Co-management in Land Demarcation to Reduce Forest Utilization Conflicts: A Case Study of Mae Tia-Mae Tae Watershed, Chom thong District, Chiang Mai Province

Wittaya Nawapramote[1] , Sidthinat Prabudhanitisarn[1*], Somporn Sangawongse[1], Panomsak Promburom[2]

[1]Sustainable land use and natural resource management Program
Faculty of Social Sciences, Chiang Mai University
[2]Faculty of Agriculture, Chiang Mai University

Abstract

This research was based on the observation of phenomenon that occurred in every group of stakeholders through an implementation of modern management or co-management in land demarcation of the forest area in the Joint Management of Protected Area (JoMPA) In this regard, reviews of relevant concepts, theories, and study reports used in formulating explanation and utilization of natural resources along with an analysis of good points and limitations of the conventional explanation and management were conducted. It was also to evaluate how the conceptual thinking frameworks, management, and operating procedures of the co-management in land demarcation secured successful results. Afterwards, those results were subject to a proof through an implication of Geographic Information System (GIS) to detect any changes of the forest utilization based on the high-resolution satellite images and secondary data obtained from the project's studies. Meanwhile, an analysis of accomplishments concerning a reduction of conflicts over the forest utilization along with a decline in the forest encroachment was also undertaken.

The results disclosed that the land conflicts stemmed from unclear land use boundaries in need of mutual acceptance between the communities and government agencies. The co-management hereby is regarded as the mechanism bridging and transferring the management power to local stakeholders so that they can learn and find the solutions to settle arising problems in collaboration with the government agencies and other local organizations. Therefore, this co-management requires four components; 1) complete concepts for a holistic approach, 2) co-management mechanism, 3) co-management tools, and 4) clear and complete operating procedures. The success of land demarcation was collaboratively operated by four direct and indirect stakeholders; local communities, government agencies, non-government organizations (NGOs) and academic support groups. In this regard, topographic map and satellite image by Landsat and Ikonos were used to initially investigate the topography. Meanwhile, color aerial photography along with Global Positioning System (GPS) were also applied during a walkthrough survey to ensure the accurate land demarcation. In addition the evidence base as agreed by all concerned parties in the local community forums was used to map the color aerial photography land demarcation signed by relevant organizations such as Chom Thong Deputy District Chief, Local Administration Organizations, and Ob Luang National Park in the presence of NGOs, Sustainable Land Use and Natural Resource Management Academic Center (SLUSE), and others as a witness. This also resulted in the agreements and regulations for land utilization.

The results of co-management in land demarcation bring an end to the conflicts over the land utilization between the high and low-land communities of the watershed as well as between the communities and government agencies. Upon the report of forest encroachment, the community committee and National Park's authorities will retrieve the encroached Land and impose a fine against encroachers. According to the interpretation of satellite images, a reduction of forest encroachment was averagely at 8.64 ha per year during 2008-2010 after the co-management in land demarcation, compared to 27.39 ha per year during 2002-2008 before the land demarcation.

Keywords*:* Co-management/ Land demarcation/ Land use conflict /Holistic

1. Introduction

In the past, Thailand was a society that produced food for domestic consumption. The economic system was a subsistence economy. Land exploitation became the way of life in every community. When the land was over- exploited, the forestland was encroached to make room for farming activities. The rapid growth of population has resulted in more land exploitation. For this reason, the government enacted a Land Demarcation Act in 1935 in order to protect bare land, which is a national asset, from being exploited. However, as a result of recent decades of market economy and modernization especially in upland areas, the products obtained from the expansion of land and exportation of raw-material such as rice, rubber, teakwood, and tin increased dramatically. Consequently, the reduction of forest areas from 27.36 million ha (53.3%) in 1961 to

* Corresponding author:

E-mail: sidtinat@gmail.com

only 15.86 million ha (30.86%) in 2009, the forest area reduction to 11.52 million ha within 48 years was evident. (Protected Area Rehabilitation and Development office, 2011). The problem of forest area use can be explained under the following frameworks: Ecosystem Framework; the government used this framework to protect the forest area by balancing the ecosystem through various Forest Acts. Likewise, Ecological Economics; Ecological Economics is another separate concept of using resources wisely according to the rules and procedures that treat resources as products that yield economic benefits on the basis of ecosystem**.** Meanwhile, the Political Ecology; Political Ecology emphasizes an understanding on its own framework of how ecosystem works and the relationship between political powers that could change the nature. This is beyond the perception of deforestation by villagers; instead, commercial agricultural system production powered by capitalism destroys the ecosystem.

However, according to the former explanations and management schemes that followed which had separate frameworks, they could not solve the problem of forest area usage. The invasion of forest areas is still going on and there has been a continuation of conflicts between people: within the same community, community versus community, and community versus the government. Various supports are from NGOs and academics who have different frameworks based on their own explanation and management. The conflicts have resulted from unclear boundaries, both on the map and the land title deed and actual land use. Each party tried to figure out by themselves from their own perspectives. They often used conventional explanation and management which considered each part separately even within the same framework. This further worsened conflicts between the old and new groups supported by NGOs and academics.

To solve the problem of using forest areas, it is necessary to develop and use unconventional explanation and management which cover all areas by the advantage of the integration of ecosystem, ecological economics, and political ecology through co-management so that all stakeholder can use the forest areas in harmony. Prabudhanitisarn (2010) pointed out that stakeholders are more willing to analyze natural resource management as stated in Prabudhanitisarn (2007) Grimble and Wellard (1997) Roling and Wegemakers (1998); Chevalier (2001). To recognize the importance of users or natural resource manager not only includes individuals but also groups or organizations, multi-stakeholders that have an interaction with the area and various natural resource levels. This concept has been developed into co-management. Besides, Sukawong (2009) stated that the co-management in protected areas in the future is very challenging because it needs more effective measures. However, the most difficult mission is to form collaboration from grassroot level, living in the forests and other outsiders in order to co-manage the protected areas. The western critic in political ecology such as Bryant (1992) proposed that the political ecology framework is the way to analyze conflicts in natural resource management which includes capitalism development. The use of government policies or power as it plays the role on the interaction between the people and resources is considered a problem of rights, land ownership, ethnic discrimination, as well as reflecting political alteration linked to resistance, the power of farmers or those who lose benefits. Most political ecology theorists emphasize on explaining based on right regime. To manage the resources between the government and communities, claiming the rights over the resources by the government which is single and by the communities a complex problem according to critics similar to the conflict of colonizers and modern government that has more power and tries to take over all natural resources by preventing villagers gaining access to their traditional rights as stated in Vandergeest & Feluso (1993), Ganjanapan (1996), Wittayapak (1996), cited by Prabudhanitisarn (2010).

We can see that each framework should be combined together for solving the problems. For example, on the ecosystem viewpoint, when it rains, the forest holds the rain water within the soil. If the forest is used for concession, people may lack water during dry season. However, if the land is steep, landslide and soil erosion will occur easily. The community must find a way to survive since they cannot grow any crops, so they may choose to invade more forest areas. This practice will exceed the carrying capacity of the ecosystem followed by the conflict of people living in the watershed. If it reaches the critical point, it will take more time and budget to keep the balance and in some areas even this cannot be done, for the forest and the relationship of people living in the same area. Co-management should be used to solve the problem starting from land demarcation that compromises; ecological risks, sustainable use of land for sufficient food and income customary and regal right. Co-management of the protected forest, where multiple conflicts, and with the above–mentioned compromises, is not by any means straight forward. The researcher found out that this concept has recently been modified by integrating several sub–concepts and tools, and later on employed under the JoMPA at 11 national parks in Thailand. The researcher as one of the stakeholders had a full collaboration with this project at Mae Tia – Mae Tae, Ob Luang National Park this enables the researcher to use it as empirical information for the analysis of the potentials and limitations of this version of Co-Management. Mae Tia-Mae Tae the study site is a small watershed of Mae Klang sub watershed (Figure 1). This area has been facing a problem of water insufficiency for more than seven years, 1996-2002. The cause of the problem is from the

change of land use, from agricultural purposes to commercial purposes. Also, it used to be a plantation for opium, so now people need more land to grow crops that can yield equivalent benefits. More chemical substances are being used, more plantation areas are needed, and this area is now Ob Luang National Park where many rules and regulations are enforced. People living in the area gathered and named themselves as Highland Conservative group of Chom Thong district. This group has expanded ten villages and developed into a political movement in order to alter national resource management policies (Youngyubol, 2001). These conflicts could not be solved by the conventional way of thinking, so the conflicts now are growing larger. Doi Kaew Administrative Office intervened in order to solve the problem together with NGOs and government officials under Mae Tia - Mae Tae Committee. The Co-management in Mae Tia - Mae Tae was established under JoMPA in 2005. The main objective of the project is to protect the area with sustainable development through collaboration of related organizations and people living in the area. The success of land demarcation was collaboratively operated by four direct and indirect stakeholders; local communities e.g. land owners whose land bordered with the forest area together with the community committee and watershed committee; government agencies e.g. Ob Luang National Park and Tambon Doi Kaew Administration Organization; non-governmental organizations e.g. Sustainable Development Foundation (SDF), Raks Thai Foundation, and Inter Mountain Peoples Education and Culture in Thailand Association (IMPECT); and academic and operational support groups e.g SLUSE and Geo-Informatics for Watershed Management Center. The results revealed that all parties participatory agreed upon areas used, solved problems, and set land demarcation together. After, 3 years of operation there has been evidence showing more sustainable use phenomenon of protected forest and decrease in conflict. How empirically and conceptually true has the co-management contribute to this is the main research question.

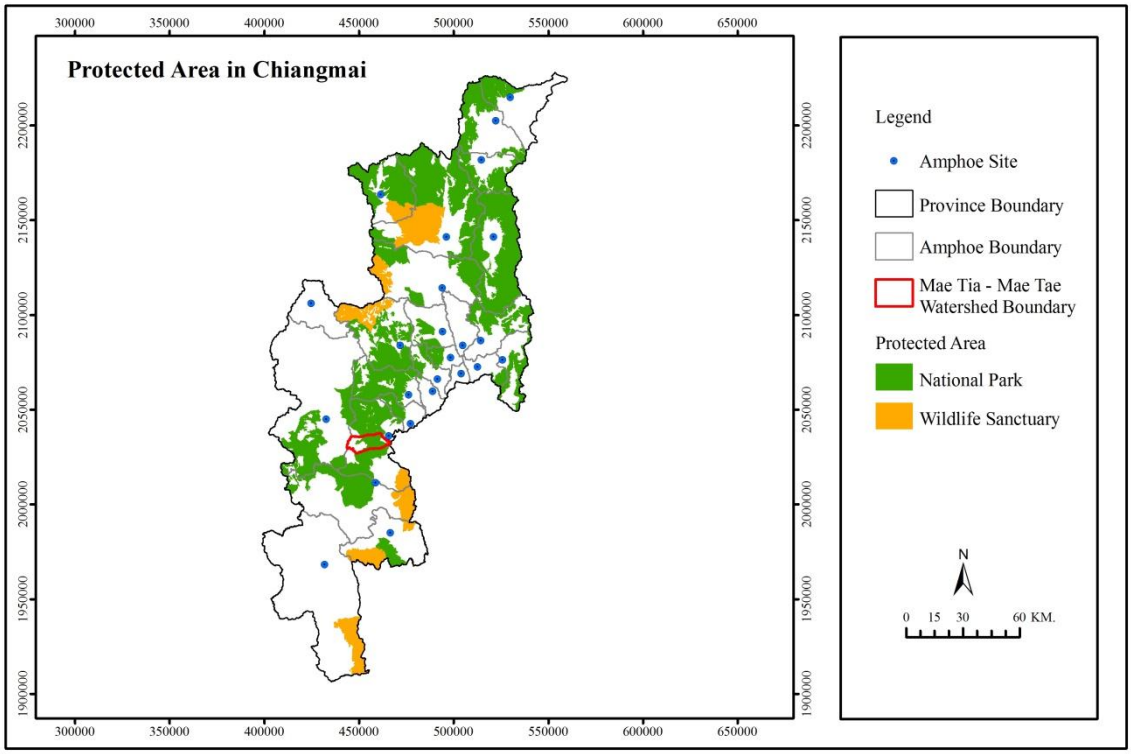

Figure 1: Global forest area trend (Sq.Km): FRAs comparison (n=75)

1.1 Research Objectives

1) Conceptualizing the frameworks, explanations, and former management procedures in terms of their potentials and limitation, comparing with the new co-management in the forest area;

2) Synthesizing co-management process on land demarcation of Mae Tia-Mae Tae.

3) Evaluating the process to prove the results of co-management on land demarcation in the forest area.

1.2 Conceptual Framework

Base on reviewing several theories, concepts research works, and experiences about, firstly explaning about the degradation of ecology in the forest areas, and secondly, solutions to such problem, it eventually reaches the following

conclusions. There has been recognition that forest areas have decreased and the impacts on ecological imbalance have been noted. The driving forces are quite complex from micro (Farms and each plot of land use) to meso (watershed utilization and malfunction) to macro (Global warming and policies) level. However, there have been inadequate explanations at each level, and the interaction among them. For example, at the micro and meso levels, those ecological – oriented explanations point out the inability of regeneration owing to the extensive utilization of forests beyond their carrying capacities. Therefore, strong measure including watershed classification along with legal and enforced measures to separate people from the forest have been the main solution. Likewise those people/community– oriented explanation blame the impacts on the market economy and the power of the government to protect the forest ignoring the communities' right. These factors cause local people to expand their land into the forest resulting in such problems. The solutions are using community control and managing the forest using their social and cultural capitals. Regardless of how valid these different ways of explaining and solving these problems are, the problems still remain. Therefore, what we need new thinking methods and explanations will link all conceptual thinking frameworks together with holistic knowledge and modern management through co-management. In addition, the evidence based obtained from the widely accepted information and knowledge in conjunction with co-management of stakeholders will be applied for land demarcation in the forest areas viewed as priority problems with aims to settle the conflicts of all parties and minimize abundant forest encroachment.

1.3 Proposition of co-management in JoMPA

To settle the problem concerning natural resources and environment requires the recognition of the arising problem, particularly conflicts of usage and possession of natural resources between different communities, as well as between the communities and government. Regarding the problem of the forest area usage, it is essential to start with solutions to land use with respect to rights to use and to occupy land. Then, economic development and sustainability of the resources and ecology can be further promoted. Indeed, the solution must begin with an establishment of complete concepts to identify the problem and set out the solutions in all respective dimensions based on holistic approaches

Participatory management must start from;

1) The concept as an essential overview in solving the arising problems effectively and sustainably. It is therefore necessary to define and develop clear concepts since most of the performers might be reluctant to take into account such concepts due to a lack of knowledge. It then requires those experienced personnel to render their supports and create an overview concept of co-management. To comply with the study on co-management, it revealed that the concept under the JoMPA projects of SLUSE was initiated and shared by Seub Nakhasathien Foundation and SDF.

2) Strategy, it must be included to bridge the objectives with its purposes and operation plans. Strategic planning can be set out only if the concept is completely outlined for further operations based on a situational analysis of each area.

3) Process and procedure, they are essential for the performers who prioritize the output of each activity before any operation without recognizing the relation of each particular activity. It also raises a question on how conservation and economic development among villagers can be cooperatively managed. The answer is indeed connected to the sequence of procedures as agreed by all respective parties.

1.4 Co-management in Action

With aims to obtain profound understanding on co-management, it is necessary to clearly synthesize the effectiveness of co-management to identify the relationship of components affecting the achievement and cooperation, compatibility of each opponent, weaknesses and strengths. Co-management contains major components subject to be studied as described below.

1.4.1 Application of Co-management Concept

The created concept must at least cover three main dimensions which include the management of natural resources, management of economic land utilization, and effective management process by a collaborative mechanism. In spite of being a good concept, the operation is going to be problematic based on the research's finding, saying that implication of one concept into a proper operation is variable. The most successful cases are achieved only when the local key actors that are part the collaborative mechanism, agree on such a concept and work together, because their objective to address the disputes over land demarcation is met. All concerned parties are undoubtedly regarded as local stakeholders. The actors also develop better understanding about the problems as they collaboratively work in the locality, which explains why co-management in land demarcation can minimize disputes. The actors do not recognize this concept specifically through the meetings or training programs but rather their operation in the targeted areas. This concept is viewed as the way to tackle the problems arising in the local areas since it incorporates the phenomenon and problem found in such areas. Indeed, a concept which is relatively identical to the problem will facilitate its application for all different levels. Meanwhile, the created concept can reflect more reality than any other concept. According to the plans set out for land demarcation, the forest management along with the promotion of land utilization must be established for sustainability. Moreover, mechanisms to improve co-management of the government sectors, NGOs, and local communities must be introduced.

1.4.2 Organizing of Co-Management Mechanism

The management mechanism is a key element to drive management collaboratively. However, these were coordinated with multi-level and multi-party stakeholders. So the management mechanism needs to create a mechanism to support both the management and operation of the driving force.

1) Mechanism management support is comprised of participation of several multiple parties such as Ob Luang National Park, SDF, Raks Thai Foundation, IMPECT, Dhammanaat Foundation for Conservation and Rural Development, Geo-Informatics for Watershed Management Center, and SLUSE. All parties have been supportive of the various functions. For instance: a) the technical support knowledge management from academic institutions; withfunding support from the Danish International Development Agency (DANIDA), and The Department of National Parks, Wildlife and Plant Conservation(DNP); b) legal relief and policy on the implementation of the pilot program from the DNP; c) the preparation of the various databases; d) the development of management systems; e) the preparation of plans and activities; and f) coordinating with various departments and urban areas.

2) The operation management mechanism. It must establish a committee that is responsible for controlling and monitoring the use of shared resources. The community network under the project can be divided into two levels: the village level and the watershed level.

3) A mechanism of the community's rules and regulation. This support mechanism is used when the control of the social networking community and the settlement agreement is not clear, and to conclude the conflict by the rules that have been specifically defined. The primary user is authorized to settle disputes with the staff of the park, beyond the specifics of the law, act or regulations. Together with the Village Board regulations, the watershed committee has also agreed to jointly monitor the use of the land, and invasive forest walks that are off the fields that have been settled by the committee. This finding is in harmony with the study of Tyler ((2006, which found that the outsiders must adjust one's behavior, attitude, and thoughts to be compliant with characteristics of a facilitator, a negotiator, and a supporter. According to Tylor, this work should be done by encouraging the local people to participate in managing and determining the learning process so that there is security and equality in accessibility to resources.

1.4.3 Deployment of Co-management Tools

Tools of the JoMPA project in land demarcation must generate more participation by encouraging all parties to get involved in land demarcation while each party can propose their own opinions freely through the public stage. Moreover, all information obtained from all relevant parties is subject to further consultation and consideration. Likewise, data synthesized through the scientific instruments and advanced technology will be taken into account and Carry out land demarcation by seeking acceptance of all respectable parties based on the agreed scientific evidence such as color aerial photography and joint survey of land demarcation regarded as detectable evidence for the mapping process of land demarcation.

1) Participatory-GIS (PGIS)

PGIS has been employed for the mapping preparation, GPS-based land demarcation and mapping-based land demarcation to obtain a new set of data identical to real circumstances and gain acceptance. Thus, the obtained data will be used for land demarcation in the forest area. PGIS combines a range of geo-spatial information management tools and methods such as sketch maps, Participatory 3D Models, aerial photo, satellite image, GPS and GIS to represent people's spatial knowledge in the forms of virtual or physical, 2 or 3 dimensional maps used as interactive vehicles for spatial learning, discussion, information exchange, analysis, decision making and advocacy (Michael K. McCall, 2004).

2) Mapping

Mapping serves as the initial mapping for an exchange of information among the respectable parties regarding demarcation of the National Park, village boundary, relocation, and other functions of land use. This is in agreement with the study of Tan-kim-yong (1988), which indicated that the success of participatory land use planning came partly from the use of a mediator to promote mutual understanding in the area's condition, utilization form, and resource management, base on the objective to encourage discussion and exchange of knowledge, data, and information.

The map for land demarcation will cover a set of complete data for land demarcation apart from being updated and easily understandable to stakeholders.

- Geographical maps signifying the watershed boundary, village, road, waterway, and others function as main landmarks to link the factual data gathered in the area to comply with a further step of map reading, with a scale of 1:10,000.

- The colored aerial photo-based maps at a scale of 1:10,000 and 1:4,000, capable of demonstrating details of land functions such as forest area, rice field, farm land, village location, and others must be updated to classify the land demarcation along with the GPS-based survey.

1.4.4 The Process of Co-management in action

Accomplishments of the co-management process derive from several informal meetings to recognize the problems and local community forums Co-management is the process that is used to identify the problem that needs to be solved by gradually reducing the size of the total considered problem. With all of the hassle and problems that cannot be resolved by the parties with the cooperation of a local stakeholder requires support from outside with a local area agreement, which does not require efforts from all

parties involved or stakeholders, whether directly or indirectly.

1) Meeting to understand the problem. The problem is then examined (problem orientation) with academic institutions or an organization that is neutral, in order to reduce any mutual distrust between the former opponents and to build confidence between all parties.

2) Thinking about the framework. An examination of the problem with factors (outside-in approach), and then develop a framework based on data received from the comments made by participants, with the knowledge of the total situation and related areas, including those comments from participants with management experience.

3) There is a mutual understanding of others with the same problem. There may be an issue of discrimination with each of the problems and classification of problems, including the prioritization of problems. In order to take steps to resolve any issues, determine the starting point of the problem that caused the conflict and spread to other matters and the important stakeholder in the proposed area of operations (Inside-out approach).

4) Public hearings, the first public hearing for land demarcation of Huai Sompoi village was arranged in December of 2008, or 16 months after the survey for demarcation of special use zones. The process of public hearing was conducted in two villages; Huai Sompoi village and Huai Khanoon village, drawing several participants engaged. The final public hearing was done in December of 2009 to gain signatures of acceptance on the map of land demarcation.

2. Methodology

This research is based on the observation of phenomenon that occurs in every group of stakeholders in Mae Tia - Mae Tae watershed.

2.1 Review concepts, theories, and study reports to create the explanations and resource management through the state's operating mechanism and changing dynamics of forest areas and land demarcation driven by the communities and NGOs under the JoMPA adopting the co-management.

2.2 Collecting field data on the procedures and processes involved in managing the success of the land demarcation by interviews from all stakeholders groups involved.

2.3 Input GIS data in order to evaluate the land demarcation and changes in land use such as physical data, boundary of national park and forest reserve area, land use data based on aerial photography and satellite image, land demarcation data for the project operation

2.4 Evaluate what the conceptual thinking frameworks, management, and operating procedures of the co-management for the land demarcation are and what the tools and methods for creating the evidence based as well as joint agreements for the land demarcation are.

2.5 Test and prove land use changes. Data on change of land use based on the aerial photo and satellite images (before the project operation and after the project completion) are used for assessing the success of co-management on land demarcation in the following aspects. a) Reduction of disputes over the forest usage. b) Reduction of forest encroachment.

3. Result

Findings on Co-Management in JoMPA

3.1Circumstances which lead to co-management.

Circumstances of the area have a conflicts of water resources and land use, separation and establishment of conservation groups, establishment of community networks and ethnic groups in both highland and lowland communities, engagement of NGOs in respect of forest conservation for water sources and promotion of community rights for management and use of natural resources, limitation of an access to the natural resources to comply with the applicable laws, breakup of conflicts concerning the use of natural resources by blocking the routes of the highland to the urban area and provoking a protest to attract the government to involve in proper solutions. An external situation is decentralization, Implementation of community rights as a guideline for land occupancy Arrivals of piloted projects for national parks in 2001 and the JoMPA projects, generating concepts of modern management or co-management to jointly settle down the disputes of land usage in the shaded areas.

3.2 Implementation of Co-Management in JoMPA.

1) Meetings were launched on several occasions whereas different results were received owing to the involvement and authority. To take an example, the meeting of district-level steering committee showed no action due to lack of understanding and essential data. On the contrary, the meeting of watershed committee brought a greater impact on the implementation of co-management since they were regarded as local stakeholders. In other words, informal meetings or discussion groups played a key role in driving the co-management procedure to set up strategic planning and operational guideline in the targeted areas. Meanwhile, the proposal of "Special Use Zone" was shared and considered as the startup for an operation introduced by SLUSE with aims to settle the dispute. The first sub-district level meeting also outlined the conceptual framework and operating procedures of the project in line with the application of watershed maps showing biological and physical data based on the geographical areas and satellite images (1:10,000).

2) Agreement based on the sub-district level meeting to address the existing conflicts were achieved before land demarcation. The accomplishments were seen when opponents in the communities and government officials shared their problems and facts together. They also recognized a, lose-lose situation if these problems still continued as they were unable to develop the land for productivity. In this manner, the government officials became aware of the forest encroachment whereas the locals were in fear of

being charged. The main agreement was on land demarcation which required their co-management.

3) Operating procedures in Joint management played an essential role on the operation in the targeted areas, ranging from a walkthrough survey along with the use of aerial photos created in 2002 (1:4,000) and GPS showing the entire areas. More importantly, the operating procedures attended by officials of national parks, Geo-Informatics for Watershed Management Center, and Communities including IMPECT and SDF raised more confidence among all relevant parties. Meanwhile, SLUSE provided suggestions on the conceptual framework and operating guideline to equalize the power relationship of each party to promote more acceptance of the operation. The process also required witnesses and signatures respectively affixed by local administrative organizations and relevant networks to remind them of their agreement. Otherwise, they might claim their own land demarcation which would worsen the conflicts. Therefore, the evident-based data as approved by all parties such as the colored aerial photography used in a walkthrough survey and land demarcation must be adopted.

3.3 Co-management in Land Demarcation in Action

Co-management is therefore an appropriate method for dynamic problems as it is the approach to empower the stakeholders of such problems and the guideline to enhance their capacity to handle the problems (Berkes, 2009). The management mechanisms can be further developed and adjusted to the current problems caused by changing circumstances or factors. This research specifically concentrates on the reasons why co-management is necessary. In addition, it is found that co-management in land demarcation in the forest area rests on several factors; evidence-based information, budgets for the meetings, field surveys, and pegs or markers of the surveyed area. All concerned parties have their own expectations and mandates. The process of participatory land demarcation and special use zone, therefore, need to be jointly agreed and approved. If these factors are not fully addressed, the participatory land demarcation might fail underway because only the budget cannot push forward cooperation of all parties. It is obvious that relations of stakeholders to the problem will help complete the recognition of co-management. An analysis of stakeholders in respect of power relationships for co-management in land demarcation demonstrates that communities claimed for land possession show high expectations toward land demarcation as they are likely to lose the land if it is not agreed under the process. However, villagers have little power in decision making whereas the National Park's officials are fully empowered on the subject matter but little involvement in the risk of losing the land among villagers as the head level is subject to a regular transfer. This nature of relationship causes an error in decision making when facts and details collected in a particular area are ignored. It is therefore essential to equalize the power relationship of all parties concerned.

3.4 Step in Participatory Land Demarcation

The Project of JoMPA operated in the Mae Tia – Mae Tae Watersheds allows several parties to cooperatively discuss and find out the solutions to the agricultural land within the forest. This also results in the plan for land demarcation requesting participation of all parties involved. The procedures and operations include the followings.

- Meeting to discuss about the background and gain mutual understanding.
- Appointing the working groups participated by several parties, such as local organizations, community leaders of the high land and flat land, government officials, and non-government organizations.
- Establishing the database of land possession of each household or community
- Surveys and demarcation made by the joint working groups
- Drafting the agreements for each type of land use
- Summarizing the data for consideration in conjunction with the working groups and watershed committee
- Seeking an approval of the watershed committee to raise trust and confidence
- Mapping land demarcation to the public hearing.
- Formulating and modifying the regulations for the land use in the communities
- Applying local customs and beliefs to establish obligations
- Approving the land demarcation and Regulation of the land use among the communities, Local Administrative Organizations, Ob Luang National Park, and other involved parties

4. Discussion

Based on the research, the implementation of JoMPA has been successful in several aspects. Indeed, the main focuses of this research were to analyze if and how co-management in land demarcation can lessen the land utilization conflicts and minimize forest encroachment.

4.1 Result in Term of Conflict and Cooperation

Co-Management in land demarcation demonstrated that rising confidence and acceptance resulted from participation in each single step in land demarcation before an operating procedure which included walkthrough survey and aerial photo (1:4,000). Moreover, a detailed study on the data contained in the aerial photo along with application of GPS was cooperatively attended by officials of national parks and relevant parties. An operating procedure also required the NGOs such as SDF to take part in mediating the opponents. As a result, more cooperation, negotiation, and lessening measures were eventually obtained, for instance, reduction of community's land utilization prone to ecological impacts or lessening measures in land utilization for agricultural purposes of the villagers.When the situation is recognized and an accepted boundary is agreed, it needs to be

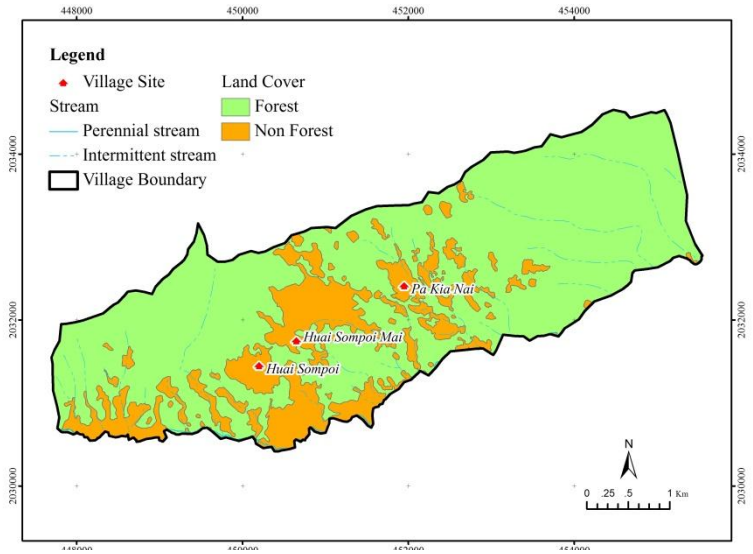

Figure 2 Land Cover Map 2002 : Huai Sompoi Village

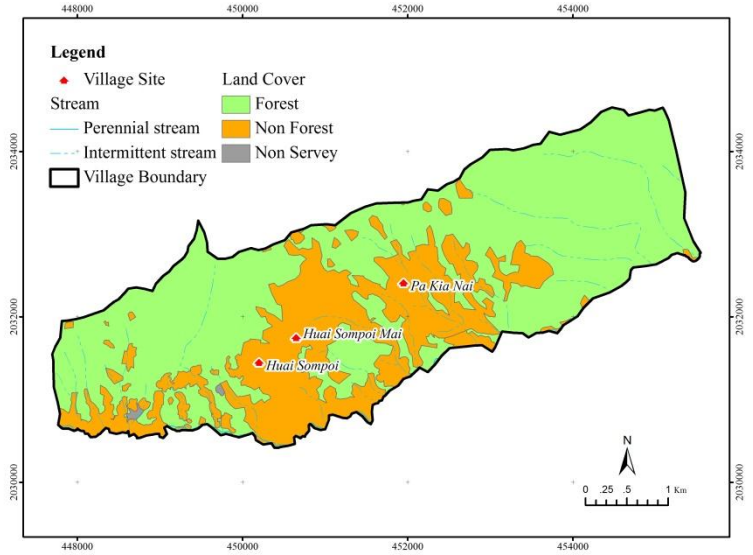

Figure 3 Land Cover Map 2008 : Huai Sompoi Village

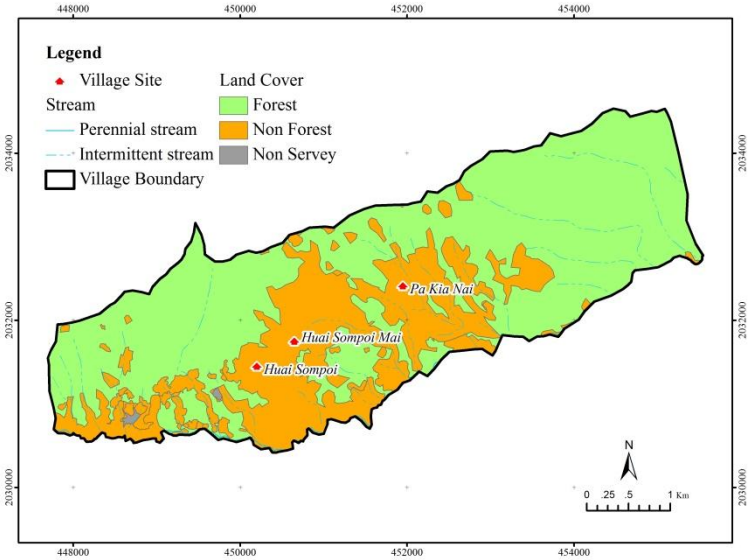

Figure 4 Land Cover Map 2010 : Huai Sompoi Village

checked by the park staff that will work within the community by providing GPS and to map out a preliminary result from a physical investigation. The participatory land demarcation in the area must be determined, and if any changes by moving boundary fixed pins or the expansion of space, there will be a record made together with community leaders and with witnesses. The record should coordinate storage areas that have been compromised by a moving boundary. The processing and mapping should use the GIS that can be used as evidence in a criminal verification, and for the community.

The result of solving land use conflicts in the area found that the intrusion and broadening of the land for planting in the village can be used in conjunction with empirical data management mechanisms. The event took place in the study area that has been extended to land outside the boundary of the area and the scene needs to be inspected. Initially, the culprit did expand to an area outside of the boundary which was found by the GPS survey. Dealing the village council and the watershed makes it possible to detect and identify the specific culprit. Then it is necessary to thoroughly investigate the allegations. The offender was fined as per the rules agreed upon. And the recorded evidence is semi-formal. On the case of the opening of new land, when the area is checked, it is determined that it is located outside the area of real relief. The staff guardian of Ob Luang National Park, Doi Kaew District Vice President and the Village Board call the perpetrator in to answer the allegations. The offender has admitted that there is a real invasion area and agrees to follow the rules of the area. This approach of solving conflicts and its outcomes are similar to those revealed in the study of Pinkantayong (2010).

4.2 Results in Terms of Land Cover Changes in Forest Area

With aims to study the participatory land demarcation on changes of the forest area, the area of Huai Sompoi village, consisting of three small communities with approximate areas of 1597.12 ha of land in total, was then used as a study model. The surrounding areas are generally described as the evergreen forest, mainly in the conserved forest and partly in the Ob Luang National Park whereas the pine and mixed forest is found along the lower area of this village.

The study on land cover changes was conducted through different techniques as the data of land use and land cover during the time of study require outside secondary sources for evaluation. The study of land use and land cover to complete three periods of time employed two types of techniques;

1) Visual-classification technique was applied for the land boundary and land cover based on the aerial photo and satellite image. Moreover, the GIS spatial database was used in two periods of time as follows.

- Data of the land use and land cover in 2002 based on the aerial photo (Figure 2)
- Data of the land use and land cover in 2010 based on U.S. satellite images from Google Earth application, which were developed by Keyhole, Inc. (Figure 4)

2) Data-combination technique was used to obtain information on the land use and land cover in 2008 based on a data combination of special use zones under the JoMPA project and land occupancy provided by SDF. (Figure 3).

Data of the land use and land cover in 2008 was subject to be compared with changes after the participatory land demarcation undertaken in the area, capable of demonstrating the efficiency of co-management aimed to reduce the conflicts of land demarcation.

To compare the results brought by the participatory land demarcation with changes on the forest area utilization, it revealed that during six years (2002-2008) before the participatory land demarcation, totally 164.32 ha of forest area were invaded or on average 27.39 ha of land per year. During the year of 2008-2010 or two years after the land demarcation completed, totally 17.28 ha of forest area are invaded or on average 8.64 ha of land per year. This also pointed out that the land demarcation reduced the forest invasion on average 18.75 ha of land per year.

Table 1: Land cover changes in Huai Sompoi Village

Year	Land cover (ha)		Land cover change (ha)	
	Forest	Non forest	Forest	Non forest
2002	1258.56	338.56	0	0
2008	1094.24	502.88	-164.32	164.32
2010	1076.96	520.16	-17.28	17.28

5. Conclusions

Co-management is anticipated to function as a new model for resolving the conflicts of natural resources engaging the targeted stakeholders to share their roles in planning and solving problems. The analysis of co-management key factors will enable it to successfully solve the problems arising from the natural resources.

5.1 Policy Implication on Co-Management in JoMPA.

A concept of co-management has been raised with regards to some conflicts of the land use in the forest area since no alternative solutions were available. More importantly, these problems have caused severe conflicts among the different groups of people who are backed up by various supporters such as the government offices, NGOs,

or scholars. Problem orientation and public space for discussions regarding the problem and its solutions are viewed as the startup of co-management necessary for this process. That is to say, public space or stage facilitates consultation over the causes of this problem and opinions from relevant parties to form the concept on a basis of scientific and social knowledge. Strategic plans and effective operation procedures through accurate and reliable findings as agreed by all parties can also be established in compliance with the Inside-out approach rather than the Outside-in approach.

Detailed studies of co-management under JoMPA by analyzing four main components of co-management; Complete concept of all dimensions, Co-management mechanism, Co-management tools, and Co-management process will help promote co-management to achievements with regard to ecological sustainability, sustainable economic development, and better life quality of the locals. Conclusions can be drawn below.

- Cooperatively establishing and developing the concept to comply with the holistic approaches for all dimensions
- Incorporating four main elements; Holistic concept,Co-management mechanism,Co-management tools, and Co-management process
- Applying the concept for any operations which include strategies and appropriate procedures
- Addressing the turning points of the conflicts over the resources utilization regarded as a starting point to minimize the existing problems while urging more cooperation for natural resources management; land demarcation as agreed by all parties concerned
- Exercising the new authority as agreed by everyone based on the detectable evidence
- Strengthening the targeted stakeholders to fully take part while minimizing the number of people who are involved in the conflict, at the lowest level
- Promoting joint agreements and commitments as well as regulations for land demarcation

Formerly, solutions to conflicts of land usage in the shaded area were differently recognized by two parties. That is to say, the government officials whose duty is to conserve the forest viewed villagers as invaders. Accordingly, they rely on the applicable laws of forestry; Forestry Act B.E.2484, National Forest Act B.E.2507, National Park B.E.2504 and Wild Animal Conservation and Protection Act B.E.2535 to block access to use the land. In contrast, villagers claim their right over the land they occupied before official announcements by the government. Conflicts in relation to the land use arise among the communities are widespread. The problems are more complicated when there is a demand to reduce the opium problem, poverty, arrival of NGOs in support of the rights and participation of the communities for the natural resources management, and study of scholars regarding the right over the land use and natural resources.

Clear land demarcation as agreed by all parties is regarded a starting point of problem-solving approach over land use, while it helps the locals to agree upon the use of resources for economic development and ecological sustainability. Creation of the concept, strategy, systematic management process, proper sequence of actions, and proximity of stakeholders to the problem are truly essential.

The current trends of natural resource management incorporating more participation of villagers, NGOs, scholars and developers all help enable effective co-management. It is expected that better cooperation and joint management of involved parties will strengthen the targeted communities and stakeholders to effectively manage natural resources, land, water and forest based on an: ecological balance, economic development, and sustainable life quality. Co-management can be used in policy making for decentralization of natural resources management to the local level to generate participatory management and appropriate application for a particular context of each area and improve the method for right verification to comply with the Cabinet's resolution on June 30, 1998 referred to as measures and guidelines for land disputes in the forest area, specifying only the use of recorded aerial photo's.

Changes on the policy implication to adopt co-management rest on successful cases that are used as evidential proof in several areas are based on the fact that the decision making related to the land demarcation policy in the forest truly involves some considerations with regard to government administration, politics, and authority.

5.2 Policy Application

Regarding suggestions for co-management under JoMPA, achievements of this project based on participatory land demarcation which motivates concerned stakeholders to participate in the process of land demarcation as agreed by them. This also results in joint agreements and regulations for land use as well as effective enforcement apart from promoting the sustainability of natural resources management. The land use of communities and economic developments through a variety of productions either agriculture or non-agriculture occupations are effectively sustained. Suggestions for co-management are described as follows.

1) Success of co-management in land demarcation in the forest area can be further used for prevention of forest invasion by developing the database of government's land demarcation, especially in forest areas. This will bring positive accuracy and acceptance of all relevant parties whereas a survey can be undertaken quickly with no arising conflicts.

2) Co-management can be used to improve the method for right verification to comply with the Cabinet's resolution on June 30, 1998 referred to measures and guidelines for land disputes in the forest area.
3) Co-management can be used in policy making for decentralization of natural resources management to the local level to generate participatory management and appropriate application for a particular context of each area to accord with four main components of co-management.
4) Co-management can be used to keep track of forest resource management by getting the locals engaged in a survey and follow-up of the forest area utilization within regulations, as agreed among them before further reporting to the authorities.

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