	43,700	26,500	70,450	950	6,350	10,500	50,000	4,900	61,550	282,450
TOTAL			11,590	48,370	34,040	87,610	5,805	13,320	11,760	66,400	8,120	68,213	**355,228**

Remark: Total value per 261 households of 10 villages

X = Scientific name is not known.
[1] = Unit is 100 animal
[2] = Unit is 1 animal
[3] = Unit is kg

Table 4-14 shows that seasonal calendar for harvest edible insects and ant eggs starts from the end of rainy season until the summer. As a result that shown in Table 4-14, ant eggs and *Holotrichia sp.* was harvested in every village in the study area.

From Table 4-16, total value of edible insects in the study area can be ranked by species which collected as follows; the first is *Acheta testacea* Walker. that is about 33,985 baht per year, the second is *Holotrichia sp.* that is 30,423 baht per year, the third is *Meimuna opalifera* Walker, *Pompania sp.* that is 6,870 baht per year and the last is *Lethocerus indicus* Lep.-Serv. at 1,500 baht per year.

Total value of ant eggs that harvested from seasonally flooded forest in the study area can be ranked as follows; the highest is Pak Yam that is 70,450 baht per year, the second is Ban Oun that is 61,550 baht per year and the third is Had Pang village that is 50,000 baht per year.

Figure 4-11 Ant eggs that harvested from seasonally flooded forest

Total value of edible insects and ant eggs that harvested from seasonally flooded forest in the study area can be ranked as follows; the highest is Pak Yam that is 87,610 baht per year, the second is Ban Oun that is 68,213 baht per year and the

third is Had Pang village that is 66,400 baht per year. The lowest value of edible insects and ant eggs is Yang Ngoi village at 5,805 baht per year. Total value of edible insects and ant eggs that harvested from seasonally flooded forest in the study area is 355,228 baht per year.

4.3.7 Medicinal plants

Nowadays, herbal medicine is not popular because of the lack of practitioners and successor. According to the interview with older villagers and Thai Baan research, up to 83 kinds of herb used to be collected and utilized in the past. However, traditional medicine has become less popular as modern medicine has expanded and become relatively accessible in the local communities. At the present, traditional doctors are still available only in some villages. Traditional medicinal formula and relevant knowledge are inherited from older generations in some villages, but not fully. In some villages where traditional doctors are still available, most doctors practiced are old but they still go out to collect medicinal plants in seasonally flooded forest. In most cases, these medicinal plants are used for their households to cure only some disease. In some villages, villagers know about medicinal plants but they do not have time to collect it so they prefer to use modern medicine over traditional medicine. However, some medicinal plants are used to produce traditional medicines for sale outside the local communities such as medicine for pregnant woman. The volume of medicinal plants which villagers collect is relatively small; therefore, the value of the medicinal plants will be disregarded.

Figure 4-12 Medicinal plants which collected from seasonally flooded forest

4.3.8 Total value of non timber forest products

Table 4-1 to 4-16 show total value of non timber forest products which collected from seasonally flooded forest in the study area in each groups as follow; total value of wild vegetable plants, total value of edible mushrooms, total value of bamboo shoots, total value of firewood, total value of fodder, total value of edible insects and ant eggs.

Total value of non timber forest products from seasonally flooded forest in the study area are shown in Table 4-17 and the value of non timber forest products per household from seasonally flooded forest in the study are shown in Table 4-18.

Table 4-17 Total value of non timber forest products in the study area

No.	Name of village	Total Households	Value of wild vegetable plants (baht/year)	Value of edible mushrooms (baht/year)	Value of bamboo shoots (baht/year)	Value of firewood (baht/year)	Value of fodder (baht/year)	Value of edible insects and ant eggs (baht/year)	Total value of NTFPs (baht/year)
1	Tha bo song khram	130	49,078	123,810	46,480	48,243	92,939	11,590	372,140
2	Don dang	226	56,974	327,240	16,965	54,413	533,165	48,370	1,037,127
3	Ban khae	137	27,924	80,130	40,045	76,800	396,700	34,040	655,639
4	Pak yam	131	21,288	129,205	129,560	24,000	112,876	87,610	504,539
5	Yang ngoi	117	42,446	161,220	24,340	67,848	24,084	5,805	325,743
6	Dong nong bua	95	56,062	134,520	36,150	17,043	96,370	13,320	353,465
7	Tha kong	65	36,083	102,940	14,440	79,200	173,426	11,760	417,849
8	Had pang	117	6,160	277,495	40,280	78,405	110,832	66,400	579,572
9	Kham hai	117	15,924	155,480	46,765	57,600	33,717	8,120	317,606
10	Ban oun	119	42,601	328,560	26,535	19,922	341,095	68,213	826,926
TOTAL		1,254	354,540	1,820,600	421,560	523,473	1,915,204	355,228	**5,390,606**

Remark: Total value per 261 households of 10 villages

Table 4-18 Value of non timber forest products per household per year in the study area

No.	Name of village	Average value of non timber forest products (baht/household/year)	Total Samples	Total value of non timber forest products (baht/year)
1	Tha bo song khram	14,313	26	372,140
2	Don dang	23,047	45	1,037,127
3	Ban khae	23,416	28	655,639
4	Pak yam	19,405	26	504,539
5	Yang ngoi	13,573	24	325,743
6	Dong nong bua	17,673	20	353,465
7	Tha kong	20,892	20	417,849
8	Had pang	24,149	24	579,572
9	Kham hai	13,234	24	317,606
10	Ban oun	34,455	24	826,926
TOTAL		**20,654**	**261**	**5,390,606**

Remark: Total value per 261 households of 10 villages

Total value of non timber forest products (Table 4-17) in the study area is 5,390,606 baht per year or an average value of non timber forest products per household per year in the study area (Table 4-18) is 20,654 baht. The highest value is the value of fodder that is 1,915,204 baht per year because almost all villagers in the study area have cattle that must to feed every day. Therefore, the value of fodder tends to be high. Total value of non timber forest products also depend on number of sample of each village and location of village. Some village has a lot of samples but the location of village is closed to urban area, and thus have lower value of non timber forest products utilized than other village that far from town because of their opportunity to collect these products. In case of Dong Nong Bua and Tha Kong village, that has a number of household less than Yang Ngoi village but the former has value of non timber forest products more than the latter because Dong Nong Bua's villagers and Tha Kong's villagers still maintain their livelihood and prefer to collected non timber forest products more than Yang Ngoi's villagers. Both Dong Nong Bua's villagers and Tha Kong' s villagers lifestyle was depend on natural resource more than other villages. Therefore the average value of non timber forest products was higher than other villages.

4.4 Valuation of fishery products

Seasonally flooded forests provide stream habitats many freshwater species. Many species of fish contribute to the quality of villager's diets. Therefore the Songkhram River provides a fertile habitat for a good variety of fish. Villager in the sample group do fishery throughout the year. But majority mostly do fishery in May to June and September to October. In some villages, there are fisherman village that do commercial fishing during rainy season, because the most of fish were breeding in these period. Fishery period of each village is not different. Most of them were fishing during 15.00-18.00 and 05.00-08.00. In the evening the fisherman would take their fishing gears to lie down on the river. In the morning they would take time for catch or pick their fishery yields.

Fishery yields from fishing can be divided into 2 groups. The first group is a group of the low price fish that called "Pla Kao" which villagers would take for their own consumption and for making fermented fish. The prices of these fish are about 20 baht per kilogram. The low price fish are as following; *Osteochilus hasselti* (Val. in Cuv.&Val.), *Hampala macrolepidota* Van Hasselt, *Hampala dispar* Smith, *Henicorhynchus siamensis* (Sauvage), *Henicorhynchus ornatipinnis* (Roberts), *Osteochilus melanopleura* (Bleeker), *Labiobarbus leptocheilus* (Val.), *Mystus mysticetus* (Roberts), and *Thynnichthys thynnoides* (Bleeker). The second group of fish is a group of the high price fish which villagers would sell in their village or to local merchant and middleman in their village. Species of fish in this group, *Hemibagrus sp.*, *Pristolepis fasciatus* (Bleeker), *Channa striata* (Bloch), *Cyclocheilichthys enoplos* (Bleeker), *Clarias batrachus* (Linnaeus), *Micronema bleekeri* (Gunther) and *Monopterus albus* (Zieuw).

The villagers in the study area mostly use the following fishing gears: fish net, fish hook, dip net and square dip net. Some households have a commercial fishing gear just like seine which can catch about 100 kilogram per day especially in May or September that is high season of fishing.

Figure 4-13 Housewives from Kham Hai village with their fishing gear

Figure 4-14 Fisherman's livelihoods in the study area

Table 4-19 Table of fish species caught by villagers in the study area

No.	Scientific name	English name	Local Name	Common name
1	*Hemibagrus sp.*	Black catfish	ปลากดหม้อ	ปลากดคัง
2	*Paralaubuca riveroi* (Fowler, 1935)	Silver knife barb	ปลากระแตบกลม	ปลาแปบ
3	*Mystus mysticetus* (Roberts)	Southeast asian striped mystus	ปลาแขยงข้างลาย	ปลาแขยงข้างลาย
4	*Pristolepis fasciatus* (Bleeker)	Compress climbing perch	ปลาก่า	ปลาหมอช้างเหยียบ
5	*Thynnichthys thynnoides* (Bleeker)	Tiny scale barb	ปลากุ่ม	ปลาสร้อยเกล็ดถี่
6	*Anabas testudineus* (Bloch)	Climbing perch	ปลาเขง	ปลาหมอ
7	*Labiobarbus leptocheilus* (Val.)	Striped long-fin labeo	ปลาตุยลามขาว	ปลาซ่า
8	*Cyclocheilichthys enoplos* (Bleeker)	Giant sensory line barb	ปลาโจก	ปลาตะโกก
9	*Channa striata* (Bloch)	Green snakehead	ปลาค่อ	ปลาช่อน
10	*Ompok siluroides* (Lecepede)	Black-ear sheath fish	ปลาเซือมจุด	ปลาชะโอน
11	*Clarias batrachus* (Linnaeus)	Walking catfish	ปลาดุกนา	ปลาดุก
12	*Chitala ornate* (Gray)	Clown feather back	ปลาตองกราย	ปลากราย
13	*Notopterus notopterus*(Pallas)	Bronze feather back	ปลาตองแนบ	ปลาฉลาด
14	*Barbonymus gonionotus* (Bleeker)	Java barb	ปลาปาก	ปลาตะเพียนขาว
15	*Micronema bleekeri* (Gunther)	Blue Sheathfish	ปลานาง	ปลาแดง, ปลาเนื้ออ่อน
16	*Cyprinus carpio* (Linneas)	Common carp	ปลาไน	ปลาไน
17	*Oxyeleotris marmorata* Bleeker	Marble sleeper goby	ปลาบู่	ปลาบู่ทราย
18	*Cosmocheilus hardmandi* (Sauvage)	Fringe lip river barb	ปลาปากบาน	ปลาตะกาก
19	*Kryptopterus cheveyi* Durand	Chevey's sheathfish	ปลาปึกไก่	ปลาดอกบัว, ปลาเพียว
20	*Acanthopsis sp.*	Horse-face loach	ปลาพันทราย	ปลารากกล้วย, ปลากล้วย
21	*Xenentodon canciloides* (Bleeker)	Asian gar	ปลาสบโทง	ปลากะทุงเหว

Table 4-19 Table of fish species caught by villagers in the study area (Continued)

No.	Scientific name	English name	Local Name	Common name
22	*Henicorhynchus siamensis* (Sauvage)	Common Siamese barb	ปลาสร้อยหัวแข็ง	ปลาสร้อย
23	*Hampala macrolepidota* Van Hasselt	Banded wolf barb	ปลาสูดขาว	ปลากระสูบขีด
24	*Helicophagus leptorhynchus* Ng	Mouse-face shark catfish	ปลาหนู	ปลาหอย, ปลาสวายหนู
25	*Morulius chrysophekadion* (Bleeker)	Crow labeo	ปลาอีตู๋	ปลากาดำ
26	*Osteochilus hasselti* (Val. in Cuv. & Val.)	Red spotted robust labeo	ปลาอีไท	ปลากะไท, ปลาสร้อยนกเขา
27	*Macrognathus semiocellatus* Roberts	Ocellated spiny eel	ปลาหลดทราย	ปลาหลดหลังจุด
28	*Wallago attu* (Schneider)	Crocodile sheath fish	ปลาค้าว	ปลาเค้าขาว
29	*Channa micropeltes* (Cuv.in Cuv. & Val.)	Giant snake-head	ปลาโด	ปลาชะโด
30	*Monopterus albus* (Zieuw)	Swamp eel	ปลาเอี่ยน	ปลาไหล
31	*Anabas testudineus* (Bloch)	Climbing perch	ปลาเขง	ปลาหมอ
32	*Mystus singaringan* (Bleeker)	Long adipose mystus	ปลาเก้ง	ปลากะมัง
33	x	-	กุ้งแม่น้ำ	กุ้งแม่น้ำ

Source: Thai Baan research, 2005

Table 4-19 show numbers of fishery products caught by villagers in the study area. There are about 33 kinds of aquatic animal caught in the study area including fish and shrimp. Most of fish caught in every village in the study area are fishes in group of low price fish (20 baht) that compose of *Osteochilus hasselti* (Val. in Cuv. & Val.), *Barbonymus gonionotus* (Bleeker) and "Pla Kao" group. Another kind of fish such as *Clarias batrachus* (Linnaeus), *Channa striata* (Bloch) and *Hemibagrus sp.* was normally caught in the study area but their price are over than 20 baht per kilogram.

According to Table 4-19, some species are caught in only some villages. For example; *Paralaubuca riveroi* (Fowler, 1935), *Pristolepis fasciatus* (Bleeker), *Cosmocheilus hardmandi* (Sauvage), *Kryptopterus cheveyi* Durand, *Acanthopsis sp.*, *Xenentodon canciloides* (Bleeker), *Morulius chrysophekadion* (Bleeker), *Wallago attu* (Schneider), *Macrognathus semiocellatus* Roberts, *Channa micropeltes* (Cuv.in Cuv. & Val.), *Monopterus albus* (Zieuw) and shrimp.

In case of *Monopterus albus* (Zieuw) and shrimp caught at Don Dang village, villagers have to use specific fishing gear in order to catch them. Some key informant from Don Dang village catch especially the *Monopterus albus* (Zieuw) as their living. "Toom ean" is the special fishing gear for catching *Monopterus albus* (Zieuw).

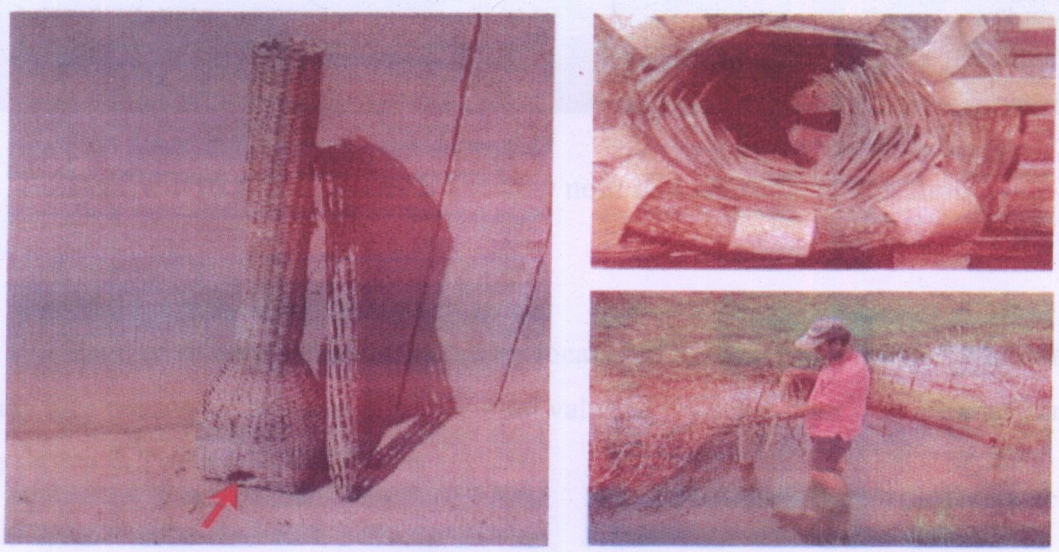


Figure 4-15 "Toom ean": the fishing gear for catching *Monopterus albus* (Zieuw)

Source: Koanantakul, 2004

The price of *Monopterus albus* (Zieuw) is about 60 baht per kilogram depending on their size. *Monopterus albus* (Zieuw) is available from May to August.

For the shrimp, villager can catch them from July until April. The price of shrimp is about 40 baht per kilogram. Villager uses the fishing gear like a fish trap with a narrow neck for catching them.

Figure 4-16 A fish trap with a narrow neck that use for catching shrimp

4.4.1 Fishery yields

Total of fishery yields harvested by local fishing from Songkhram River in the study area are shown in Table 4-20 and total value of fishery products in the study area are shown in Table 4-21 as follows;

Table 4-20 Total of fishery yields that caught by villagers in the study area

No.	Name	Fishery yields (kg/year)										Total
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	ปลากดหม้อ	290	-	590	1,530	112	893	84	1,780	3,250	500	9029
2	ปลากระแตบกลม	-	96	-	-	-	-	-	-	-	360	456
3	ปลาแขยงข้างลาย	-	-	-	370	480	216	1056	70	680	60	2932
4	ปลาก่า	-	316	-	-	-	-	-	-	-	-	316
5	ปลากุ่ม	980	1,400	840	240	540	36	-	-	360	420	4816
6	ปลาเขง	-	-	-	-	-	-	-	-	150	-	150
7	ปลาคุยลายขาว	100	-	-	300	-	-	-	-	240	-	640
8	ปลาโจก	-	-	-	-	60	-	-	-	290	-	350
9	ปลาค่อ	180	2,785	50	300	890	220	200	323	100	1,114	6162
10	ปลาเซือมจุด	115	940	-	420	-	190	312	-	-	-	1977
11	ปลาดุกนา	-	1,150	480	300	750	225	380	463	320	196	4264
12	ปลาตองกราย	1,290	1,195	540	2,000	-	14	-	340	-	1,080	6459
13	ปลาตองแนบ	-	-	-	300	240	-	-	-	-	-	540
14	ปลาปาก	1,830	800	1,330	1,190	540	400	168	415	60	720	7453
15	ปลานาง	260	-	80	1,630	-	830	84	265	350	60	3559
16	ปลาไน	60	-	-	-	-	-	-	-	-	-	60
17	ปลาบู่	180	-	-	-	-	-	-	80	-	624	884
18	ปลาปากบาน	-	-	-	-	-	-	-	-	-	60	60
19	ปลาปีกไก่	-	-	-	-	-	720	-	-	-	-	720
20	ปลาพันทราย	-	-	-	600	-	-	-	-	-	120	720
21	ปลาสบโทง	60	-	-	-	-	-	-	-	-	90	150

Table 4-20 Total of fishery yields that caught by villagers in the study area (Continued)

No.	Name	Fishery yields (kg/year)										Total
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
22	ปลาสร้อยหัวแข็ง	1,660	-	1,080	900	-	-	-	5,610	-	-	9,250
23	ปลาสูดขาว	620	960	760	-	240	260	-	-	-	-	2,840
24	ปลาหนู	-	-	200	2,040	-	410	-	390	425	60	3,525
25	ปลาอีตู๋	-	-	-	200	60	-	-	-	-	-	260
26	ปลาอีไท	390	2,650	880	2,120	780	260	800	400	840	540	9,660
27	ปลาหลดทราย	-	-	-	20,150	-	-	-	-	-	-	20,150
28	ปลาค้าว	-	40	-	-	-	-	-	-	95	-	135
29	ปลาโด	-	-	-	-	-	-	-	-	45	20	65
30	ปลาอี่ยน	1,630	-	-	-	-	-	-	-	-	-	1,630
31	ปลาขาวรวม	10,610	8,779	4,450	9,120	2,938	7,044	1,424	2,400	4,218	9,548	60,531
32	ปลาเขง	-	600	-	-	-	-	-	110	150	-	860
33	ปลาเก้ง	-	-	-	600	-	120	-	300	-	360	1,380
34	กุ้งแม่น้ำ	-	300	-	-	-	-	-	-	-	-	300
Total		**20,255**	**22,011**	**11,280**	**44,310**	**7,630**	**11,838**	**4,508**	**12,946**	**11,573**	**15,932**	**162,283**

Table 4-21 Total value of fishery products in study area

No.	Name	Fishery products value (baht/year)										Total (baht)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
1	ปลากดหม้อ	17,400	-	31,900	83,200	2,240	55,580	5,040	109,600	180,650	33,300	518,910
2	ปลากระแตบกลม	-	1,920	-	-	-	-	-	-	-	7,200	9,120
3	ปลาแขยงข้างลาย	400	-	-	7,400	7,440	5,520	21,120	1,400	16,600	1,200	61,080
4	ปลาก่า	-	11,000	-	-	-	-	-	-	-	-	11,000
5	ปลากุ่ม	19,600	112,000	16,800	4,800	10,800	720	-	-	7,200	8,400	180,320
6	ปลาแขง	-	-	-	-	-	-	-	-	4,500	-	4,500
7	ปลาคุยลามขาว	3,000	-	-	6,000	-	-	-	-	4,800	-	13,800
8	ปลาโจก	-	-	-	-	6,000	-	-	24,000	32,800	-	62,800
9	ปลาค่อ	9,000	162,300	2,500	18,000	43,100	15,800	12,000	17,050	5,000	61,340	346,090
10	ปลาเซือมจุด	9,200	64,400	-	21,600	-	11,400	21,360	-	-	-	127,960
11	ปลาดุกนา	-	77,900	28,800	12,000	39,100	13,500	26,600	20,520	19,200	10,880	248,500
12	ปลาตองกราย	73,700	68,100	31,800	120,000	-	560	-	22,800	-	54,000	370,960
13	ปลาตองแนบ	-	-	-	15,000	9,000	-	-	-	-	-	24,000
14	ปลาปาก	54,300	23,720	39,300	35,700	13,800	10,000	5,040	12,450	1,800	21,600	217,710
15	ปลานาง	-	-	8,800	-	-	100,100	8,400	31,800	30,500	8,400	188,000
16	ปลาไน	3,000	-	-	-	-	-	-	-	-	-	3,000
17	ปลาบู่	14,400	-	-	-	-	-	-	6,400	-	52,800	73,600
18	ปลาปากบาน	-	-	-	-	-	-	-	-	-	1,200	1,200
19	ปลาปีกไก่	-	-	-	-	-	51,600	-	-	-	-	51,600
20	ปลาพันทราย	-	-	-	33,000	-	-	-	-	-	6,000	39,000
21	ปลาสบโทง	3,200	-	-	-	-	-	-	-	-	4,500	7,700

Table 4-21 Total value of fishery products in study area (Continued)

No.	Name	Fishery products value (baht/year)										Total (baht)
		Tha bo	Don dang	Ban khae	Pak yam	Yang ngoi	Dong nong bua	Tha kong	Had pang	Kham hai	Ban oun	
22	ปลาสร้อยหัวแข็ง	35,600	-	21,600	18,000	-	-	-	112,200	-	-	187,400
23	ปลาสูดขาว	14,900	19,200	15,200	-	4,800	5,200	-	-	-	-	59,300
24	ปลาหนู	-	-	10,600	61,200	-	24,400	-	27,000	37,750	4,200	165,150
25	ปลาอีตู๋	-	-	-	4,000	4,800	-	-	-	-	-	8,800
26	ปลาอีไท	9,300	53,000	17,600	42,400	15,600	5,200	16,000	8,000	16,800	12,000	195,900
27	ปลาหลดทราย	-	-	-	32,000	-	-	-	-	-	-	32,000
28	ปลาค้าว	-	4,800	-	-	-	-	-	-	9,500	-	14,300
29	ปลาโด	-	-	-	-	-	-	-	-	2,250	2,000	4,250
30	ปลาเอี่ยน	-	110,400	-	-	-	-	-	-	-	-	110,400
31	ปลาขาวรวม	223,200	152,580	89,000	203,400	56,360	136,380	28,480	60,000	85,260	190,960	1,225,620
32	ปลาเขง	-	12,000	-	-	-	-	-	3,300	-	-	15,300
33	ปลาแก้ง	-	-	-	18,000	-	3,600	-	9,000	-	10,800	41,400
34	กุ้งแม่น้ำ	-	12,000	-	-	-	-	-	-	-	-	12,000
Total		490,200	885,320	313,900	735,700	213,040	439,560	144,040	465,520	454,610	490,780	**4,632,670**

Table 4-22 Net benefit of fishery of villagers in the study area

No.	Name of village	Total Samples	Fishery yields (kg/year)	Average fishery Yields (kg/household/year)	Total value of fishery products (baht/year)	Average value of fishery products (baht/household/year)
1	Tha bo song khram	26	20,255	779	490,200	18,854
2	Don dang	45	21,695	489	885,320	19,674
3	Ban khae	28	11,280	403	313,900	11,211
4	Pak yam	26	24,160	1,704	735,700	28,296
5	Yang ngoi	24	7,630	318	213,040	8,877
6	Dong nong bua	20	11,838	592	439,560	21,978
7	Tha kong	20	4,508	225	144,040	7,202
8	Had pang	24	12,946	539	465,520	19,397
9	Kham hai	24	11,423	482	454,610	18,942
10	Ban oun	24	15,932	664	490,780	20,449
	TOTAL	**261**	**162,283**	**622**	**4,632,670**	**17,750**

It has been (Table 4-21) found that total fishery yields of villagers in the study area were 162,283 kilogram per year. Fishery yields of Pak Yam village are the highest at 24,160 kilogram per year or an average of 1,704 kilogram per household per year. The lowest fishery yields of villages in the study area are 4,508 kilogram per year or an average of 225 kilogram per household per year for Tha Kong village.

In case of Pak yam village, they have high fishery yields because the location of village that has two streams flowing through the village and hence is rich in fishery resource. Pak Yam's villagers also have the commercial fishing gears with high potential for large amount of catch but they have high investment too.

4.4.2 Value of fishery

The total value of fishery from 10 villages is shown in Table 4-21. The net benefits of fishery are including fresh, fermented fish and other aquatic animals. Calculation of value of fishery followed "Economic Valuation of Wetlands" studied by Barbier (1997) as presented in Chapter 3.

The total value of fishery was 4,632,670 baht per year. The highest values of fishery of villages in the study area are Don Dang village at 885,320 baht per year and the lowest is Tha Kong village at 144,040 baht per year (Table 4-21).

The total value of fishery from 10 villages is shown in Table 4-21 and has total value of 4,632,670 baht per year. This study estimate benefit of fishery products from local people utilization or small scale fishing. Therefore, commercial fishing as the fishing auction system shall be not considered.

Generally, there are fishing auction system in the study area. The fishing auction system begins led about June untill December every year. The process of auction was control by village's committee. The committee wolud fix an initial price of swamp and announce the compititor to tender the bid. The bidder who offers the highest price would get exclusive fishing right in community's swamp. The village's committee takes the money from the bid for developing their village.

- The fishing auction of Ka San swamp in Had Pang village is just one example. An area of Ka San swamp is about 10 rai. The highest bid was 3,000 bahts and they had the right to fish from June untill December last year. After that period, other villagers can fish at the swamp as usual.

Figure 4-17 Had Pang's villagers fishing from Ka San swamp

The estimated value of non timber forest products and fishery products, that shown in Table 4-1 to 4-21 and summarized in Table 4-22, was estimated from the information obtained from 261 samples of 10 villages in the study area. The information received was used to estimate the total value of seasonally flooded forest in form of the direct use value from fishery and non timber forest products.

Table 4-23 The value of fishery and non timber forest products of 10 villages in the study area

No.	Name of village	Total Samples	Total value of fishery products (baht/year)	Total value of non timber forest products (baht/year)	Total value of non timber forest products and fishery products (baht/year)	Average value of non timber forest products and fishery products (baht/household/year)
1	Tha bo song khram	26	490,200	372,140	862,340	33,167
2	Don dang	45	885,320	1,037,127	1,922,447	42,721
3	Ban khae	28	313,900	655,639	969,539	34,626
4	Pak yam	26	735,700	504,539	1,240,239	47,702
5	Yang ngoi	24	213,040	325,743	538,783	22,449
6	Dong nong bua	20	439,560	353,465	793,025	39,651
7	Tha kong	20	144,040	417,849	561,889	28,094
8	Had pang	24	465,520	579,572	1,045,092	43,546
9	Kham hai	24	454,610	317,606	772,216	32,176
10	Ban oun	24	490,780	826,926	1,317,706	54,904
TOTAL		**261**	**4,632,670**	**5,390,606**	**10,023,276**	**38,403**

Table 4-22 shows about the total value and the average value of fishery and non timber forest products of 10 villages in the study area. The total value of fishery and non timber forest products of Don Dang village is the highest that is 1,922,447 baht per year and the lowest value is 538,783 baht per year at Yang Ngoi.

The total value of Don Dang village is the highest value because number of sample of Don Dang village is the highest too. The village with the lowest value of non timber forest products and fishery products is Yang ngoi village because it is closed to an urban area and the villager of Yang ngoi has a variety of occupation that reduce the opportunity for collecting non timber forest products and fishery products. However, an average value of non timber forest products and fishery products per household is not much different.

As a result the average value of fishery and non timber forest products is 38,403 baht per household per year. According to the result of this study, the direct use value of seasonally flooded forest which utilized by local people indicates the importance of seasonally flooded forest for local people's livelihood. At the present, the value of natural resources was excluding from average income of people because there is no information concerned the value of this resources. But it is clearly valuable for local people because it is the major source of their consumption and revenue.

4.5 Total valuation of fishery products and non timber forest products

According to Table 4-22, the value of fishery products are 4,632,670 baht and non timber forest product are 5,390,606 baht. The total annual value of fishery products and non timber forest products of seasonally flooded forest of 261 husehold is therefore equal to 10,023,276 baht. The result of this study shows that the value of non timber forest products is more than the value of fishery products because the cost of collecting non timber forest products is quite negligible due to the tool for harvesting non timber forest products are regular equipments in the household. The cost of fishing includes depreciation of boat and fishing gear and maintenance and is also not very high, but compared to the former, it is not insignificant. On the other hand, the value of non timber forest products was higher than fishery products owing to variety of non timber forest products.

Table 4-24 Total value of fishery and non timber forest products from seasonally flooded forest in the study area

Type	Value (baht)
Non timber forest products value	
-Wild vegetable plants value	354,540
-Edible mushrooms value	1,820,600
-Bamboo shoots value	421,560
-Firewood value	523,473
-Fodder value	1,915,204
-Edible insects and ant eggs value	355,228
Fishery products value	4,632,670
TOTAL	**10,023,276**

Table 4-23 shows total value of fishery products and non timber forest products from seasonally flooded forest in the study area at 10,023,276 baht per year. This value was estimated from the direct use value of seasonally flooded forest from 261 samples of 10 villages in the study area.

According to the result of Department of Environmental Quality Promotion in the Mun River Basin, the total economic value of seasonally flooded forest in the Mun River Basin, 14,239,637 baht per year (366 households), is more than in the Lower Songkhram River Basin because sample size is more than in this study and this study does not include the value of agriculture products. The average economic value of seasonally flooded forest in the Mun River Basin of 38,906 baht per household per year showed that it is quite close to the average value in the Lower Songkhram which is 38,403 baht per household per year.

When comparing non timber forest products value of seasonally flooded forest in the Lower Songkhram River Basin (5,390,606 baht) with non timber forest products value of Thongphaphum Teak Plantation (1,150,000 baht/year) (Charoenporn, 2003), it was found that the value of non timber forest products of seasonally flooded forest in the Lower Songkhram River Basin is more than in Thongphaphum Teak Plantation because non timber forest products in plantation are not as rich in variety as in seasonally flooded forest.

CHAPTER V
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study of valuation of fishery and non timber forest products of seasonally flooded in the Lower Songkhram River Basin, Nakhon Phanom aim to estimate the direct use value of fishery products and non timber forest products from seasonally flooded forest: a case study of Lower Songkhram River Basin, Nakhon Phanom Province, which is crucial in the management of seasonally flooded forest in the area of Songkhram River. Because the fishery products and non timber forest products is major source for household consumption and sale of villagers on the Lower Songkhram River Basin. The population samples are randomly selected by quota sampling about 20 percent of total household from 10 villages in the study area. The studied village is distributed in 5 sub-district closed to Songkhram River and seasonally flooded forest. Number of samples on this study are 261 samples from 1,254 households of 10 villages in the study area.

The researcher used market price method for estimating the direct use value of fishery and non timber forest products. Value of fishery and non timber forest products was calculated from amount of fishery and non timber forest products which harvested from seasonally flooded forest both for household consumption and sale. As a result of this study (table 4-20), the total value of non timber forest products of 261 households can be summarized as follow;

1) Value of wild vegetable plants is 354,540 baht per year.
2) Value of edible mushrooms is 1,820,600 baht per year.
3) Value of bamboo shoots is 421,560 baht per year.
4) Value of firewood is 523,473 baht per year.
5) Value of fodder is 1,915,204 baht per year.
6) Value of edible insects and ant eggs is 355,228 baht per year

The total value of non timber forest products which harvested from seasonally flooded forest of 261 households is about 5,390,600 baht per year and the total value of fishery products which harvested from seasonally flooded forest is about 4,632,670 baht per year. Total value of fishery and non timber forest products of seasonally flooded in the Lower Songkhram River Basin for 261 households is about 10,023,276 baht per year.

5.2 Recommendations

5.2.1 Policy recommendations

1. According to the result of this studied it quite clear for important the seasonally flooded forest to local people in term of generating implicit revenue for local people about 41,167 baht per household per year with almost no cost. Therefore, an option to maintain their source of revenue is to formulate community's forest scheme by own community for conserving seasonally flooded forest.

2. A policy to conserve seasonally flooded forest by educating the public should be formulated, especially the children about the importance and value of seasonally flooded forest to their life. Moreover, the negative impacts that we are facing now, they create lots of damages and effected on their source of food and income.

3. The worth, importance and utilization of seasonally flooded forest should be added in the local curriculum for the student in local area.

4. Tambon Administrative Organization could allocate suitable amount of budget for establishing strategy for sustainable seasonally flooded forests usage and management.

5.2.2 Recommendation for further study

1. This research is a survey research which does not focus on socio economic characteristics of population samples. Therefore, the further study could investigate about the characteristics of population samples in order to find the different of value of fishery and non timber forest products in each village.

2. Participatory Rural Appraisal (PRA) technique should be adapted along with questionnaire for completion of data collection.

3. Total value of fishery products for this study was not included value of commercial fishing such as the bidding of community's swamp or some fishing which use the commercial fishing gear. Therefore, the commercial value should be investigated.

4. This research was done exclusively on only non timber forest products and fishery products from seasonally flooded forest. Therefore, other benefits of seasonally flooded forest should be further investigated.

5.3 Limitation of study

1. Secondary data of this study was limited because seasonally flooded forest received less attention than other resources and this forest not to be well known so few people were interested in studying about seasonally flooded forest.

2. The villagers have to daytime working therefore the researcher has to collect data only nighttime.

3. At the early of data collection, the one of obstacles is local language that is so difficult to understand.

4. Questionnaire is a tool of this study which cannot collect some detailed data. However, the researcher spent almost one year in the study area and has opportunity to do some follow up to obtain necessary information.

5. Some period of data collection is covered the harvesting season that is inconvenient for data collection.

6. Some species of plants are unable to identify common name and scientific name so local name has to be used instead.

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APPENDIX

APPENDIX A

Table A-1 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005)

Number	Local Name(Thai Name)	Scientific Name
1	ต้นคอนผึ้ง	X
2	ต้นขาไก่	*Sericocalyx schomburgkii* Brem.
3	ต้นคอนทอย	X
4	ต้นหวดค่า	X
5	ต้นส่านทาม	X
6	ต้นส่านใหญ่	X
7	ต้นเป้าทาม	X
8	ต้นเป้าโคก	X
9	ต้นเม่าขี้มด	X
10	ต้นจินจ้ำ	X
11	ต้นตีนเป็ด (พญาสัตบรรณ)	*Alstonia scholaris*
12	ต้นตูมกา	*Strychnos nux-vomica* Linn.
13	ต้นเหมือดใหญ่	*Helicia robusta* R.Br.ex.Wall.
14	ต้นเหมือดขน	*Aporosa villosa*
15	ต้นก้ามปู(จามจุรี)	*Samanea saman* Merr.
16	ต้นกุ่ม	*Crateva magna* DC.
17	ต้นเอื้อง(เอื้องหมายนา)	*Costus speciosus* (Koen.) J.E. Smith
18	ต้นลุกพุก	X
19	ต้นเลือดดัง	X
20	ต้นโสน	X
21	ต้นหว้าจ่อย	X
22	ต้นเบือกขี้	X
23	ต้นมะเดื่อปล้อง	*Ficus hispida* Linn. f.
24	ต้นสะมัด(ชะมัด,สะมัดน้อย)	*Micromelum glanduliferum* B.Hansen.
25	ต้นแกใหญ่	X
26	ต้นแกดำ	X
27	ต้นมะเดื่อ	*Ficus racemosa* Linn
28	ต้นหงอนไก่	*Cnestis palala* Merr.

Table A-1 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

Number	Local Name(Thai Name)	Scientific Name
29	ต้นยาง	Diptero carpus spp.
30	ต้นแคน(ตะเคียน)	X
31	ต้นดู่	X
32	ต้นตะนา	X
33	ต้นคัดเค้า	*Randia siamensis* Craib
34	ต้นบ่งนั่ง	X
35	ต้นเหมือดกุ้ง	X
36	ต้นพุ่มค้า	X
37	ต้นมุ่งมัง	X
38	ต้นตะไก้ (ตาไก้)	*Salacia chinensis* L.
39	ต้นตะกวง	X
40	ต้นขี้เหล็กทาม	X
41	ต้นเปือยหนาม	X
42	ต้นกระโดนน้ำ	*Barringtonea acutangula* (Linn.)
43	ต้นหนามกะทิ้ง	X
44	ต้นกะยอม (พะยอม)	*Shorea roxburghii* G.Don.
45	ต้นสะแบง	*Dipterocarpus intricatus.*
46	ต้นเสียว	X
47	ต้นกะโดนโคก (กระโดนโคก)	*Careya sphaerica* Roxb.
48	ต้นเม่า	*Syzygium grandis* Wight
49	ต้นผีผ่วน	*Uvaria pierrei* Finet & Gagnep.
50	ต้นเปือยล้าน	X
51	ไผ่ป่า (ไผ่หนาม)	*Bambusa bambos* (L.) Voss.
52	ต้นมะเฟืองน้ำ	X
53	ต้นแซง	X
54	กอใคร้ใหญ่	X
55	ต้นหว้าขี้มด (แดงกล้วย)	*Acmena pblyantha* Merr. Perry.
56	ต้นปอทาม	X
57	ต้นหนามแท่ง	*Cartunaregam spathulifolia* Triveng
58	ต้นกระสิน	X

Table A-3 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

Number	Local Name(Thai Name)	Scientific Name
59	ต้นกระเบา	*Hydnocarpus anthelminthicus*
60	ไผ่กะซะ	*X*
61	ผักหนอกใหญ่(ผักหนอก)	*Hydrocotyle javanica* Thunb.
62	ผักหนอกชาย(ผักหนอก)	*Hydrocotyle javanica* Thunb.
63	ผักไช่ทาม	*X*
64	บัวแดง	*Nymphaea lotus* Linn.
65	ผักปอด	*Sphenoclea zeylanica* Gaertn.
66	ผักปังน้ำ(ผักปลัง)	*Basella alba* Linn.
67	ผักบุ้ง	*Ipomoea aquatica* Forsk.
68	ผักกะเฉดทาม(ผักกระเฉด)	*Neptunia oleracea* Lour.
69	ผักแพรว	*Heliotropium indicum* L.
70	ผักแขยง	*Limnophila aromatica* Merr.
71	ผักขมขี้ปลา	X
72	กะจับน้ำ	X
73	ผักกาดฮอง	X
74	ผักแพงพวย	*Jussiaea repens* Linn.
75	ผักกะน่องม้า(ตับเต่า)	*Sagittalia guayanensis* Humb.
76	ผักพายใหญ่	*X*
77	ผักอีฮีน(ผักขาเขียด)	*Monochoria vaginalis* (Burmf.) Presl
78	ผักตังโอ๋	*Chrysanthemum coronarium* Linn.
79	บับแบ้	X
80	ผักเกล็ดหอย	X
81	ผักขี้ส้ม	X
82	ผักไฮไก่	X
83	ผักขี้บ่อ	X
84	ผักกะเตียวเฟือง	X
85	ผักแว่น	*Oxalis corniculata* Linn.
86	ผักสายไหม	X
87	ผักขี้หอย	X
88	ผักหัวเหลือง	X
89	ผักบ้วง(ตำนินทอง)	*X*
90	หัวกะบุก	*X*

Table A-4 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

Number	Local Name(Thai Name)	Scientific Name
91	ผักกระเจียวใหญ่	X
92	ผักก้านจอง(ตาลปัตรฤาษี)	*Limnocharis flava* (L.) Buchenau
93	เทา	X
94	ผักกระเจียวเล็ก	X
95	ผักด่างขม	X
96	ผักตีนฮุง	X
97	ผักอีแป๊ะ	X
98	เครือหมากเก็บ	X
99	เครือคันจาง	X
100	เครือขี้กา	X
101	เครือจี้จ้อ	X
102	เครือกะแด้ง	X
103	เครือตาปลา	*Derris thorelii* Craib
104	หวายน้ำ	*Calamus godefroyi* Becc
105	เล็บแมว(หนามเล็บแมว)	*Zizyphus oenoplia* var.brunoniana TardieuMill.
106	เครือซูดใบเล็ก	X
107	เครือซูดใบใหญ่	X
108	เครือบีเอี่ยนทาม	X
109	เครือกูดน้อย	X
110	เครือกูดแดง	X
111	เครือกูดง่องแง่ง	X
112	เครือไพสง	X
113	เครือพายถงน้อย	X
114	เครือนมวัว	X
115	หนามขี้แฮด	X
116	เครือข้างควาย	X
117	เครือซีช้าง	X
118	เครือหุน	X
119	เครือหมาว้อ	X
120	ครืออำไอ	X
121	เสียวน้ำ	*Phyllanthus taxodiifolius* Beille

Table A-5 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

Number	Local Name(Thai Name)	Scientific Name
122	เครือขี้อ้นทาม	X
123	เครือญ่านาง	X
124	เครือตดหมา	X
125	เครือเบ็ญน้ำ	X
126	เครือเขาแกลบ	X
127	เครือตาดิบ	X
128	เครือหมากยาง	X
129	เครือหางนาค	X
130	เครือเขือง	X
131	เครือเขาปอก	X
132	เครือถอบแถบ	X
133	เครือจาน	X
134	เครือหนามคอม	X
135	เครือสะข่างน้ำ	X
136	ผือนา	X
137	หญ้าหนวดแมว	*Bulbostylis barbata* Clarke
138	หญ้าแฝกทาม	*Themeda triandra* Forsk.
139	หญ้าไผ่	X
140	ผือฮังกา	X
141	ต้นเงี่ยงปลาดุก	*Canthium berberidifolium* Geddes.
142	ญอเตี้ย	X
143	ต้นพังคี	X
144	ต้นชายชู้	X
145	ต้นข้าวจี่	X
146	ต้นต้อนแต้น	X
147	ต้นขี้ควายเทวทัต	X
148	หนามลิงญอก	X
149	ต้นกากะเลา(อินทนิลบก)	*Lagerstroemia microcapa* Wall.
150	เครือใส้ตัน	X
151	ขี้ไฟนกขุ่ม	X
152	เครือหมาน้อย	X

Table A-6 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

Number	Local Name(Thai Name)	Scientific Name
153	เครือลิ้นแฮด	*X*
154	ผักโฮบเฮบ	*Ottlia alismoides*
155	ต้นซาด	*X*
156	เห็ดขี้ควาย	*Psilocybe cubensis* Sing
157	เห็ดญอ	*X*
158	เห็ดซื่นโดน	*X*
159	เห็ดไค	*X*
160	เห็ดไผ่	*Lentinus infundibuliformis*
161	เห็ดตีนแฮด(เห็ดตีนแรด,เห็ดตับเต่าขาว)	*Macrocybe crassa* (Beak)
162	เห็ดขาว	*Lentinus squrrosulus*
163	เห็ดตั่น	X
164	เห็ดหัวหญ้า	X
165	เห็ดคอนกอง	X
166	เห็ดปลวกตาบนกกี้	*X*
167	เห็ดบด(เห็ดลม,เห็ดกระด้าง)	*X*
168	เห็ดทา	*X*
169	เห็ดแทด	X
170	เห็ดผึ้งทาม	*X*
171	เห็ดปลวกไก่น้อย	*X*
172	เห็ดละโงก	*Amanita vaginata*
173	ต้นหมี่(กะทัง)	*Litsea monopetala* (Roxb.) Pers.
174	ต้นโมกเตี้ย(พุดน้ำ)	*Holarrhena curtksii* King & Gamble
175	ต้นโมกใหญ่	*Holarrhena antidysenterica* Wall.
176	ต้นเขทาม	*X*
177	ต้นอินถวา(พุดซ้อน)	*Gardenia augusta*
178	ต้นเหมือดแอ่(พลองขี้ใต้)	*Memecylon pauciflorum* Blume
179	ต้นแสง	*X*
180	ต้นกล้วยน้อย	*Xylopia vielana* Pierre
181	ต้นข่อยทาม	*X*
182	ต้นทม	*X*
183	ต้นหมากแซว(มะกอกน้ำ)	*Elaeocarpus hygrophilus* Kurz.

Table A-7 List of plant and mushroom species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

Number	Local Name(Thai Name)	Scientific Name
184	ต้นส้มกุ้ง	*Begonice sp.*
185	ต้นก้างป่า	X
186	ต้นเข็มขาว(เข็มใหญ่)	*Ixora finlaysoniana* Wall.
187	ต้นหมากหนอด	X
188	ต้นหูลิง	*Hymenocardia wallichii*
189	ต้นคางฮุง(คาง)	*Albizia lebbekioides* Benth.
190	ต้นกางของ	X
191	ต้นไฮ	X
192	ต้นมะดัน	*Garcinia schomburgkiana* Pierre.
193	ต้นส้มป่อย	*Acacia rugata* Merr.
194	ต้นเมี๊ก	*Eugenia grata* Wight var. collinsae Craib
195	ต้นซี	X
196	ต้นสบู่(สบู่ดำ)	*Jatropha curcus* Linn.
197	ต้นแฮ่	X
198	ต้นเซี่ยนผี	X
199	ต้นมันป่า	X
200	ต้นกะโดนเบี้ย(กระโดนดิน,กระโดนเบี้ย)	*Careya herbacea* Roxb.
201	ต้นก่าม(กุ่มบก)	*Crateva adansonii* DC.ssp. trifoliata (Roxb.) Jacobs
202	ต้นจาน(ทองกวาว)	*Butea monosperma* Kuntze.
203	ต้นติ้ว	*Cratoxylum formosum* (Jack) Dyer ssp.
204	ต้นเบ็ญอ้า	X
205	ต้นญอ	X
206	ต้นคูณ(ต้นราชพฤกษ์)	*Cassia fistula* L.

X = Scientific name is not known.

APPENDIX B

Table B-1 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005)

No.	Local name	Common name	English name	Scientific name
1	ปลากั้ง	ปลากั๊ง	Dwarf snakehead	*Channa limbata* (Cuvier)
2	ปลากดเผือก	ปลากดคัง,ปลากดแก้ว	Red-tail catfish	*Hemibagrus wyckioides*
3	ปลากดหม้อ	ปลากดคัง,ปลากดแก้ว	Black catfish	*Hemibagrus sp.*
4	ปลากดเหลือง	ปลากดขี้ลิง	Golden catfish	Hemibagrus aff. Nemurusn(Val.in Cuv.&Val.)
5	ปลากัดจีน		Long-tail Siamese fighting fish	*Betta splendens var.*(Regan)
6	ปลากัดสั้ว	ปลากัดอีสาน	Korat fighting fish	*Betta smaragdina* Ladiges
7	ปลากัดหม้อ		Short-tail Siamese fighting fish	*Betta splendens* (Regan)
8	ปลากุ่ม	ปลาสร้อยเกล็ดถี่	Tiny scale barb	*Thynnichthys thynnoides* (Bleeker)
9	ปลากระแด้ง	ปลาดอกงิ้ว, ใส้ตันตาขาว	White sensoryline barb	*Cyclocheilichthys repasson* (Bleeker)
10	ปลากระเดิด	ปลากระดี่หม้อ	Three-spotted gouramy	*Trichogaster trichopterus* (Pallas)
11	ปลากระแดบกลม	ปลาแปบ	Silver knife barb	*Paralaubuca riveroi* (Fowler, 1935)
12	ปลากระแดบคีงบาง	ปลาแปบ	Glass Asian hatchet	*Parachela cf oxygastroides* (Bleeker)
13	ปลากะมัน	ปลากระโห้	Giant barb	*Catlocarpio siamensis* Boulenger
14	ปลากวง	ปลาม้า	Freshwater drum fish	*Bosemania microlepis* (Bleeker)
15	ปลาก้วน	ปลาช่อนข้าหลวงแม่น้ำโขง	Mekong cobra snakehead	*Channa aff. Marulia* (Hamilton)
16	ปลากอก	-	-	X
17	ปลาก่า	ปลาหมอช้างเหยียบ	Compress climbing perch	*Pristolepis fasciatus* (Bleeker)
18	ปลาแก้ง	ปลากะมัง	Long adipose mystus	*Mystus singaringan* (Bleeker)

Table B-2 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

No.	Local name	Common name	English name	Scientific name
19	ปลาแกด	ปลาแดง, ปลาเนื้ออ่อน	Southeast asian striped mystus	*Mystus mysticetus* Roberts
20	ปลาเกาะ	ปลาน้ำผึ้ง	Green snakehead	*Channa striata* (Bloch)
21	ปลาแกง	ปลาสร้อยน้ำเงิน	Chinese mud carb	*Cirrhinus molitorella* (Val.)
22	ปลาขบ	ปลาเบี้ยว	Hook-teeth sheathfish	*Belodontichthys truncates* (Kottelat & Ng)
23	ปลาข้างลาย	ปลาร่องไม้ตับ	Black striped robust Labeo	*Osteochilus microcephalus* (Val.)
24	ปลาขี้โก๊ะ	ปลากาแดง	Red-fin shark	*Epalzeorhynchos frenatus* (Fowler)
25	ปลาขี้เหี่ย	ปลาแขยงหิน	Bumble bee catfish	*Pseudomystus siamensis* (Fowler)
26	ปลาขง	ปลาหมอ	Climbing perch	*Anabas testudineus* (Bloch)
27	ปลาแขยงโค	ปลาแขยงใบข้าว	Long adipose msytus	*Mystus singaringan* (Bleeker)
28	ปลาแขยงข้างลาย	ปลาแขยงข้างลาย	Southeast asian striped mystus	*Mystus mysticetus* (Roberts)
29	ปลาค่อ	ปลาช่อน	Green snakehead	*Channa striata* (Bloch)
30	ปลาคันทุง	ปลากะทุงเหว	High-fin mystus	*Xenentodon canciloides* (Bleeker)
31	ปลาคับของ	ปลาแป้นแก้ว	Siamese glass fish	*Parambassis siamensis* (Fowler)
32	ปลาค้าว	ปลาค้าขาว	Crocodile sheath fish	*Wallago attu* (Schneider)
33	ปลาคุยลามขาว	ปลาช่า	Striped long-fin labeo	*Labiobarbus leptocheilus* (Val.)
34	ปลาคุยลามแดง	ปลาช่า	Striped long-fin labeo	*Labiobarbus siamensis* (Sauvage)
35	ปลาคูน	ปลาค้าดำ	Giant black sheath-fish	*Wallago leeri* (Bleeker)
36	ปลาเคิง	ปลากดแก้ว	Red-tail bagrid	*Hemibargrus wyckioides* (Chaux & Fang)
37	ปลาแค้	ปลาแค้, ปลาตุ๊กแก	Crocodile Catfish	*Bagarius yarrelli* (Sykes)

Table B-3 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

No.	Local name	Common name	English name	Scientific name
38	ปลาแค้วไก่	ปลาหมูสัก, ปลาหมูขาว	Silver Botia	*Yasuhikotakia lecontei*
39	ปลาจาด ข้างลาย	ตะเพียนลาย	Siamese tiger barb	*Systomus partipentazona* (Fowler)
40	ปลาจีน	ปลาลิ่น, ปลาเกล็ดเงิน	Silver scale Chinese barb	*Hypophthalmichthys nobilis* (Richardson)
41	ปลาโจก	ปลาตะโกก	Giant sensory line barb	*Cyclocheilichthys enoplos* (Bleeker)
42	ปลาชะนาด	ปลาสะนาก, ปลานางอ้าว, ปลาดอกนาก	Trout barb	*Raiamas guttatus* (Day)
43	ปลาชวย	ปลาสวาย	Irridescent shark catfish	*Pangasisnodon hypophthalmus* (Sauvage)
44	ปลาชิว ข้างลาย	ปลาขี้โก๋, ปลาเล็บมือนาง	Mekong algae eater	*Crossocheilus atrilimes* (Kottelat)
45	ปลาชิวท้องคม	ปลาชิวควาย	Silver rasbora	*Rasbora cf myersi* Brittan
46	ปลาชิวหางแดง	ปลาชิวหางแดง	Red-tail rasbora	*Rasbora borapetensis* Smith
47	ปลาเซือมจุด	ปลาชะโอน	Black-ear sheathfish	*Ompok siluroides* (Lecepede)
48	ปลาเซือมเลา	ปลาชะโอน	Black-ear sheathfish	*Ompok siluroides* (Lecepede) (female specimen)
49	ปลาดอกแก้ว	ปลาชิวแก้ว	Thai river sprat	*Clupeichthys aesarnensis* (Wongratana)
50	ปลาดาบลาว	ปลาท้องพลุ, ปลาฝักพร้า	Laotian sword barb	*Macrochirichirus* (Cuv & Val)
51	ปลาดุกนา	ปลาดุก	Walking catfish	*Clarias batrachus* (Linnaeus)
52	ปลาดุกยักษ์	ปลาดุกรัสเซีย	African walking catfish	*Clarias gariepinus* (Burchell)
53	ปลาดุกอุย	ปลาดุก	Broad-head walking catfish	*Clarias macrocephalus* Gunther
54	ปลาดุกเอื่น	ปลาดุก	Walking catfish	*Clarias cf batrachus*
55	ปลาโค	ปลาชะโด, ปลาแมลงภู่, ปลาอ้ายป๊อก	Giant snake-head	*Channa micropeltes* (Cuv.in Cuv.&Val.)
56	ปลาตองกราย	ปลากราย	Clown featherback	*Chitala ornate* (Gray)

Table B-4 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

No.	Local name	Common name	English name	Scientific name
57	ปลาตองแนบ	ปลาฉลาด	Bronze featherback	*Notopterus notopterus* (Pallas)
58	ปลาตองลาย	ปลาตองลาย	Royal featherback	*Chitala blanci* (Aubenton)
59	ปลาตาโป่	ปลาตามิน	Bigeye barb	*Amblyrhynichthys truncates* (Bleeker)
60	ปลานกเขา	ปลาสร้อยนกเขา	Black ear robust labeo	*Osteochilus melanopleura* (Bleeker)
61	ปลา นวลจันทร์	ปลานวลจันทร์เทศ	Mrigal	*Cirrhinus mrigala* (Hamilton)
62	ปลานาง	ปลาแดง, ปลาเนื้ออ่อน	Blue Sheathfish	*Micronema bleekeri* (Gunther)
63	ปลานิล	ปลานิล	Nile tilapia	*Oreochromis niloticus* (Linneas)
64	ปลาไน	ปลาไน	Common carp	*Cyprinus carpio* (Linneas)
65	ปลาบึก	ปลาบึก	Giant Mekong catfish	*Pangasianodon gigas* Chevey
66	ปลาบู่	ปลาบู่ทราย	Marble sleeper goby	*Oxyeleotris marmorata* Bleeker
67	ปลาปก	ปลาแก้มช้ำ	Reed cheek barb	*Systomus orphoides* (Val.)
68	ปลาปึกไก่	ปลาดอกบัว, ปลาเพียว	Chevey's sheathfish	*Kryptopterus cheveyi* Durand
69	ปลาปาก	ปลาตะเพียนขาว	Java barb	*Barbonymus gonionotus* (Bleeker)
70	ปลาปากบาน	ปลาตะกาก	Fringe lip river barb	*Cosmocheilus hardmandi* (Sauvage)
71	ปลาปาก หนวด	ปลาตะพาก	Malcom's barb	*Hypsibarbus malcolmi* (Smith)
72	ปลาป่าน	ปลาลิ้นหมา	Ovate sole	*Brachirus harmandi* (Sauvage)
73	ปลาปักเป้า ควาย	ปลาปักเป้าสุวัตถิ	Suvatti's puffer	*Monotrete suvatti* (Sontirat & Soonthornsatit)
74	ปลาปักเป้า ทอง	ปักเป้าเขียว	Golden puffer	*Auriglobus nefastus* (Roberts)
75	ปลาเผาะ	ปลายาง, ปลาหัวม่วม, อ้ายด้อง	Bocourt's shark catfish	*Pangasius bocourti* (Sauvage)

Table B-5 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

No.	Local name	Common name	English name	Scientific name
76	ปลาฝาออง			
77	ปลาฝาไล	ปลากะเบนลาว	Mekong stingray	*Dasyatis laosensis* (Robert & Karnasuta)
78	ปลาพอน	ปลายี่สกเทศ	Rohu	*Labeo rohita* (Hamilton)
79	ปลาพันทราย	ปลารากกล้วย, ปลากล้วย	Horse-face loach	*Acanthopsis sp.*
80	ปลาโพง	ปลาบ้า	Giant red-tail barb	*Leptobarbus hoevenii* (Bleeker)
81	ปลาแมว	ปลาแมวหูดำ	Freshwater anchovy	*Setipinna melanochir* (Bleeker)
82	ปลายอนข้างลาย	ปลาสังกะวาดเหลือง	Long-barbel shark catfish	*Pangasius macronema* Bleeker
83	ปลายอนขี้หนอน	ปลาสังกะวาด	Flat-barbel shark catfish	*Laides longibarbis* (Fowler)
84	ปลายอยคึงบาง	ปลาสังกะวาด	Flat-barbel shark catfish	*Laides longibarbis* (Fowler)
85	ปลายอนชวย	ปลาสวายหนู, ปลาหนู, ปลาหอย	Mouse-face shark catfish	*Helicophagus leptorhynchus* Ng & Kottelat
86	ปลายอยท้องคม	ปลาสังกะวาดท้องสัน	Big-eye shark catfish	*Pangasius pleurotaenia* (Sauvage)
87	ปลายาง	ปลาผอ	Snail-eater shark catfish	*Pangasius conchophilus* (Roberts & Vidthayanon)
88	ปลายี่สก	ปลายี่สกเทศ	Rohu	*Labeo rohita* (Hamilton)
89	ปลาเลิม	ปลาเทพา	Sanitwong's shark catfish	*Pangasius sanitwongsei* Smith
90	ปลาเวียนไฟ	ปลาตะเพียนทอง, ปลาตะเพียนหางแดง	Golden barb	*Barbonymus altus* (Gunther)
91	ปลาสลิด	ปลาใบไม้	Snake skin gouramy	*Trichogaster pectoralis* (Regan)
92	ปลาสบโพง	ปลากะทุงเหว	Asian gar	*Xenentodon canciloides* (Bleeker)
93	ปลาสร้อยหัวแข็ง	ปลาสร้อย	Common Siamese barb	*Henicorhynchus siamensis* (Sauvage)
94	ปลาสร้อยหัวมน	ปลาสร้อย	Red-fin Siamese barb	*Henicorhynchus ornatipinnis* (Roberts)

Table B-6 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

No.	Local name	Common name	English name	Scientific name
95	ปลาสะงั่ว	ปลาดังแดง, ปลาเจ็ก	Mekong sheathfish	*Hemisilurus mekongensis* Bornbursh & Lundberg
96	ปลาสูดขาว	ปลากระสูบขีด	Banded wolf barb	*Hampala macrolepidota* Van Hasselt
97	ปลาสูดจุด	ปลากระสูดจุด	Spotted wolf barb	*Hampala dispar* Smith
98	ปลาเสือตอ	ปลาเสือ, ปลาลาด	Siamese Tiger fish	*Datnioides pulcher* Kottelat
99	ปลาเสือลาย	ปลาเสือตอลายเล็ก	Mekong tiger fish	*Datnioides undecimradiatus* Roberts & Kottelat
100	ปลาหน้าหมอง	ปลาสร้อยนกเขาหน้าหมอง	Lin's robust labeo	*Osteochilus lini* Fowler
101	ปลาหูหมาด	ปลาเทโพ	Black-ear shark catfish	*Pangasius larnaudii* Boucourt
102	ปลาหนู	ปลาหอย, ปลาสวายหนู	Mouse-face shark catfish	*Helicophagus leptorhynchus* Ng
103	ปลาหมู	ปลาหมูหางแดง, ปลาหมูขาว	Red-fin Botia	*Yasuhikotakia modesta* Bleeker
104	ปลาหมูกี้	ปลาหมูหางแดง, ปลาหมูขาว	Red-fin Botia	*Yasuhikotakia modesta* Bleeker
105	ปลาหมูพาย	ปลาหมูข้างลาย	Tiger botia	*Syncrossus helodes* Sauvage
106	ปลาหมูหางแดง	ปลาหมูขาว	Red-fin Botia	*Yasuhikotakia modesta* Bleeker
107	ปลาหลาด	ปลากะทิง	Zig-zag spiny eel	*Mastacembelus armatus* (Lecepede)
108	ปลาหม่อง	ปลาเสือพ่นน้ำ	Archerfish	*Toxotes microlepis* (Hamilton)
109	ปลาหมากบก	ปลาเสือดำ	Asian Leaf fish	*Nandus oxyrhynchus* Ng Vidthayanon and Ng
110	ปลาหมากผาง	ปลาหมากผาง	Mekong shad	*Tenualosa thibaudeaui* (Durand)
111	ปลาหลุดจุด	ปลาหลด	Peacock spiny eel	*Macrognathus siamensis* (Gunther)
112	ปลาหลดทราย	ปลาหลดหลังจุด	Ocellated spiny eel	*Macrognathus semiocellatus* Roberts
113	ปลาหลังขอ	ปลาหนามหลัง	Yellow tail-hook barb	*Mystacoleucus marginatus* (Val. In Cuv.&Val.)

Table B-7 List of fish species in the Lower Songkhram River Basin, (Thai Baan research: 2005) (Continued)

No.	Local name	Common name	English name	Scientific name
114	ปลาหมัด	ปลากริมสี	Mekong croaking gouramy	*Trichopsis schalleri* (Ladiges)
115	ปลาหว้า	ปลาสร้อยบัว	Thick lip labeo	*Labeo pierrei* (Sauvage)
116	ปลาหางพร้า	ปลาฝักพร้า	Laotain sword barb	*Macrochirichthys macrochirus* (Valenciennes)
117	ปลาอีจน	ปลากระสง	Marble Snake-head	*Channa lucius* (Cuv & Val)
118	ปลาอีตู๋	ปลากาดำ	Crow labeo	*Morulius chrysophekadion* (Bleeker)
119	ปลาอีไท	ปลากะไท, ปลาสร้อยนกเขา	Red spotted robust labeo	*Osteochilus hasselti* (Val. in Cuv.&Val.)
120	ปลาอีดกลม	ปลาสายทอง	Hasselt's sand loach	*Lepidocephalichthys hasselti* (Val. in Cuv.&Val.)
121	ปลาเอิน	ปลายี่สก	Seven-line carp	*Probarbus jullieni* Sauvage
122	ปลาเอี่ยน	ปลาไหล	Swamp eel	*Monopterus albus* (Zieuw)
123	ปลาโอดโอ	ปลาดุกมูล, แขยงโค, ปลากดหมู	High-fin blunt nose catfish	*Bagrichthys majuscules* Ng

APPENDIX C

แบบสัมภาษณ์ครัวเรือน

เรื่อง การประเมินมูลค่าการประมงและผลิตภัณฑ์จากป่าของป่าบุ่งป่าทาม

กรณีศึกษาลุ่มแม่น้ำสงครามตอนล่าง จังหวัดนครพนม

ชุดที่ 1 การประเมินมูลค่าผลิตภัณฑ์จากป่า

แบบสอบถามนี้เป็นส่วนหนึ่งของวิทยานิพนธ์ของนายยงยุทธ ก้อนจันทร์เทศ นักศึกษาปริญญาโท สาขาเทคโนโลยีการบริหารสิ่งแวดล้อม คณะสิ่งแวดล้อมและทรัพยากรศาสตร์ มหาวิทยาลัยมหิดล

ผลิตภัณฑ์ที่สัมภาษณ์

O 1. เห็ดผึ้งทาบ	O 2. เห็ดปลวกดาบนกกี้	O 3. ไข่มดแดง
O 4. เห็ดไค	O 5. ไผ่กะซะ	O 6. ไผ่ป่า
O 7. มันแซง	O 8. ผักกระโดนน้ำ	O 9. ผักขี้บ่อ
O 10. ผักกะเม็ก	O 11. ผักติ้ว	O 12. เทาน้ำ
O 13.	O 14.	O 15.
O 16.	O 17.	O 18.
O 19.	O 20.	O 21.

ชื่อผู้ให้สัมภาษณ์ (นาย/นาง/นางสาว).....อายุ.....ปี

ชื่อบ้าน.....ที่อยู่เลขที่.....หมู่ที่.....

ตำบล.....อำเภอ.....จังหวัด.....

ชื่อผู้สัมภาษณ์.....

วันที่สัมภาษณ์.....

ข้อสังเกต.....

ส่วนที่ 1 ข้อมูลส่วนบุคคลและครัวเรือน

1) เพศ ( ) 0. ชาย ( ) 1. หญิง

2) อายุ.....ปี

3) สถานภาพ ( ) 0. โสด ( ) 1. สมรส ( ) 2. หม้าย/หย่าร้าง/แยกกันอยู่

4) ระดับการศึกษาสูงสุด

( ) 0. ไม่ได้เรียน/เรียนไม่จบ ป.4 ( ) 1. ประถมศึกษา

( ) 2. มัธยมศึกษาตอนต้น ( ) 3. มัธยมศึกาตอนปลาย/ เทียบเท่า

( ) 4. อนุปริญญา/เทียบเท่า ( ) 5. ปริญญาตรี

( ) 6. ปริญญาโทหรือสูงกว่า ( ) 7. อื่นๆ (ระบุ).....

5) จำนวนสมาชิกในครัวเรือน (รวมตัวท่านด้วย).....คน

6) ครอบครัวท่านอยู่อาศัยในหมู่บ้านแห่งนี้มา.....ปี

7) ท่านและครอบครัวประกอบอาชีพใดบ้าง (ตอบได้มากกว่า 1 ข้อ) และอาชีพใดเป็นอาชีพหลัก

( ) 0. เกษตรกรรม.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 1. รับราชการ.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 2. รับจ้าง.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 3. ค้าขาย.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 4. หาของป่า.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 5. เลี้ยงสัตว์.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 6. ประมง.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 7. ผลิตภัณฑ์แปรรูปจากการประมง.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

( ) 8. อื่นๆ.....รายได้เฉลี่ย.....บาท/เดือน/ปี(หลัก/รอง)

8) รายได้ของครัวเรือนที่ได้จากแหล่งอื่นๆ เช่น ลูก สามี หรือภรรยาส่งเงินมาให้จำนวน.....บาท/เดือน/ปี

9) รายได้หลักของครัวเรือนมาจากอาชีพใด.....

10) ค่าใช้จ่ายในการครองชีพและการประกอบอาชีพ

ประเภทของค่าใช้จ่าย	รายจ่าย (บาท/เดือน/ปี)	
	เป็นเงินสด	ไม่เป็นเงินสด
1. ค่าอาหาร		
1.1 ค่าข้าวสาร 1.2 ค่ากับข้าว		
2. ค่าเครื่องนุ่งห่ม		
3. ค่าใช้จ่ายเบ็ดเตล็ด		
4. ค่าน้ำ/ค่าไฟฟ้า		
5. ค่ารักษาพยาบาล		
6. ค่าการศึกษา		
7. ค่าเดินทาง		
8. ค่าพิธีกรรม (แต่งงาน/งานบวช/ทำบุญทางศาสนา/ทำบุญงานศพ)		
9. ค่าพิธีกรรม		
10. ค่าบันเทิง		
10.1 ท่องเที่ยว 10.2 ลอตเตอรี่ 10.3 อื่นๆ (ระบุ).....		
11. ใช้คืนเงินกู้ (เพื่อการผลิต/เพื่อการบริโภค) เงินต้น.....บาท อัตราดอกเบี้ย.....%		
12. อื่นๆ (ระบุ).....		
รวมทั้งสิ้น		

หมายเหตุ : การสอบถามอาจเป็นรายวัน รายสัปดาห์ หรือรายเดือน เพื่อใช้ในการคำนวณ

ส่วนที่ 2 ข้อมูลลักษณะทั่วไปของพื้นที่ป่าบุ่งป่าทามที่เก็บหาผลผลิต

1. สภาพป่าบริเวณที่เก็บผลผลิตเป็น ( ) ป่าสมบูรณ์..... ( ) ป่าที่ถูกรบกวน

2. บริเวณที่พบหรือเก็บมีน้ำท่วมทุกปีหรือไม่.....

3. ท่านทราบได้อย่างไรว่าของป่า (เห็ด, หน่อไม้ และอื่นๆ) จะออก.....

4. สภาพดินฟ้าอากาศมีส่วนกำหนดให้ท่านออกไปเก็บหาของป่าหรือไม่ อย่างไร.....

5. อุปกรณ์ที่ใช้ประกอบการเก็บหาผลผลิต (ระบุทุกชนิด) เช่น รถมอเตอร์ไซค์ มีด เสียม เป็นต้น

- อุปกรณ์ที่ใช้.....ราคาที่ซื้อมา.....บาท อายุการใช้งาน.....(เดือน/ปี)
- อุปกรณ์ที่ใช้.....ราคาที่ซื้อมา.....บาท อายุการใช้งาน.....(เดือน/ปี)
- อุปกรณ์ที่ใช้.....ราคาที่ซื้อมา.....บาท อายุการใช้งาน.....(เดือน/ปี)
- อุปกรณ์ที่ใช้.....ราคาที่ซื้อมา.....บาท อายุการใช้งาน.....(เดือน/ปี)

ส่วนที่ 3.ข้อมูลการใช้ประโยชน์ทรัพยากร (เพิ่มเติม) ในแต่ละปีท่านได้รับประโยชน์อะไรจากพื้นที่ป่าบ่งป่าทามโดยรอบของชุมชนของท่านบ้าง

1. พืชอาหาร

1.1 ผักและพืชอาหาร

ผลิตภัณฑ์	พื้นที่เก็บหา (ทาม ,โคก)	ระยะทางจากบ้าน (กม.)	ลักษณะการเกิด (ใต้ดิน, โคนต้นไม้)	เดือนที่เก็บหา	จำนวนครั้งที่เก็บหา (วัน/เดือน)	เวลาที่ใช้ในการเก็บหา (ชม./วัน)	ปริมาณที่เก็บได้ (กก./ครั้ง)	บริโภค (ร้อยละ) คิดเป็นกก.	ขาย (ร้อยละ) คิดเป็นกก.	สถานที่ที่นำผลผลิตไปขาย	ราคาขาย สด (บาท/กก.)	ลักษณะการแปรรูป	ค่าใช้จ่ายในการแปรรูป (ต่อกก.)	ราคาขายหลังแปรรูป (บาท)	หมายเหตุ

1.2 หน่อไม้และเห็ด

ผลิตภัณฑ์	พื้นที่เก็บหา (ทาม ,โคก)	ระยะทางจากบ้าน (กม.)	ลักษณะการเกิด (ใต้ดิน, โคนต้นไม้)	เดือนที่เก็บหา	จำนวนครั้งที่เก็บหา (วัน/เดือน)	เวลาที่ใช้ในการเก็บหา (ชม./วัน)	ปริมาณที่เก็บได้ (กก./ครั้ง)	บริโภค (ร้อยละ) คิดเป็นกก.	ขาย (ร้อยละ) คิดเป็นกก.	สถานที่ที่นำผลผลิตไปขาย	ราคาขายสด (บาท/กก.)	ลักษณะการแปรรูป	ค่าใช้จ่ายในการแปรรูป (ต่อกก.)	ราคาขายหลังแปรรูป (บาท)	หมายเหตุ

1.3 ผลไม้ป่า

ผลิตภัณฑ์	พื้นที่เก็บหา (ทาม ,โคก)	ระยะทางจากบ้าน (กม.)	ลักษณะการเกิด (ใต้ดิน, โคนต้นไม้)	เดือนที่เก็บหา	จำนวนครั้งที่เก็บหา (วัน/เดือน)	เวลาที่ใช้ในการเก็บหา (ชม./วัน)	ปริมาณที่เก็บได้ (กก./ครั้ง)	บริโภค (ร้อยละ) คิดเป็นกก.	ขาย (ร้อยละ) คิดเป็นกก.	สถานที่ที่นำผลผลิตไปขาย	ราคาขายสด (บาท/กก.)	ลักษณะการแปรรูป	ค่าใช้จ่ายในการแปรรูป (ต่อกก.)	ราคาขายหลังแปรรูป (บาท)	หมายเหตุ

1.4 พืชสมุนไพร

ผลิตภัณฑ์	พื้นที่เก็บหา (ทาม ,โคก)	ระยะทางจากบ้าน (กม.)	ลักษณะการเกิด (ใต้ดิน, โคนต้นไม้)	เดือนที่เก็บหา	จำนวนครั้งที่เก็บหา (วัน/เดือน)	เวลาที่ใช้ในการเก็บหา (ชม./วัน)	ปริมาณที่เก็บได้ (กก./ครั้ง)	บริโภค (ร้อยละ) คิดเป็นกก.	ขาย (ร้อยละ) คิดเป็นกก.	สถานที่ที่นำผลผลิตไปขาย	ราคาขายสด (บาท/กก.)	ลักษณะการแปรรูป	ค่าใช้จ่ายในการแปรรูป (ต่อกก.)	ราคาขายหลังแปรรูป (บาท)	หมายเหตุ

1.5 ไม้ฟืนและไม้ใช้สอยต่างๆ

ผลิตภัณฑ์	พื้นที่เก็บหา (ทาม,โคก)	ระยะทางจากบ้าน (กม.)	จำนวนครั้งที่เก็บหา (วัน/เดือน)	เวลาที่ใช้ในการเก็บหา (ชม./วัน)	ปริมาณที่เก็บ (กก./ครั้ง)	ปริมาณการใช้เชื้อเพลิง (หน่วย/ปี)	ลักษณะเชื้อเพลิงที่ใช้	ราคาเชื้อเพลิง (บาท/กก.)	หมายเหตุ

1.6 แมลงกินได้

ผลิตภัณฑ์	พื้นที่เก็บหา (ทาม,โคก)	ระยะทางจากบ้าน (กม.)	ลักษณะการเกิด (ใต้ดิน, โคนต้นไม้)	เดือนที่เก็บหา	จำนวนครั้งที่เก็บหา (วัน/เดือน)	เวลาที่ใช้ในการเก็บหา (ชม./วัน)	ปริมาณที่เก็บได้ (กก./ครั้ง)	บริโภค (ร้อยละ) คิดเป็นกก.	ขาย (ร้อยละ) คิดเป็นกก.	สถานที่ที่นำผลผลิตไปขาย	ราคาขายสด (บาท/กก.)	ลักษณะการแปรรูป	ค่าใช้จ่ายในการแปรรูป (ต่อกก.)	ราคาขายหลังแปรรูป (บาท)	หมายเหตุ

ชุดที่ 2 การประเมินมูลค่าการประมง

ส่วนที่ 1 ข้อมูลทั่วไปเกี่ยวกับการทำประมง

1) จุดที่ออกไปทำการประมงคือ..

2) ระยะห่างจากหมู่บ้าน..

3) ท่านออกไปทำประมงประมาณ.....................เดือน ช่วงเวลา.....................................ถึง..................................

เดือนละ...................................วัน ปีละ...วัน

4) ช่วงเดือนที่ทำประมงได้ผลดีที่สุด..

5) ช่วงเดือนที่ไม่ได้ทำประมง...เพราะ...

6) ช่วงเวลาในการทำประมง

- ( ) กลางวัน (8.01-18.00 น.) ตั้งแต่............................ถึง..........................เป็นเวลา..........................ชั่วโมง
- ( ) กลางคืน (18.01-8.00 น.) ตั้งแต่............................ถึง..........................เป็นเวลา..........................ชั่วโมง
- ( ) ทั้ง 2 ช่วงเวลา (ตลอด 24 ชั่วโมง) ตั้งแต่......................ถึง....................เป็นเวลา..........................ชั่วโมง

7) เครื่องมือที่ใช้ในการทำประมง

- เครื่องมือ..ช่วงเวลาที่ใช้...
  อายุการใช้งาน..ราคาของเครื่องมือ..
- เครื่องมือ..ช่วงเวลาที่ใช้...
  อายุการใช้งาน..ราคาของเครื่องมือ..
- เครื่องมือ..ช่วงเวลาที่ใช้...
  อายุการใช้งาน..ราคาของเครื่องมือ..
- เครื่องมือ..ช่วงเวลาที่ใช้...
  อายุการใช้งาน..ราคาของเครื่องมือ..
- เครื่องมือ..ช่วงเวลาที่ใช้...
  อายุการใช้งาน..ราคาของเครื่องมือ..
- เครื่องมือ..ช่วงเวลาที่ใช้...
  อายุการใช้งาน..ราคาของเครื่องมือ..

ส่วนที่ 2. ข้อมูลลักษณะและปริมาณการใช้ประโยชน์ทรัพยากรประมง

ชนิดปลาที่จับได้	[illegible]	[illegible]	จำนวน [illegible] (เดือน)	เวลาที่ใช้ (ชม./วัน)	ปริมาณที่ (กก./วัน)	บริโภค [illegible]กก.	ขาย [illegible]กก.	สถานที่ที่ ขาย	ราคาขาย [illegible] กก.)	[illegible]	การแปร [illegible] เป็นกก.	ค่าใช้จ่าย [illegible] กก.)	ราคาขาย [illegible] (บาท)	

APPENDIX D

Table D-1
Present Value of $1 Due at the End of n Periods

$$PVIF_{k,n} = \frac{1}{(1 + k)^n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486
21	.8114	.6598	.5375	.4388	.3589	.2942	.2415	.1987	.1637	.1351
22	.8034	.6468	.5219	.4220	.3418	.2775	.2257	.1839	.1502	.1228
23	.7954	.6342	.5067	.4057	.3256	.2618	.2109	.1703	.1378	.1117
24	.7876	.6217	.4919	.3901	.3101	.2470	.1971	.1577	.1264	.1015
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923
26	.7720	.5976	.4637	.3604	.2812	.2198	.1722	.1352	.1064	.0839
27	.7644	.5859	.4502	.3468	.2678	.2074	.1609	.1252	.0976	.0763
28	.7568	.5744	.4371	.3335	.2551	.1956	.1504	.1159	.0895	.0693
29	.7493	.5631	.4243	.3207	.2429	.1846	.1406	.1073	.0822	.0630
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573
35	.7059	.5000	.3554	.2534	.1813	.1301	.0937	.0676	.0490	.0356
40	.6717	.4529	.3066	.2083	.1420	.0972	.0668	.0460	.0318	.0221
45	.6391	.4102	.2644	.1712	.1113	.0727	.0476	.0313	.0207	.0137
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085
55	.5785	.3365	.1968	.1157	.0683	.0406	.0242	.0145	.0087	.0053

Source: Eugene F.Brigham, 1985

Table A-3
Continued

Period	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.1631	.1229	.1069	.0980	.0708	.0541	.0320	.0193	.0118	.0073
17	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
21	.0926	.0638	.0531	.0443	.0309	.0217	.0109	.0056	.0029	.0016
22	.0826	.0560	.0462	.0382	.0262	.0181	.0088	.0044	.0022	.0012
23	.0738	.0491	.0402	.0329	.0222	.0151	.0071	.0034	.0017	.0008
24	.0659	.0431	.0349	.0284	.0188	.0126	.0057	.0027	.0013	.0006
25	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
26	.0525	.0331	.0264	.0211	.0135	.0087	.0037	.0016	.0007	.0003
27	.0469	.0291	.0230	.0182	.0115	.0073	.0030	.0013	.0006	.0002
28	.0419	.0255	.0200	.0157	.0097	.0061	.0024	.0010	.0004	.0002
29	.0374	.0224	.0174	.0135	.0082	.0051	.0020	.0008	.0003	.0001
30	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
35	.0189	.0102	.0075	.0055	.0030	.0017	.0005	.0002	.0001	*
40	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001	*	*
45	.0061	.0027	.0019	.0013	.0006	.0003	.0001	*	*	*
50	.0035	.0014	.0009	.0006	.0003	.0001	*	*	*	*
55	.0020	.0007	.0005	.0003	.0001	*	*	*	*	*

*The factor is zero to four decimal places.

Source: Eugene F.Brigham, 1985

$$PVIFA_{k,n} = \sum_{t=1}^{n} \frac{1}{(1+k)^t} = \frac{1 - \frac{1}{(1+k)^n}}{k} = \frac{1}{k} - \frac{1}{k(1+k)^n}$$

Number of Periods	1%	2%	3%	4%	5%	6%	7%	8%	9%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285
21	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922
22	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424
23	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	9.5802
24	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226
26	22.7952	20.1210	17.8768	15.9828	14.3752	13.0032	11.8258	10.8100	9.9290
27	23.5596	20.7069	18.3270	16.3296	14.6430	13.2105	11.9867	10.9352	10.0266
28	24.3164	21.2813	18.7641	16.6631	14.8981	13.4062	12.1371	11.0511	10.1161
29	25.0658	21.8444	19.1885	16.9837	15.1411	13.5907	12.2777	11.1584	10.1983
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737
35	29.4086	24.9986	21.4872	18.6646	16.3742	14.4982	12.9477	11.6546	10.5668
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574
45	36.0945	29.4902	24.5187	20.7200	17.7741	15.4558	13.6055	12.1084	10.8812
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617
55	42.1472	33.1748	26.7744	22.1086	18.6335	15.9905	13.9399	12.3186	11.0140

Source: Eugene F.Brigham, 1985

Number of Periods	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
21	8.6487	7.5620	6.6870	6.3125	5.9731	5.3837	4.8913	4.1212	3.5514	3.1158
22	8.7715	7.6446	6.7429	6.3587	6.0113	5.4099	4.9094	4.1300	3.5558	3.1180
23	8.8832	7.7184	6.7921	6.3988	6.0442	5.4321	4.9245	4.1371	3.5592	3.1197
24	8.9847	7.7843	6.8351	6.4338	6.0726	5.4509	4.9371	4.1428	3.5619	3.1210
25	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
26	9.1609	7.8957	6.9061	6.4906	6.1182	5.4804	4.9563	4.1511	3.5656	3.1227
27	9.2372	7.9426	6.9352	6.5135	6.1364	5.4919	4.9636	4.1542	3.5669	3.1233
28	9.3066	7.9844	6.9607	6.5335	6.1520	5.5016	4.9697	4.1566	3.5679	3.1237
29	9.3696	8.0218	6.9830	6.5509	6.1656	5.5098	4.9747	4.1585	3.5687	3.1240
30	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
35	9.6442	8.1755	7.0700	6.6166	6.2153	5.5386	4.9915	4.1644	3.5708	3.1248
40	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
45	9.8628	8.2825	7.1232	6.6543	6.2421	5.5523	4.9986	4.1664	3.5714	3.1250
50	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
55	9.9471	8.3170	7.1376	6.6636	6.2482	5.5549	4.9998	4.1666	3.5714	3.1250

Source: Eugene F.Brigham, 1985

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