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Livelihood Transition and Adaptive Bamboo Forest Management: A Case Study in Salakpra Wildlife Sanctuary, Thailand

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Abstract

The connection between livelihood transition and adaptive bamboo forest management was investigated in a village adjoining Salakpra Wildlife Sanctuary, Kanchaburi Province, where three species of bamboo-Dendrocalamus membranaceus, Bambusa bambos, and Thyrsostachys siamensis-were collected by villagers. From January to December 2014, 141,539 full culms (180,873 logs) of bamboo were harvested, generating a total income of 1,856,616 baht. Of the respondents surveyed, 46.4% had already stopped bamboo cutting, and 39.6% were retiring between 31 and 45 years of age. The main reasons for their retirement were changing to a new occupation (52.7%) and old age (31.9%). Today, only 14.8% of respondents are still bamboo cutters, and their declining numbers mean that the bamboo forest in Salakpra Wildlife Sanctuary continues to degrade due to the area of bamboo forest and access to it being limited. In 2005, the local community established activities for forest conservation after they built a weir in Salakpra Wildlife Sanctuary. Specifically, new customary regulations and village-level bamboo forest demarcation was introduced to sustain production and services, particularly bamboo culms. The situation in Salakpra Wildlife Sanctuary and Thungna Village indicated that partial forest transition is occurring in at least, a village in Thailand.

Keywords

Livelihood Transition; Adaptive bamboo forest management; Forest transition

Introduction

This paper describes the situation of adaptive bamboo forest management in Salakpra Wildlife Sanctuary (SPWS), Thailand's first wildlife sanctuary, established in 1965 in Kanchanaburi Province [1]. SPWS is situated on the eastern bank of the Mae Klong or Khwae Yai River (14° 09' to 14° 40' N and 99° 09' to 99° 30' E, Figure 1). SPWS is dominated by three forest types that occur in a landscape mosaic: Seasonal dry evergreen forest, deciduous dipterocarp forest, and mixed deciduous forest. About 60% of SPWS area (515.13km²) is mixed deciduous forest with much more bamboo in the lowlands [1]. Bamboo has a long history of intense exploitation in this area, and SPWS is an important source of bamboo for cutting. In 1977, SPWS was partially

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abrogated, creating an area of about 77.65km² to be used for the Srinakarin dam-building project and preparation for resettlement [2]. This project directly affected SPWS because bamboo cutting was the main cash income of the reservoir refugees. The process of the development policy from the past to the present time has affected the local people's livelihoods and bamboo forest utilization in SPWS.

Thus, focusing on the occupational change of bamboo cutters and adaptive bamboo forest management by locals based on modified traditional knowledge, the livelihood transition and its relationship with bamboo in natural forest is investigated. The purpose of this paper, therefore, is to examine a case of forest transition in Thailand. Forest transition refers to the change from shrinking to expanding forest focusing on the changing forest area [3-8] owever, the forest transition theory by Mather pointed that not only forest area changes but forest transition also implies a changeover to a different system of forest use or management [3]. They defined Thailand as a non-forest transition country in Asia [9], resulting in a reduction of forestland from 53.33% in 1961 to 31.57% in 2013 [10,11]. However, the changing of forest management by local people who use the forest could be one type of forest transition on a local scale in some parts of Thailand.

Study Site and Methods

The study area is Thungna Village. It is the largest resettlement village in Nongped Sub-district, Srisawat District, Kanchaburi Province, and is located on the north side of SPWS. It consists of villagers from many small villages from the area flooded after completion of the Srinakarin Dam. Bamboo cutting was the main source of cash income for the villagers before they moved to the new area.

Rapid rural appraisal (RRA) and Participatory rural appraisal (PRA) were used for data collection, namely, participatory mapping, indepth interviews, semi-structured interviews, small group discussions



and participatory observation. The trading record by middlemen was used to identify the quantity, market price and income from bamboo harvesting. Information on age, education level, migration, occupation, land tenure, bamboo utilization, bamboo utilization zone, opinion on bamboo cutting, and problems and limitations on bamboo cutting was compiled from questionnaires (n= 198). Basic Minimum Needs (BMN) in 2014 of Nongped Sub-district Administrative Organization was used to describe other information about the socio-economic situation in Thungna Village.

Results and Discussion

The current socio-economic situation of bamboo cutters and former bamboo cutters

The study found that 14.8% of respondents were bamboo cutters and 46.4% were former bamboo cutters, and thus in the past 61.2% of respondents had been bamboo cutters. The main sources of bamboo are most of the respondents harvested in SPWS. Table 1 shows the socio-economic characteristics of bamboo cutters and former bamboo cutters, such as age, educational level, main occupation and land holding. The majority of the bamboo cutters were between 46 and 55 years of age, younger than most of the former bamboo cutters. The youngest person to begin this occupation was eight years of age, and the oldest person beginning bamboo cutting was 46 years old. As for educational background, most of the bamboo cutters and former bamboo cutters were of primary school level and illiterate. The main occupation of the bamboo cutters and former bamboo cutters was agriculture and wage labor, both in- and off-farm but former bamboo cutters engaged in more diversified occupations than bamboo cutters. Although the main occupation of bamboo cutters and former bamboo cutters was agriculture, 93% of bamboo cutters had land holdings of less than two hectares, which was not sufficient for their household consumption or to earn cash income. Thus bamboo cutting as the main source of cash income was carried out during spare time between waiting for harvesting on their farms and waiting for a new job as a wage laborer.

Table 2 shows the age of bamboo cutters and reasons for bamboo cutters to retire from the bamboo cutting occupation. As for the background of former bamboo cutters, 39.6% of bamboo cutters retired from bamboo cutting at an age of between 31 and 45. According to the study, these people stopped cutting bamboo at this age because they wished to begin a new occupation.

The study found that the main reasons for bamboo cutters to retire from bamboo cutting were that the person needed a new occupation (52.7%), old age (31.9%), fear of being captured (9.9%) and fear of wild elephants (9.9%). The reasons for former bamboo cutters changing to other occupations were stability of household (76.9%), higher income (67.0%), and safety from danger (58.6%). Therefore, the study indicated that bamboo cutters require stability and security in their lives and careers.

Bamboo harvesting and marketing

In SPWS, three species of bamboo were cut by the local people, namely, *Bambusa bambos, Thyrsostachys siamensis* and *Dendrocalamus pendulas.* Table 3 shows the sizes, lengths, trading names, and market prices of bamboo by species and utilization. These bamboo species have diverse sizes and market prices, all of which are based on market demand. The difference in species and sizes of bamboo lead to differences in utilization. A selective cutting method was used for bamboo harvesting. In the first step, the bamboo cutters select straight bamboo. A knife was use for bamboo cutting, the handle of which is used for measuring the lengths of bamboo. A saw was used to split the bamboo into the lengths required to fulfil market orders. Bamboo cutters count the number of bamboo culms to calculate the income. Bamboo cutters stop cutting bamboo if the income from bamboo cutting is sufficient for around two to three days of household expenses.

Table 1: Socio-economic characteristic of bamboo cutters and former bamboo cutter.

List of Socio-economic	Bamboo cutters (n=29) n (%)	Former bamboo cutters (n=91) n (%)	Total (n=120) n (%)	
Age				
Less than 36 years	4 (13.8)	4 (4.4)	8 (6.7)	
36-45 years	7 (24.1)	10 (10.9)	17 (14.2)	
46-55 years	10 (34.5)	22 (24.2)	32 (26.7)	
More than 55 years	8 (27.6)	55 (60.5)	63 (52.4)	
Education level				
Illiterate	1 (3.4)	28 (30.8)	29 (24.2)	
primary school	26 (89.7)	55 (60.4)	81 (67.5)	
Secondary school	0 (0.0)	3 (3.3)	3 (2.5)	
High school	2 (6.9)	2 (2.2)	4 (3.3)	
Others	0 (0.0)	3 (3.3)	3 (2.5)	
Main occupation				
Agriculture 17 (58.7)		49 (53.8)	66 (55.0)	
Wage-labor	11 (37.9)	22 (24.2)	33 (27.5)	
Commercial	1 (3.4)	9 (9.9)	10 (8.3)	
Official	0 (0.0)	2 (2.2)	2 (1.7)	
Others	0 (0.0)	9 (9.9)	9 (7.5)	
Land holding				
0 ha	7 (24.1)	24 (26.4)	31 (25.8)	
0.01-2.00 ha	20 (69.0)	30 (33.0)	50 (41.7)	
2.01- 4.00 ha	2 (6.9)	18 (19.8)	20 (16.7)	
4.01-6.00 ha	0 (0.0)	14 (15.4)	14 (11.7)	
More than 6.00 ha	0 (0.0)	5 (5.4)	5 (4.1)	

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Bamboo cutters retired	Frequency (household)	Percentage
Age* (n=48)		
Less than 31 years	13	27.0
31-45 years	19	39.6
46-55 years	8	16.7
More than 55 years	8	16.7
Reasons for stopped bamboo cutting (More than one answer)		
Needs a new occupation	48	52.7
Elder	29	31.9
Captured by SPWS rangers	9	9.9
Afraid wild elephant	9	9.9
Be tired or be weary	8	8.8
Shortage of bamboo and labor	4	4.4
The purpose for occupation changing (More than one answer)		
Stability of their household	70	76.9
Get better income	61	67.0
Safety for their life	47	51.6
rest, be comfortable	28	30.8

Table 2: Age of bamboo cutters and reasons of bamboo cutters to retired from bamboo cutting occupation.

Table 3: Size of bamboo for trading, market price and use by consumers.

Bamboo species	trading name	Length (m)	Market price* (baht/unit)	Utilization
Bambusa bambos	Phai Khaao Laam (diameter about 5 cm)	3.0	13 / 1 culms	Khaao Laam (Thai sweet style)
		2.5	17/ 1 culms	
	Phai oon or The young bamboo/Jumbo size (diameter about 7-9 cm)	3.0	20-22/ 1 culms	
		4.0	27/ 1 culms	
		4.5	30/ 1 culms	
		6.0	40/ 1 culms	
		6.0	40/ 1 culms	
	Phai kae or the mature bamboo	2.5	24/ 1 culms	Construction, scaffolding and
	The age over two year	3.0	26-27.5/ 1 culms	shack
	(diameter about 7-10 cm)	4.0	32/ 1 culms	
		6.0	50/ 1 culms	
	Mai sor (cutting the culms at 15-30 cm above the ground to the middle of culm or depend on the market order)	2.5	17/ 1 culms	
		3.0	17/ 1 culms	
		4.0	27/ 1 culms	
		4.5	32/ 1 culms	
Dendrocalamus	Nual lum	3.5	13/1 culms	Stakes used in mussel farm,
membranaceus	Nual lek (small culms)	3.5	22.5/5 culms	construction, scaffolding, handicraft
	Nual kaeg	3.5	22.5/5 culms	
	Nual hok sok	3.0	20/5 culms	
Thyrsostachys siamensis	Pad Sok	4.0	32/10 culms	Handicraft, crutches in agriculture,
	Samwamud/mud oon	6.0	40-50/10 culms	broomstick
	Kao Sok	4.5	30-32/10 culms	
	Hok Sok	3.0	28/10 culms	
	Ha Sok	2.5	22/10 culms	

In selective cutting, bamboo cutters leave about three to four culms per bamboo clump or all of the bamboo culms in the clump if the sizes and lengths are not suitable for the market orders.

The quantity of bamboo cutting from SPWS is shown in Table 4. The largest quantity of bamboo was cut in September. 29,416 culms were cut by bamboo cutters, most of this being *Dendrocalamus membranaceu*, which is a multipurpose bamboo for farmers in Thailand. However, "*Pai Khaao Laam*," the first year (8-12 months) of *Bambusa bambos*, is the most popular kind of bamboo, because it fetches a high price. Only 30 to 40 culms are cut per day per trolley, from which the bamboo cutters obtain the equivalent sum of more than 150 culms of *Dendrocalamus membranaceus*. The cutting period for *Pai Khaao Laam* is around October to April. From May to September the bamboo cutters cut "*Mai Sor*" from *Bambusa bambos. Mai Sor* are used for bridge construction in the mangrove forest, orchard scaffolding, and for constructing shacks on mussel farms.

The gross income from bamboo cutting in 2014 is show in Table 5, which shows that the bamboo cutters earned a total gross income of 1,856,616 baht from bamboo cutting. The highest income was obtained

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	The quant	The quantity of bamboo									
Month	Bambusa bambos			Dendrocalamus pendulus		Thyrsostachys	Total of bit/	Total of culms			
	Culms (bit)	Phai Khaao Iaam (bit)	Mai Sor (bit)	Total (bit)	Culms (bit)	Sor Kaeg (bit)	Total (bit)	Siamensis (bit)	log		
Jan.	774	7,584	60	8,418	1,265	0	1,265	1,370	11,053	10,993	
Feb.	33	3,793	428	4,254	3,060	0	3,060	1,970	9,284	8,856	
Mar.	166	3,590	311	4,067	4,635	0	4,635	680	9,382	9,071	
Apr.	759	1,874	0	2,633	0	0	0	0	2,633	2,633	
May	3,819	0	1,867	5,686	0	0	0	70	5,756	3,889	
Jun.	1,239	0	581	1,820	4,777	0	4,777	0	6,597	6,016	
Jul.	2,262	0	786	3,048	11,435	0	11,435	0	14,483	13,697	
Aug.	456	0	150	606	10,725	17,970	28,695	0	29,301	11,181	
Sep.	1,651	0	162	1,813	26,335	12,540	38,875	1,430	42,118	29,416	
Oct.	530	1,078	30	1,638	9,235	3,910	13,145	16,660	31,443	27,503	
Nov.	0	2,129	539	2,668	4,142	0	4,142	1,690	8,500	7,961	
Dec.	259	10,064	0	10,323	0	0	0	0	10,323	10,323	
Total	11,948	30,112	4,914	46,974	75,609	34,420	110,029	23,870	180,873	141,539	

 Table 4: The quantity of bamboo cutting from Salak Phra wildlife sanctuary in 2014.

Table 5: Gross income from bamboo cutting in 2014 (1 US\$ = 32.49 Baht in 2014).

Month	Gross income by Species								
	Bambusa bambos	Dendrocalamus pendulus	Thyrsostachys siamensis	Total (Baht)					
Jan.	176,402	3,289	5,054	184,745					
Feb.	97,894	7,936	6,090	111,920					
Mar.	93,279	12,051	2,870	108,200					
Apr.	61,721	0	0	61,721					
May	139,331	0	280	139,611					
Jun.	46,470	62,101	0	108,571					
Jul.	79,848	148,655	0	228,503					
Aug.	16,362	174,025	0	190,387					
Sep.	47,331	171,621	3,824	222,776					
Oct.	30,197	70,079	46,046	146,322					
Nov.	99,838	19,838	4,784	124,460					
Dec.	229,401	0	0	229,401					
Total	1,118,073	669,595	64,164	1,856,616					



from bamboo cutting in December, and only *Pai Khaao Laam* were cut during this month. The market chain for bamboo is shown in Figure 2, which shows the beginning and the end of the bamboo trade from SPWS and the price of bamboo at each step. The price from SPWS to the end user group rose between 22 and 32 baht per bamboo log or more depending on the number of middleman.

Livelihood transitions of bamboo cutters in Thungna Village

The livelihood transition is described by the changing occupation of bamboo cutters in Figure 3, which shows the personal history of bamboo cutters. This study defined the period of bamboo cutters ceasing to cut bamboo into three periods. The first period was before 1975, at which time the villagers cultivated crops for subsistence and earned their main cash income from bamboo cutting and the collection of non-timber forest products. As the bamboo forest area for bamboo cutting was not limited, bamboo cutters cut bamboo wherever they wanted to. The second period was in between 1978 to 1997, and then the villagers moved from the flooded area to the new village (1975-1978).



Agriculture was the main income source for villagers with minor income earned from wage labor and bamboo cutting. The bamboo forest area decreased due to the flooding. The data shows that some of the bamboo cutters stopped cutting bamboo in this period. In 1984 almost all the bamboo cutters stopped cutting bamboo because the transportation method was changed from the *I Kird* (animal traction) using buffalo to trolley and labor. Some bamboo cutters did not have sufficient labor and the work was too heavy to do alone, and therefore the bamboo cutters changed their occupations.

Agriculture was chosen as the main occupation for former bamboo cutters. Agriculture in this period complied with the development policy of Thailand, supporting monoculture, commercial agriculture and industries, based on The Fourth to the Sixth National Economic and Social Development Plans [12].

The third period of occupation change for the villagers was in the period 2000 to 2012. After the conflict between Khuean Srinagarindra National Park and people who encroached on the forest area (1998-2000), access control by the Department of National Park Wildlife and Plant Conservation become stricter. Most of the bamboo cutters stopped bamboo cutting after that time. The main reasons why bamboo cutters stopped cutting bamboo were the decrease in bamboo forest after the bamboo forest area was declared a protected area, licenses for bamboo cutting and transportation were canceled by the Royal Forest Department (RFD), and some of the middlemen or traders in Kanchanaburi Province ceased to trade in bamboo.

Regarding the livelihood transition of bamboo cutters in Thungna Village, the bamboo cutters were classified into two groups. The first group is the group of bamboo cutters who stopped cutting bamboo. Almost all of them made the decision to choose a new source of main income and changed their opinion on forest resources and bamboo forest conservation. The reasons for bamboo cutters are changing to a new occupation were not only the higher income, but they also considered safety, health and greater acceptance from the other villagers when they participated in community activities. Nowadays, all the former bamboo cutters focus on forest conservation; namely, check dam construction, plantation and restoration, conservation zoning, and rearrangement and revival of the customary regulations for bamboo cutting in SPWS.

The second group is the group of bamboo cutters who still cut bamboo in SPWS. Almost all the bamboo cutters want to change to a new occupation, but some of them were landless or do not have enough money to invest in a new occupation. Some of them were looking for a new occupation that would earn more income than bamboo cutting. The second group is comprised of marginal people in the village. They do not participate in any activities, especially activities on forest conservation and other activities related to community development. The main reasons for the second group of bamboo cutters not participating in community meetings and other activities is that they do not have time to join in with their neighbors and were not confident about presenting their ideas in community meetings. In particular, the customary regulations in the village were set by other villagers who had no relation to bamboo cutting. However, the bamboo cutters know about the regulations and use them in their bamboo cutting activities. Bamboo cutters expect that they will continue to earn income from bamboo cutting in SPWS as far as they follow the regulations, although they did not determine or make the decisions on the regulations themselves.

Adaptive bamboo forest management in SPWS by bamboo cutters

Bamboo forests are managed according to a culm-selection method; the clumps have to be inventively worked on for proper distribution of new culms. Bamboo older than two years is suitable for construction use such as wave barriers against sea coast erosion. Only *Bambusa bambos* at age eight months to one year is suitable for cooking *Khaao Laam* i.e. sweet rice cooked with coconut milk in bamboo tubes. The method of bamboo harvesting in the past was selective cutting in all bamboo forest areas, but nowadays the bamboo cutters apply a selective cutting and felling cycle in SPWS due to the limitation of the bamboo forest area. The bamboo cutting areas are informally divided into sections depending on species and site, and a felling cycle is about one or two years. Only three species of bamboo were harvested by bamboo cutters, each species being grown at the same site. Orders from the markets affect the felling cycle, as different species are required at different times.

In addition, the research indicated that traditional knowledge and customary regulations were used for bamboo forest management namely; (1) Selective cutting must be used for bamboo culm harvesting, and only suitable sizes for sale should be harvested, (2) It is prohibited to harvest bamboo culms of an age of less than one year, and (3) Bamboo cutting is prohibited on important days. In 2005, the local community built a reservoir in SPWS. The head of village stated the importance of the surrounding forest, especially the bamboo cutting zone, for water supply, and this became the villagers' main incentive for practicing conservation in SPWS. The regulations used before 1975 were once more returned to enforce strict practices and new regulations were created. Another reason for villagers to enforce strict regulations to control bamboo cutting is the shortage of bamboo for use in village activities and pressure by the SPWS office and patrols. This situation led the villagers to participate in community meetings to make the decision to enforce strict regulations on bamboo utilization combined with the restoration of forest conservation activities, namely, forest plantation, checking dams, and zoning of the conservation zone. The new regulations for bamboo forest management enforced from 2005 up to the present day are as follows.

- The harvesting of bamboo shoots is prohibited for commercial purposes but allowed for household consumption due to bamboo culms being more expensive than bamboo shoots when they are fully grown.
- Selective cutting must be used for bamboo culm harvesting, and only suitable sizes for sale can be harvested.
- It is prohibited to harvest bamboo culms of an age of less than one year, and it is only permitted to harvest culms of less than one year of *Bambusa bambos* for *Khaao Laam* making.
- It is prohibited to use cattle or vehicles for transporting the bamboo culms in the forest, and only trollies are allowed for transport.
- Timber cutting is prohibited. Anyone found cutting timber should be reported to the village head.
- Bamboo culm harvesting is prohibited in the conservation area, namely, *Thung Salakpra* and *Thung Na Moon*. The village head that not be a guarantor for trespassers.
- Bamboo culm harvesting in Salakpra Wildlife Sanctuary is informally allowed in the Thungna zone.

• The important days on which bamboo cutting is prohibited are;(1) Holy days, namely, Makha Bucha Day, Visakha Bucha Day, Asarnha Bucha Day, Buddist Lent Day, End of The Buddhist Lent Day (2) Other Thai holidays, namely, New Year's Day, New Year's Eve, Chakri Day, Songkran Festival Day, Coronation Day, Chulalongkorn Day, Her Majesty the Queen's Birthday, His Majesty the King's Birthday, and National Day. Bamboo cutting is not permitted on at least 16 days during the year.

Bamboo forests are informally zoned by the local people considering location and village demand. SPWS is divided into three zones for bamboo cutting, namely; the first zone for bamboo cutters in Mong Krathae village with an area of about 20.98 km², the second zone for bamboo cutters in Kobuk Village, Samsui Village and Songpeenong Village with an area of about 24.59 km², and the third zone for bamboo cutters in Thungna Village with an area of about 8.4 km². The boundaries of the bamboo forest in each village are shown in Figure 4.

The customary regulations for forest management and conservation in Thungna Village are unwritten, but most of the villagers know the regulations. The villagers invigilate, manage and protect the forest from illegal access as well as monitoring the bamboo forest through community meetings every month. These regulations and restoration activities continued in the village after the bamboo forest in SPWS was degraded. Adaptive bamboo forest management in SPWS based on traditional knowledge and developed by rural communities over the centuries [13] is an innovative forest management practice. The villagers expect that if the regulations return to traditional village practices, the bamboo forest will, in the future, help to sustain the production of multiple goods and services, particularly bamboo culms. The bamboo forest will then generate income for them again and enhance their livelihood security and quality of life.

Conclusion and Recommendation

This paper has shown the relationship between local livelihoods, bamboo utilization and bamboo forest management. The changing situation regarding bamboo forest management in SPWS by local people of Thungna Village has been studied. The results of this paper reveal that before the local people evacuated in 1978, their livelihoods depended on forest resources, especially income earned from bamboo cutting. The villagers had no boundaries in the bamboo forest area for cutting and market demand for bamboo was very high. They applied informal regulations to control the bamboo cutting, namely, the cutting method, bamboo age limitations, and working days. The bamboo cutters living in Thungna Village since 1978 were classified into two groups. The first group was the group of bamboo cutters who stopped cutting bamboo and changed to new occupations. Most of the bamboo forest area was submerged by the construction of a dam. This was the main cause of the decrease in bamboo forest area. At the same time, market demand for bamboo culms was still high and there were still groups of bamboo cutters. Under these conditions, the shortage of bamboo culms affected household income as well as the perceptions of the villagers concerning the value of SPWS [14]. These were the reasons the villagers ceased cutting bamboo. These reasons pushed the bamboo cutters out of bamboo cutting and caused them to shift to other occupations such as agriculture, wage labor and small commercial activities. These occupations led the bamboo cutters in the direction of



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safe and stable livelihoods and aided the bamboo cutters to remain in their new occupations.

The second group was the group of bamboo cutters who still cut bamboo. Most of them cut bamboo in SPWS. Between 1978 to 2005 the bamboo cutters used the old informal regulations to control the bamboo cutting. However, the limitation of the bamboo cutting area in SPWS, shortage of bamboo culms and the perceptions of the villagers concerning the value of SPWS caused the villagers to return to the use of stricter regulations and five new regulations were formulated in 2005. The new regulations enforce a prohibition on bamboo shoot harvesting, prohibitions on certain transportation methods, a prohibition on timber cutting, the establishment of a conservation area and the demarcation of harvesting areas. From 2005 until the present day, the eight regulations are being applied by the villagers to manage the bamboo forest and protect SPWS from hunting and illegal logging.

Adaptive bamboo forest management in SPWS, based on traditional knowledge, socio-economic and resource conditions, has changed to include limitations on the bamboo forest area. The shortage of bamboo culms and forest degradation led the bamboo cutters and members of the village to engage in regulation formulating activities and demarcation of the bamboo forest. The villagers created new regulations based on the traditional regulations and demarcated the bamboo forest based on perceptions concerning the value of SPWS. All of these are tools for the management of the bamboo forest area in SPWS and to protect SPWS from hunting and illegal logging. The purposes of informal regulations are (1) to sustain production of multiple goods and services, particularly bamboo culms, (2) to generate income for the villagers, and (3) to enhance livelihood security and the quality of life. The situation in Salakpra Wildlife Sanctuary and Thungna Village indicated that partial forest transition is occurring in at least, a village in Thailand.

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