

Impact of Land Use and Land Cover Change on Local Livelihood in Pha-Oudom District, Bokeo Province, Lao PDR.

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Introduction

In the main land of Southeast Asia, deforestation is a major constraint of environmental change, and the changing of Land-Use and Land-Cover always influence by the government policy on economic development pursue such as the expansion and promotion of agricultural product as well as the infrastructure needed (Fujita et al. 2007; Meyfroidt and Lambin. 2008). However, many scientists also pointed out that sometimes population growth and the density of inhabitant are also the causes in the region. In contrast, Fox and Vogler (2005) claimed that the study in Vietnam suggested the controversy of this statement.

In the case of Lao PDR, environmentalist and development experts have been discussing that development project - even benefit the country's economy in the context but the practical sometimes reverse, resulting in environment impact (Cornford. 1999; Baird and Shoemaker. 2005). It is stated in the summary of the report from Baird and Shoemaker (2005) that although economic and development policy have been very good intention in upgrading local livelihood and descending the poverty; in contrast, it often contributes to a long-term poverty and environment degradation and increasing social conflict in practice.

Forest declined in the past decades has been induced by some parts of the traditional plantation for food subsistence in the upland area. Thus, the government attempted to ban slash and burn cultivation through the land allocation program and introduced the so called "sustainable upland farming system" – this is to promote cash-crop production for both household consumption and commercial purposes. The new trend in cash-crop plantation promoted by the government of Lao PDR (GoL) is the booming of Para rubber plantation at the present. Although it is said to be the long-term income generation for the farmers, this kind of plantation recently disturbed the natural forest and some farmers shift back to shifting cultivation at the first year and then transfer to be Para plantation finally (Alton et al. 2005). Nevertheless, the historical interview of the elders in regard to the land use in the past decade will be able to develop to understand the detail of land-cover change (Fox and Volger. 2005).

Deforestation and forest degradation have continued at rapid rates. In the past, there were many reasons for the reduction of forests, including slash and burn cultivation practices, forest fires, and even logging without control (Vilayphone.et.al. 2002) cited in Thongphan (2004). Census data from 1990 indicated that 210,204 households practiced shifting cultivation, covering an area of approximately 245,877 ha (Phanthanousy.et.al. 2003) cited in Thongphanh (2004). This practice and uncontrolled forest fires have dramatically reduced the total forest area of the country.

In the past decades, development in the forestry sector has focused on conservation, land use planning, and resource tenure. However, the idea of land zoning has been talked and consulted among scientists and decision makers recently; these aspects are correlated and can not be separated in the context of forest management in Lao PDR. According to government's policy, the Land and Forestland Allocation System is a tool to stabilize shifting cultivation in order to conserve forest areas and maintain environment as well as to create job opportunity for local farmers. In many cases, after land has been allocated to communities and individual, there were no proper land use planning made at the community level, which sometimes has led to a situation where some villagers have tended to return to forest areas (Thongphanh, 2004). Therefore, land tenure and land use planning play important roles in supporting to the government's policy on Land and Forestland Allocation.

Table 1: Annual Implementations of the Land and Forestland Allocation Program

Year	No. Villages	No. Households	Total Area (ha)
1995-96	1,242	82,206	879,595
1996-97	1,327	40,158	329,580
1997-98	1,232	95,659	3,244,576
1998-99	1,009	90,886	855,527
1999-00	555	21,789	823,460
2000-01	508	29,361	673,992
2001-02	315	19,231	1,358,978
2002-03	322	22,027	495,627
2003-04	320	19,538	474,105
2004-05	300	19,316	-
Total	7,130	440,171	9,135,440

Source: Shifting Cultivation Stabilization Center, 2004

In any case, the Land and Forestland Allocation program provided opportunities for the poor farmers who had no permanent for agricultural purposes as shown in the Table 1 is the results of the implementation of the program.

Problematic Statement

The above mentioned dedicated that the destruction of forest areas is becoming a major concern of the government and some attempts have been made at policy making levels attempting to reduce this destruction. Decrees and regulations have been issued and declared in recent years. Although land use planning is a significant guideline for sustaining the utilization of land, in order to make a good land use plan, present land use and land ownership patterns should be carefully studied, especially the conflicts between government policy and local people in term of their beliefs and practice.

Present Land Allocation procedures and land use classifications are not clearly defined between agricultural land and forestland. This creates problems for local people in terms of classifying land use and their rights towards land and resources at the local level. Land use change for agricultural purposes can be indicated by means of two variables. The first is the opening up new forested land areas for rice cultivation. The second is the rotation period for shifting cultivation. Areas with shorter rotation cycles are those

where pressure tends to be greater and vegetation clearance more pervasive (Hirsch et al, 1994).

Resource Tenure and Land Use Planning are very important for the development of Lao PDR. Forest plays an important role to the rural communities. It serves as a source of firewood, shelter, food and medicine to local people. Timber is also one of the major export income earners for the country. Recently, the population has increased, leading to expansion of farmland and slash and burn cultivation, which has significantly damaged forested areas.

There are some scientists arguing that while the policy framework of the Land and Forestland Allocation act has been drawn beautifully in text, the process of implementing at the local level has been uneven, and in some cases the “ironic” effect of farmers return to protected forests, in order to invest in the land they have received from the Land Forestland Allocation Program. This is due to the fact that they do not feel the rights they have gained to use this land are secure. Until the Lao government gives villagers “secure” rights to agricultural and forestlands that cannot be revoked and give to the priority of concession, villagers will continue to engage in illegal activities on protected forests (Thongphanh, 2004). This is partially because the concerned organizations at the provincial level lack sufficient funding, time, and skilled staff members.

It has been questioned that whether the land and Forestland Allocation program is really the right way to solve the poverty problem of the local farmers. Hanssen (2007) noticed that an inadequate implementation of the policies and laws in Laos is always weak and lack of capacity in the state institutes.

Objective of Study

In Pha-oudom district, Land and Forestland Allocation were implemented in 1996. The major concern in the district is that most of the population living in this region engaged and experienced shifting cultivation and collecting non-timber forest product for their daily food consumption. The shifting cultivators settled in the mountainous area where the land is available for their cultivation, and later on the local authority had asked them to move from the uphill down to the plateau. This causes the land shortage for agriculture and raising resource conflict among the new comers and the long-settlers in the lowland areas.

In order to understand the situation of land cover change and the major impact of the on local livelihood, the following objectives are raised in this research:

- To examine the Land-Cover change in Pha-oudom and the selected villages between 1988-1997 and 2007.
- To investigate an adaptation of local people on Land Use and Land Cover Change.

Scope of the Study

Land use trends and changes are being investigated both before and after land allocation procedures. “Sustainability” is a basic criterion for resource management to be supportive of both livelihood improvements and maintaining environmental quality; sustainability is often an elusive concept, however - hard to define and even more difficult to measure. Nevertheless, a number of indicators of sustainability in livelihoods

and agricultural production can be measured in different ways (Raintree and Soybara, 2001). Basic indicators include: availability of subsistence foods, availability of land, productivity trends, and in the case of upland cultivation, trends in rotation cycles.

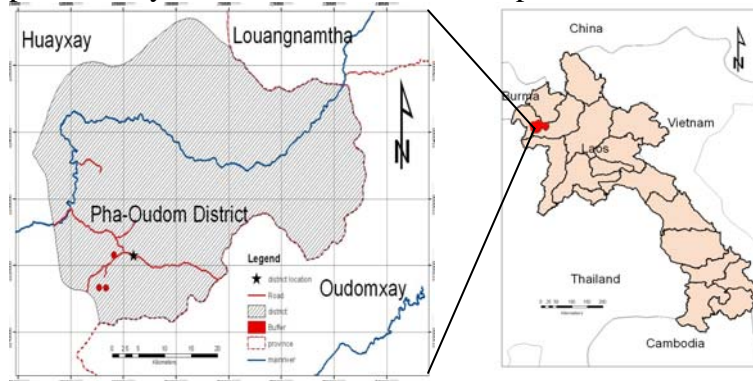


Figure 1: Study Area

This research is seeking for the indicators that affect to the changes of land-cover in the different time series (1988-1997-2007) in Pha-oudom district and the selected villages through the image interpretation. Local livelihood will be investigated through the questionnaires survey focusing on the socio-economic aspect. In this case, land use trends and the income generation are included as well as the availability of land resource for agricultural cultivation in three villages namely Namkha-Palao, Thampakae and Huaysang. The land record of individual household was also investigated collected after the implementation of the LFA program. However, this method was not easily due to the fact that some information about the land holding and the category of land type was not clear.

Materials and Methods

Materials

Unclouded and terrain corrected three Landsat images were selected to use in this study. To understand the transitional state of land-use and land-cover over the previous decades in Pha-oudom district, the satellite data of Landsat 5 TM between 1988 and 2007 were used. The image rectification was done prior to the image processing. The 1998 image was registered to UTM, zone 47 and the other were rectified using image to image registration technique based on the 1998 image. The image processing and data manipulation were conducted using ERDAS® IMAGINE™ 8.6 and ArcGis 9.1. Handheld Garmin GPS eTrex® HC (12-15 m accuracy) was used to collect the sample point during the field survey and some ancillary data were also used as reference in image process.

Methods

Spatial databases were developed by using Landsat Thematic Mapper and Enhance Thematic Mapper images (Fox and Vogler, 2005). In order to understand the transitional state of land use and cover over the previous decades in Pha-oudom District; the satellite data of Landsat5 TM between 1988 and 2007 were used. The image rectification was

done prior to the image processing. The 1998 image was registered to UTM, zone 47 and the others were rectified using image to image registration technique based on the 1998 image; the RMS (Root Mean Square Error) for the image registration was set to less than 0.02 pixels. By using the maximum likelihood classification of the supervised classification, each Landsat image was classified into five categories including water, forest, shrub, agriculture land (including swidden and paddy field). GPS data collected from the field was used to verify the image classification results. The Land use data were put into geographical Information System (GIS) analysis; ArcGis 9.0 were used for analyzing the land-cover and forest change in particular selected study sites (Thongmanivong and Fujita. 2006; Fujita et al. 2007).

- Landsat-5/TM 1988, Path/Row: 130/46
- Landsat-5/TM 1997, Path/Row: 130/46
- Landsat-5/TM 2007, Path/Row: 130/46

The classification of the land use and forest-cover types is based on the criteria of the Laotian Ministry of Agriculture and Forestry guideline as explain in the following:

- Forest: This type of land cover is dominant by trees and has crown cover density is equal 20% or higher. The standing tree usually has Diameter at Breast Height (DBH) equal or higher than 10 centimeter and height is equal or more than 10 meters. This land cover can be found mainly in the protection forest, conservation forest and on the high steep area where the accessibility is difficult.
- Secondary forest: This category is old fallow from shifting cultivation. Normally, large tree is not presented but it is dominated by bamboo. There are some small trees, DBH is less 10 centimeters and height is below 10 meters. This category could be found throughout the area especially around the active swidden field
- Shrub and grass: This type of land cover is young fallow land developed from recent shifting cultivation; they are young fallow land where the vegetation cover is mainly bushes and grass.
- Agricultural Land: The agricultural areas were compound of two category: (1) Upland agriculture; where the slope is more than 8 percents. This includes active shifting cultivation area, new clear land and residential area of the hill people and (2) Lowland agriculture; it is the agriculture land where slope is equals or less than 8%. This category is mainly lowland paddy field, pasture land and other clear lands.
- Water: This category includes all boggy area such as rivers, streams, reservoirs and wet lands.

Results

Forest-Cover Dynamic in Pha-oudom District

Image interpretation in the Pha-oudom district between 1988 and 2007 has shown a high percentage of forest cover. However, forest cover has been gradually declined during the 19 years. In 1988, 82% (153,798.66 ha) of the total landscape was dominated by forest cover - but it remaining 66% in 2007. The study proposed to select buffer areas with 2 kilometers radius from the village center point as sample in three villages namely, Namkha-Palao, Huaysang and Thampakae. Similar to the whole district, it was

dramatically shrunk within 19 years. In Namkha-Palao, forest covered 45 % in 1988, 34% and 22% between 1997 and 2007. Not that much different in percentage of forest from the previous village; Huaysang had 45% of forest in 1988; 32% in 1997 and only 9% in 2007. For the newly settling Thampakae, found that 56% of the buffer area was cover by forest in 1988; 40% in 1997 and remain 10% in 2007.

Table 2: Change Matrix of Land-Cover in Pha-oudom District in 1988 – 1997 (ha)

Land Cover Type	Mature Forest	Secondary Forest	Shrub/Grass	Agriculture	Water	1997
Mature Forest	127,310	13,164	8,084	5,224	12	153,794
Secondary forest	3,251	10,130	91	854	-	14,326
Shrub/Grass	6,927	1,057	4,741	1,790	2	14,517
Agriculture	719	505	477	1,407	-	3,108
Water	259	-	18	-	71	349
1988	138,466	24,856	13,413	9,275	86	186,094

It was between 1997 and 2007 that the forest land area has been converted to shrub/grass at about 22,890 ha; followed by secondary forest at 4,596 ha; agricultural land 3,735 ha and water 93 ha. In reverse, 9,281 ha of secondary forest were transformed to forest; 4,519 ha from shrub/grass; 2,390 ha from agricultural land and again 36 ha gained from water body.

Table 3: Change Matrix of Land-Cover in Pha-oudom District in 1997- 2007 (h a)

Land Cover Type	Mature Forest	Secondary Forest	Shrub/Grass	Agriculture	Water	1997
Mature Forest	107,150	4,596	22,893	3,735	93	138,467
Secondary forest	9,281	12,428	1,432	1,714	-	24,855
Shrub/Grass	4,519	664	6,636	1,572	22	13,413
Agriculture	2,390	2,396	2,368	2,048	72	9,274
Water	36	-	9	-	41	86
1988	123,376	20,083	33,338	9,069	228	186,094

There are some reasons of changes in Land-Cover in the past two decades. For instance, the abandon slash and burn cultivation areas are automatically converted to shrub/grass at the first stage while farmers shift to the new place for cultivation. Secondary sometimes become mature after the ban of government on slash and burn. Nevertheless, the official ban on shifting cultivation does not mean that it can completely stop the clear cutting for upland rice plantation. Mature forests are always disturbed by this kind of cultivation.

Correlation between Land and Forestland Allocation, Land-Cover Change and Tenure System in the Lao PDR

In Southeast Asia, deforestation has been degraded for decades and continuously. Likewise, Lao PDR were seriously facing the forest degradation during the transitional period of collective to market economic plan. It was clear to see that Land and Forest

Land Allocation is one of the attempts to eradicate the above mentioned problem, and thus, this program came out with some bias of security on tenure system and land use change. There are many studies indicating the root factors of shrinkages; the most popular evidence after the implementation of this policy is the insecurity in tenure and restricted access to natural resources at the local communities (Thongphanh, 2004; Barney, 2007). The case studies of three research teams of NUOL-IDRC project on community-based natural resource management (CBNRM) capacity training during 1999 to 2002 indicated the effect of LFA on land use change and livelihood. The teams concluded their results in the same direction that land for agricultural production had limited to access and villagers turn faced the food shortage because of the restrict of common resource accessibility. Beyond the limitation of access, subsistence livelihood were replaced by the market oriented economic system which is the encourages for farmers to shift themselves to rush up in cash hunting for investment of agricultural and finally reverse back to against the law by illegal activities alert in the forest (Thongphanh, 2004). However, Land Allocation does not always have an oppose results, in some cases; positive on forest protection and even can avoid the destruction of community forest (Funke, 2001).

In the case study of Pha-oudom, the forest protection in the whole district seems to be in danger. This is because of the return of shifting cultivation and the booming of Para rubber plantation. The image interpretation shows that the number of forest is slightly decrease during 1988 and 2007 from 83% in 1988, 74% in 1997 and remain only 66%. In this district the main cause of change in forest cover is the demand of upland rice cultivation (Slash and Burn) because 65% of the total land area is mountain and 80% of population is Khmu minority and those of them experienced clear cut for plantation along the hill shed.

It has been said and blamed that clear cut for farming should be abandoned, and it does-after the implementation of Land and Forestland Allocation. Thus, the long-term sustainability of this kind of restricts were not be able to achieve in some rural areas-since the official extension service does not reach the demand of farmers in term of technique and market quarantine for agricultural products. Meanwhile, the need of food consumption is demanding. Rice is the main nutrient and only way to have enough rice for household is to cultivate upland rice in the uphill of the mountain in Pha-oudom. I do not argue that the lowland is not available for rice planting in this area but it is very limited only in the flat land around the district central.

In the target villages, the tenure system still remains both customary and state law recognition. The Land Allocation program had been done during 1995-96, and thus the demarcation was clearly indicating the right to use and manage the resource within the territory of each village. The temporary certificate of land use right were documented immediately after the process of LFA, and it seemed that the resource management system were well at the beginning. There, the original habitants faced no inconvenience in regard to land availability. Thus, when the official encourage the people in uphill to move down to the flat land area, the need of land expansion for agricultural were high and some of the village have to provide some part of their territory to the new comers-this happened in the case of Thampakae village where Mokxo and Huaysang provided land for the settlement as well as the land for cultivation.

The correlation between the land allocation and land cover change in the study villages however does not directly concern to each other. However, the study found that

deforestation in these communities still continues to decline increasingly. One of the reasons for the destruction of forest is that the returning of shifting cultivation in the areas, especially in Huaysang village. The booming of Rubber plantations is taking place after the rice plantation. The state promotion of rubber is one of the strategies to support farmers after the LFA but in return it affects to the forest protection as the aim of the policy (*The provincial authority planed to have 15, 000 ha all over the province in 2010 and Pha-oudom is one of the target area for rubber plantation*). When the officials indicate the forestland as degraded forest within the villages, the concession is likely to be available for investors; this can be risky of forest clearance as well (Barney. 2007).

General Discussions

Changing in Land-Use and Land-Cover

Land-Cover change in Southeast Asia is illustrious on logging and slash and burn practice. In Laos, there are many factors affecting the changes of land use and land cover in past four to five decades. The civil war during 1963 to 1975 had claimed forest destruction from bombing; the collectivization system needed expansion of agricultural during the early socialist era (1975-1985); market liberalization and trade (1985-1990) also increased the expansion of cash-crop garden and the post-socialist era (1990-present) to stabilize slash and burn cultivation and normalization of trade still need more land cash-crop plantation as well as infrastructure development (Fujita, 2006).

Changes during 1988 – 1997

Pha-oudom district claimed to be one of the most forest damaged by slash and burn practice in the past two decades. However, although the landscapes were foreseen largely for subsistence upland rice field but the image interpretation shows a slow change of mature forest to secondary forest and agriculture during 1988 to 1997. As the result of image processing found that 5,224 ha of the forest were converted into agricultural land, therefore the secondary forest were also generated to be mature forest (3,251ha) and some agricultural land turned to be forest (719 ha); this is believed to be slash and burn which is abandoned by the farmers.

There are many reasons for the changes of land use and land cover. As mentioned by Fujita (2006) that aside from slash and burn; civil war, agricultural expansion are expected to be the causes. However, a reason for this expansion is the fact that the increasing of population and economic expectation of the farmers change their future view from subsistence to economy perspective. In this point even though I don't have any visible evident to indicate the change of population and the need of land expansion but according to the discussion with the farmers during the survey; the elders explained the historical of land use and the livelihood perspective in their younger time that land was commonly used (land for upland rice planting), and they lived easily based on the nature and land was not high in competition regarding to its usage.

According to the image interpretation during 1988 to 1997, the buffer area of the study villages found that only 49 ha of forest were transmitted to agricultural but 158 ha were claimed as shrub and grass land in average; however, the shrub and grass land will automatically develop to be second and mature forest in the next 10 years if there is no disturbance of human activity. This situation is also happened in the other two communities of Huaysang and Thampakae as well.

Changes during 1997 - 2007

It was similar with the time period of 1988 to 1997. Pha-oudom still faced the destruction of forest that effected by upland rice cultivation. However, the new evident of increasing in its population is clearer than the previous mentioned time period. Although the view of local livelihood initiative is not so much different from the time backward, the government's policy toward the poppy cultivation and poverty eradication in the rural area has pushed to the relocation of the mountainous ethnic groups. The migrant from nearby province such Oudomxay, Luangnamtha, Luangprabang province and even the returnees from Thailand refugee camp are putting the number in its population of Pha-oudom. It is found that in 1995, the population in Pha-oudom was estimated about 11,466 inhabitants; increasing in 2003 up to 33, 104 and 36,400 in 2007. This can be evidence that rapid increasing of population can not be avoided in land demand for agriculture purposes.

In the study villages; increasing in number of inhabitants is also found. Whereas the land is not available to expand any more since the demarcation made after the land and forestland allocation program putting much more pressure to the villagers to fight for their livelihood. One more factor that can not be denied to be the actor in the changes in this region is that the demand of land for rubber plantation; it was said by the province official that 15,000 ha of rubber plantation in the whole Bokeo should be reached in 2010. This is also putting the pressure to the land demand in Pha-oudom and it already happened that more than 100 ha of land were provided to Chinese company for rubber nursery within the village territory Homsouk near by Huaysang and Thampakae.

Conclusions and Recommendations

Conclusions

Following the central GoL's strategies on poverty reduction and stabilization of shifting cultivation, Land and Forest Land Allocation Project was carried out since 1990 in Luangprabang and Seabury provinces as pilot project. Given lessons learnt from these two provinces it speeded in implementing through out the nation wide in 1996, and in Pha-oudom it also started in the same year. This research focuses on the impact Land-Cover change on local livelihood. It aims to understand the economic condition and how the villagers adapt themselves to the changes especially after the completion of the Land and Forestland Allocation project.

The study found that the livelihood of the local people have not much changed during 1990s, however, it was more emphasized after 2000 when the market oriented was widely promoted. As an isolated district, limited official staff and level of skill, lack of facilities assessment, high slope landscape and minority unique- it is difficult for economic development.

Between 1988 and 1997, after the implementation of Land and Forestland Allocation, shifting cultivation was banned by the state and demarcation had been made between the inter-villages. Temporary documents on land use right were issued to the farmers who were allocated the land. The process of allocating the land was the local based with the assistance and consult from the project team, this process abolishing the cultural practice (Southavilay, 2005). Natural resources with the community's territory were controlled and managed by the villagers themselves. Wet rice cultivation and cash-crop were introduced with support by Rural Development in Mountainous Area Project (RDMA). However, in this time period the cash-crop plantations were not so boom because the

market was not easy to be reached and very few middle traders come to buy the products.

From 1997 to 2007, the ban of shifting cultivation practice were no more in effect and this is due to the fact that some villagers return back to do their cultural slash and burn plantation again. Some new comers moved from the mountain area and other near by province to settle. Some rules resulted from the land allocation program were ignored and the resource and land conflict between the original and marginal inhabitant began. For instance, the case of the settlement of Thampakae was first ignored by the Huaysang and Homsouk villages because they lost their control over the land that they use to manage before, but it was solved by the negotiation and supervision of the official.

The study also observed an inequity of land holding between the rich and the poor, especially in Huaysang Village. It seemed that the poor have less power in negotiation and fewer opportunities than the rich whenever it required an official involvement. By the regulation of LFA, one active labour can obtain one ha and it can be more if the farmer require, and however the requirements have to be considered by the officials and make sure that land will be used effectively. The farmers who have more properties and well-known or respective elites in the society always have more opportunities in making profit. However, this case is not always happened in all communities in Pha-oudom but in just some cases the inequity is feasible. In the Namkha-Palao, it was clear that the land conflict was not foreseen since the landscape is mainly lowland and the paddy field were already made before the demarcation. It is a kind of customary practice to inherit their ancient property from generation to generation. Likewise, Thampakae does not appear so much in land conflict between the villagers themselves but with the nearby villages in some cases because some of them bought the land in the other villages for wet rice cultivation. In any case, this community has a very strong and well-organize administration.

The economic condition in the study villages during the survey in 2007 presented a shameful benefit. There is a gap in the livelihood characteristic between the new settlers and original inhabitants, especially different minority. Namkha-Palao is rather relaxing their livelihood and not so much pressure made for their lives, and they mainly focus on rice production in both rainy and dry season- since the irrigation is available and water supply for cultivation is more convenience than other two communities. They can earn from selling husk rice and other cash-crop products for about 710 US\$ annually for the wealth off group, 178 US\$ for the medium and 155 US\$ for the poor (see figure2.1). There are more opportunities to run a small trading as well due to the fact that the village is located in the closer to the district capital and road assessable. For the second old settlement Khmu village, Huaysang (The poorest community), villagers are too strong in cultural practice in upland rice planting. Farmers in this village almost short out of rice for more than 5 months per year (84% of population is poor), and only 5 households are considered as the wealthy. This village also has a gap between the poor and the rich; the poor always serve as the labour for the rice or even for the villagers near by. It is difficult for the official to evaporate the poverty in this community because they still have a strong believe in their traditional of cultivation behind them; this is including the ancient's spirit respect (believe in ghost and spirit of ancient). They always have a minus balance of their saving. For the new settlers, Thampakae, the Hmong minority has a long history of hard working people. Since they have very limited land available and much pressure on incentive farming, they do have similar opportunity among the rich and the

poor. It is clear that they can develop their household economy better than other two villages in general.

To response to the research objective, it seems that the impact of the Land and Forestland Allocation policy does not directly affect the local livelihood in term of economy condition, and on the one hand it is a tool to encourage farmer to have more incentive farming and in order to increase household income and get rid of poverty. However, the traditional practice of the villager had change a bit since they have a new natural resource management system and the right over the resource is completely distinct. It means the common property on resource use and was replaced by the state rules which are sometimes difficult for villagers to accept it but it ashamed.

In the image interpretation section, land use and land cover change in the whole district shows an important factor that shifting cultivation still remains practicing. During 1988 to 1997, 13,164 ha of mature forest were converted to secondary forest, 8,084 ha to be shrub/grass land while agricultural land gained 5,224 ha from forest. It is believed that changes was not directly from one type to another but just a cycle for instance from shifting cultivation (agricultural) to shrub/grass, then secondary forest while the mature forest can be directly change to agricultural land.

From 1997 to 2007, the major change is the transform of forest to be shrub/grass land (22,893 ha) while 9,281 ha of secondary converted to forest – this is clear to be like that. Like the period of 1988 and 1997, the direct change from type to type could not be happened, except from forest to agricultural. It could be assumed that the factors affecting the change in land cover are mainly slash and burn cultivation, and this is because there were not so big project (like hydropower dam, mining etc) implemented in this region, except the irrigation dam project which is not so much impact on land cover change. There is only clear factor that could have directly impact- the increasing of population during 1988 and 1997 (22,638 people increased). The migrants that moved into this region may need the land expansion for agricultural purposes- that is one factor to affect the land cover change.

In regard to the research objective to study the impact of the LFA policy on land cover change, it is not clear if the project directly impacted. According to the field observation and the history of land use practice in the past decades, it could be understood that the changes of land cover are impacted once the implementation of the LFA project due to an official ban on slash and burn, and hence the returning of such kind of cultivation comes back because the villagers have no choice and they have to assure their food security.

The other worry of the land use change from now on is that the expansion of rubber plantation. It is, however, no evident in Pha-oudom to shows the impact on the degradation of forest recently- this is due to the fact that it just began. But no one can assure that it will not be a disturbance to forest in the future, as Alton (2005) already pointed out that conservation forest was disturbed by the need of rubber expansion in Luangnamtha province. In that case if the authority is not concerned and has a good management plan for natural resources, it would not be easy to control the expansion and finally the forest clearance will be in pressure.

Recommendations

Improving the basic need of the grass root level is important to push up and support to the country economic development. While the regional competition on development is

high, technologies are highly used to support the macro and micro economy- this is putting much pressure to natural resource utilization and significantly needs the excellent management system to avoid the rapid use of resources. In order to claim the significant of the future development, there is a need for scientific support to the master plan. Many researchers and specialists have claimed unintended ironic effect of the development policy, especially rural development project where stakeholders and actors are in different way background or point of view in the context of development; it always come out with an unaccountability impact, because of the weakness of both planning and implementation.

The study in Pha-oudom district had come out with some idea and evident that the policy sometimes is just a path way of dynamic changes. While the population is increasing, the equity opportunity will not be stable and increasing in competition among the actors. In order to ensure the equitable and sustainable development, it is necessary to evaluate the recent policy in particular the land use planning and land allocation program. It needs to make sure that the villagers benefit in a sustainable manner. In this study the author raised the following recommendations.

Livelihood Strategies

It is necessary to understand the local lifestyle before starting to do something that may occur in the way people in that area can be adapted. In this context, the land allocation attempts to provide security on land right and promoting sustainable land use in order to increase the household income at the grass root level by turning the direction of subsistence to market oriented economy. However, sometimes it can be the cause of poverty if the implementation was not carefully studied. For the future implementation, I should recommend that basic information on historic of land use should be studied. Thus, the result would not so much affect to the livelihood of the stakeholders. For the land conflict among the inter-village, law enforcement should be taken place with the respect of the local customary right and the involvement of the local official in negotiation is the good way to solve the conflict.

In order to ensure the food security and solving the gap between the rich and the poor, there is need to improve the productivity by introducing the new variety of seeding but should not ignore to traditional seed that is suitable for the land fertility in the area. As it is shown in the high opportunity in income generation, animal husbandry is very easy and suitable for the farmers to save their income, especially cattle and buffalo.

Economic development needs the strong community administration and committee to negotiate the market price and official cooperation (as appeared in Thampakae). It is important for the farmers to involve in decision making process in regard to the development project that is offered by the authority, and this will help to make clear procedure of the implementation. Cash-crops play an important role in agricultural products beyond rice, and however, farmers always have a limited choice for the market price negotiation because of the monopoly company (It appeared only 1-2 companies collecting agricultural products in Pha-oudom). Official should seek for market for farmers in order to have choices and they will be eager to increase their product if there are some more market places. Beyond the cash-crop for industrial market purpose, it seems that the local consuming of organic vegetables can be the new choice for the farmers to support domestic consumption.

Para rubber plantation is now becoming a new fashion of the farmers in Pha-oudom, although there is no clear direction of market place and price. There is a need for the official to ensure the further impact, even though it is not easy due to the lack of expertise in this field. However, the contract farming system should be clear and make it in effort that farmers will not lose their land and become wage labour finally for the foreign company.

Land Management

As the population is dramatically increased, there is much more pressure to the use of land and natural resources, and it is hard to stabilize the shifting cultivation in the remote area because the farmers have not so many choices in cultivation. The current land allocation provided the multipurpose of land use and management, nevertheless, the land information system was not the good managed and in some cases the data storage at the district level was disappeared, because of the weak data management system; this also mentioned in the workshop on Evaluation of 10 years Land Allocation (1996-2006) held in Vientiane during 18-19, December 2006.

The study in Pha-oudom had evidenced the poor management of official, due to the lack of budget, limited staff and large landscape. In order to strengthen the management, it needs the involvement of many actors and stakeholders to create the committee among the villagers and official to help in good cooperation; official alone will not be possible to control such large landscape. Authority should take responsible for the whole scene of management while the villagers should also take responsibility in obeying and follow the agreement made during the process of allocation.

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