SUSTAINABLE FOREST MANAGEMENT IN LAOS

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Laos (Lao People's Democratic Republic) has the problem of deforestation and forest degradation. One of the reasons is on shifting cultivation in short term. The increasing of the population puts a pressure on an agricultural sector. Local people cannot help performing a shifting cultivation in short term, although they had traditionally done long term. This problem is similar with 'the tragedy of commons', suggested by G. Hardin (1968). The Lao's government implements the forestry policy, 'Land Forest Allocation Program'. This policy is to define clearly the boundary and classification of land in the basis of the land-use of local communities. And, the main function of LFAP is to regard local community as forest manager and allow them to practice customary rights to utilize forest without a shifting cultivation in forestry law, that is, to adopt the approach for local community to participate in managing forest. This paper made clear that LFAP turns a shifting cultivation from sustainable method to unsustainable one. And, it made clear that community-governance plays a role as sustainable forest management in LFAP. First, it was turned that deforestation was related with the change in land-use in the basis of statistic data in LADA. Second, this problem is approached in terms of the Ostrom's theory, the analysis of economics. Third, on field survey in Louangphabang prefecture, it is turned that the system in village is consistence with the Ostrom's theory.

1. The change in land-use and deforestation in Laos

Lao People's Democratic Republic (in the following, it is called Laos) is surrounded by Vietnam, China, Myanmar, Thailand and Cambodia, and is the only landlocked country among them. The borders of Laos and Myanmar, Thailand are along Mekong River, and the borders of Laos and Vietnam is along the Annamite Range. Laos is roughly classified into two type area; upland area and lowland area. In the upland area, where the most area of Laos is consisted of, local people get various resources from forest and make use of them as fuel, food and furniture etc. They depend on forest resources for the survival.

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Figure 1: the map of Laos

Source: Researcher's own construction in the basis of this site (http://www.freemap.jp/)

   However, the current forest is decreasing at about 2% every year (refer to the table 3). It is mentioned that the cause of deforestation is a shifting cultivation, illegal logging and expanding agricultural land. Although the population in Laos is a smaller than its neighboring countries, the density of the population in Laos is increasing more and more recently (refer to table 1 and 2). And most of the population is engaging in an agriculture sector (refer to figure 2). Because the increasing of the population is mostly absorbed into an agriculture sector, the increasing of the population changes the land-use of local communities.

Table 1: Population (total) in countries neighboring Mekong River

|	2007	2008	2009	2010	2011
Lao PDR	5,931,385	6,022,001	6,112,143	6,200,894	6,288,037
Myanmar	46,915,826	47,250,315	47,601,374	47,963,012	48,336,763
Cambodia	13,669,857	13,822,644	13,977,903	14,138,255	14,305,183
Thailand	67,796,451	68,267,982	68,706,122	69,122,234	69,518,555
Vietnam	84,221,100	85,122,300	86,025,000	86,927,700	87,840,000
China	1,317,885,000	1,324,655,000	1,331,380,000	1,337,825,000	1,344,130,000

Source: The world Databank, http://data.worldbank.org/indicator, access 7,April, 2013

Table 2: Population density (people per sq. km of land area)

1990	2000	2010
18.16	23.04	26.87

Source: The world Databank, http://data.worldbank.org/indicator, access 7,April, 2013

Figure 2: Allcation of employment in each indutries
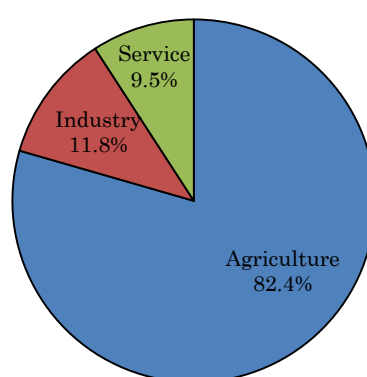
Source: Suzuki (2009)

The change of the land-use can be seen in the table 2. According to the table 2, the distribution of the current forest had decreased for 20 years while one of potential forest and permanent agriculture had increased. The potential forest includes bamboo, 'unstocked' forest, shifting cultivation. According to FAO (2010, p.7), the definition of 'unstock' is as following;

unstock forest areas are previously forested areas in which the crown density has been reduced to less 20% because of logging, shifting cultivation or other heavy disturbance. If the area is left to grow undisturbed, it becomes forest again. Abandoned ray and disturbed stands with a crown density less than 20% should be classified as unstocked forest area. Old ray in which seedlings, sapling and tree cover more than 20% of the area should be classified as some type of current forest.

Table 3: The shift of Land-use group and Land-use type

Land-use group and Land-use type	Distribution in %			Change in % per year		
	1982	1992	2002	1982-1992	1992-2002	1982-2002
1. Current forest	49.14	47.16	41.49	-1.98	-5.67	-7.65

|					
Dry dipterocarp	5.22	5.10	0.56	-0.12	0.47	0.35
Lower dry evergreen	0.37	0.36	0.24	-0.01	-0.12	-0.14
Upper dry evergreen	4.67	4.48	5.86	-0.19	1.38	1.19
Lower mixed deciduous	3.77	3.65	3.72	-0.12	0.07	-0.01
Upper mixed deciduous	32.91	31.46	23.22	-1.44	-8.24	-9.68
Gallery forest	0.38	0.37	0.12	-0.01	-0.25	-0.26
Coniferous	0.58	0.56	0.38	-0.03	-10.18	-0.21
Mixed coniferous	1.24	1.18	2.22	-0.05	1.04	0.98
Tree plantation	-	-	0.17	-	-	0.17
2. Potential forest	**36.14**	**37.97**	**47.10**	**1.67**	**9.50**	**10.97**
Bamboo	6.25	6.47	2.28	0.32	-4.19	-3.88
Unstocked	27.45	28.68	42.64	1.23	13.96	15.19
Shifting cultivation	2.52	2.64	2.18	0.12	-0.46	-0.34
3. Other wooded area	**6.53**	**6.10**	**1.21**	**-0.43**	**-4.89**	**-5.32**
Savannah/open woodlands	4.11	3.85	0.40	-0.26	-3.45	-3.71
Heath, shurb forest	2.41	2.25	0.81	-0.19	-1.43	-1.60
Sum of all forest area	**91.80**	**91.10**	**89.80**	**-0.74**	**-1.25**	**-2.00**
4. Permanent agricultural area	**2.99**	**3.59**	**5.07**	**0.60**	**1.48**	**2.08**
Rice paddy	2.78	3.33	4.07	0.55	0.74	1.29
Agriculture plantation	0.06	0.08	0.92	0.01	0.84	0.85
Other agriculture land	0.15	0.18	0.08	0.03	-0.10	-0.07
5. Other non-forest area	**5.22**	**5.36**	**5.14**	**0.15**	**-0.22**	**-0.08**
Barren land, rock	0.46	0.49	0.98	0.03	0.49	0.51
Grassland	3.40	3.48	2.45	0.08	-1.03	-0.95
Urban land	0.35	0.36	0.57	0.01	0.22	0.22
Swamps	0.14	0.15	0.22	0.01	0.07	0.07
Water	0.86	0.89	0.93	0.03	0.04	0.07
Sum of all non-forest area	**8.21**	**9.95**	**10.21**	**0.74**	**1.25**	**2.00**
Total	**100.00**	**100.00**	**100.00**	**0.00**	**0.00**	**0.00**

Source: LADA (2009) *Proceeding of the regional land degradation assessment in drylands (LADA) workshop for southeast Asia*
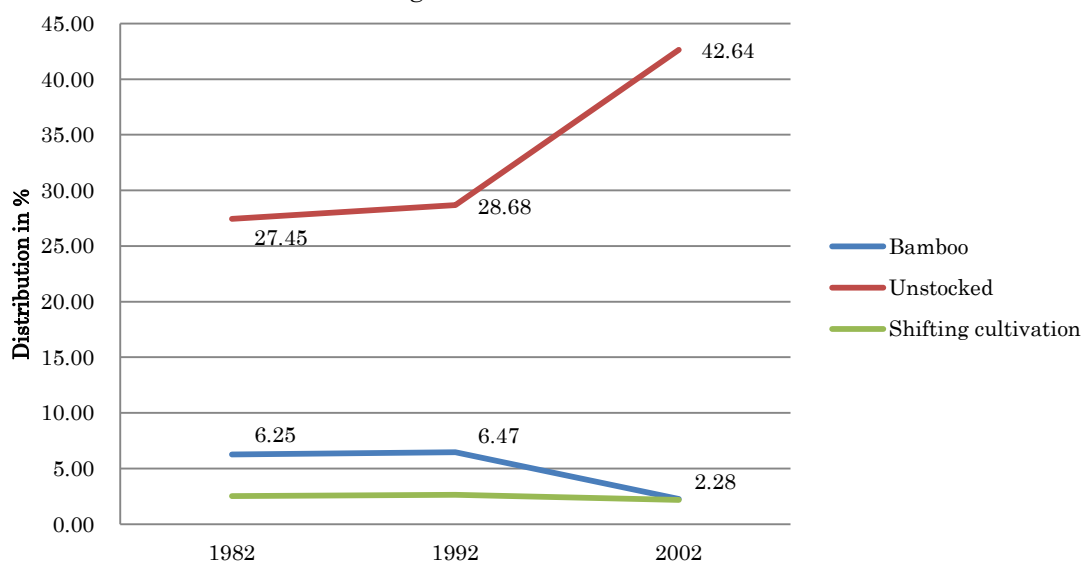
Figure 3: Land-use group and Land-use type
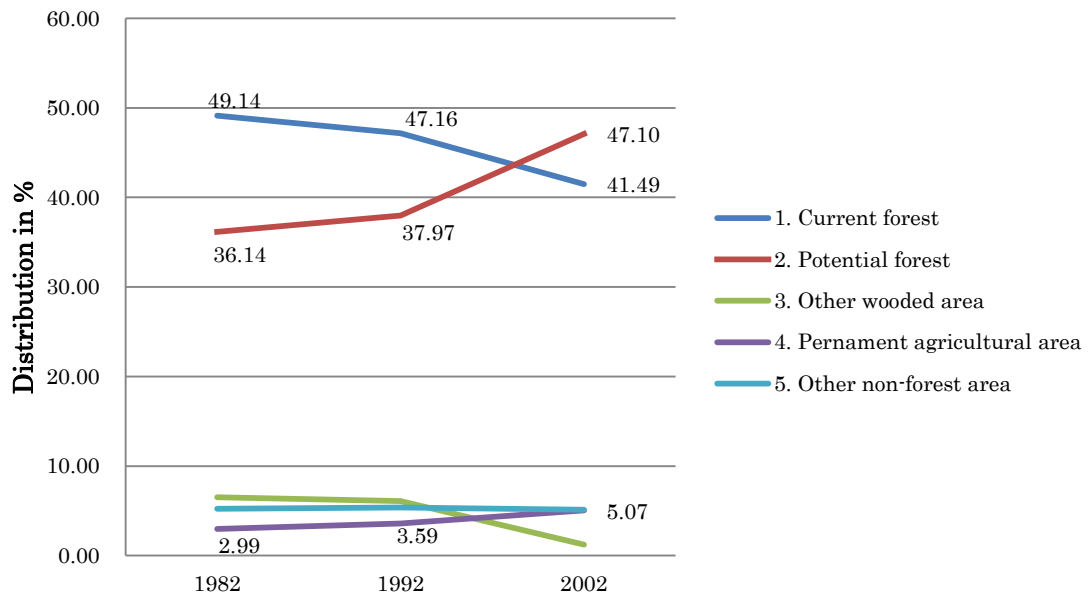
Source: Researcher's own construction in the basis of LADA (2009)

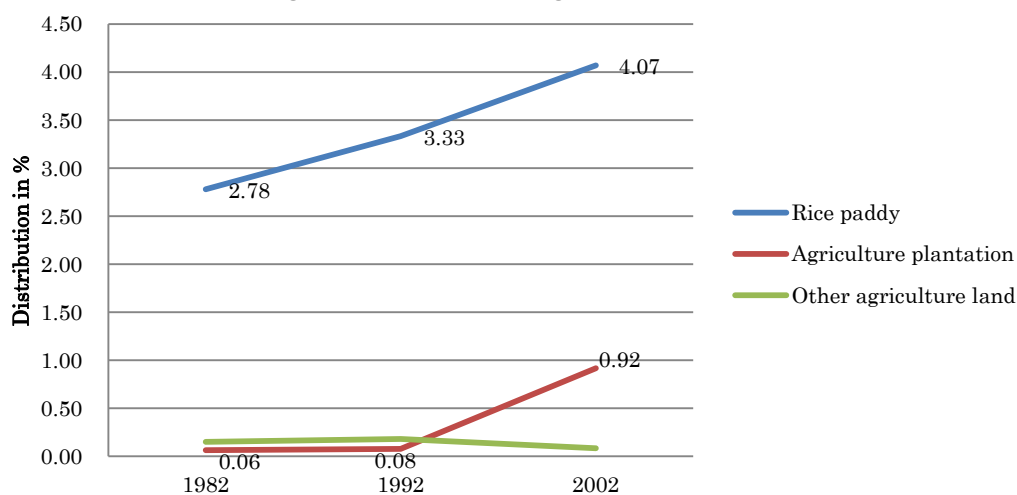
Firure 4: Current forest
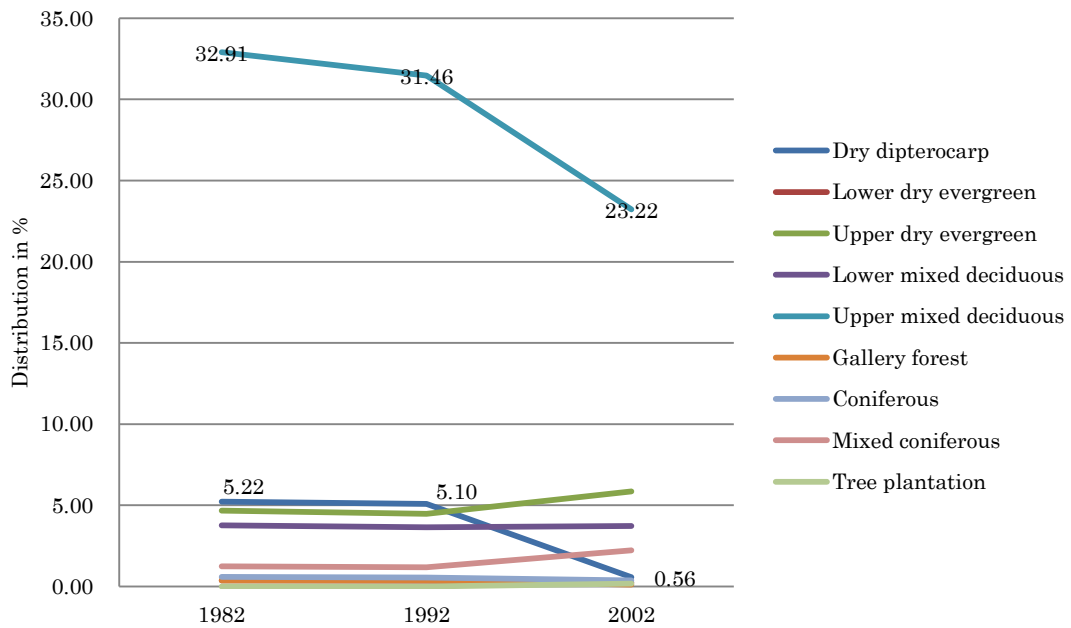
Source: Researcher's own construction in the basis of on LADA (2009)

Figure 5: Potential Forest

Source: Researcher's own construction in the basis of on LADA (2009)

Figure 6: Permanent agricultural area

Source: Researcher's own construction in the basis of LADA (2009)

In according to figure 4, the species decreasing substantially in current forest are upper mixed deciduous and dry dipterocarp. In according to Sasaki (1987), these species are cultivated by shifting cultivation in Asia. In according to figure 5, rice paddy and agriculture plantation had increased in permanent agriculture area.

From these results, it is turned out that a shifting cultivation in short term brings about the change from current forest to unstocked forest and permanent agricultural area (rice paddy and agriculture plantation). It is turned out that these change is the

cause of deforestation.

Deforestation can have the negative influence on the environment and local life. The runoff can happen in deforestation areas. That can lead to soil erosion and such natural disaster as flood and drought (e.g. the flood in Thailand). A natural disaster can put the negative influence on both upland and lowland. Soil erosion reduces upland agricultural production and food insecurity in upland. And it also turns the soil into the siltation of reservoirs and wetlands in lowland. Lestrelin (2010, p. 427) calls that process the 'chain of degradation' narrative. So, to prevent forest from decreasing can protect economic condition in both upland and lowland.

In the upland, because the increase in population makes local people practice a shifting cultivation shortly against their traditional way, the deforestation and land degradation proceed more, and that leads them to live in poverty. This is just the negative spiral.

Picture 1: The surface of upland after shifting cultivation

Source: Researcher's own photograph

So, the problem of deforestation in Laos needs to be tackled in terms of the management of forest and reduction of poverty. Laos' Government issued the forestry law in 1996 and land law in 1997, and implemented forestry policy, 'Land-Forest Allocation Program (LFAP)',[2] in 1996 in response to the deforestation and the environmental problem. This policy is to define clearly the boundary and the classification of the land on the basis of the custom of local communities to utilize a land (in detail, refer to the following sections).

The main function of LFAP is to regard local community as forest manager and allow them to practice customary rights to utilize forest without a shifting cultivation in

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[2] It is called 'Map Din Mop Pa' in Laos.

forestry law, that is, to adopt the approach for local community to participate in managing forest.

2. Forest policy in Laos
1) law institutions
The study of law institutions is advanced in Namura and Inoue (1998, pp. 24-25). The point of it is summarized the following:

· **The Constitution**
The constitution is issued in 1991 and amended in 2003. The state grantees the organization and individual's the right to use and right of the occupation, use, profit from it, transfer and inheritance (Article 17). In other words, the land is the property of state, but the organization and individual can have the right to use.

· **The land law**
The land law was issued in 1997 and amended in 2003. In Land law, the type of land are classified into eight categories; (1) agricultural land, (2) forest land, (3) water area land, (3) industrial land, (4) communication land, (5) cultural land, (6) land for national defense, (7) land around water resources, and (8) construction land. The types of land for which the right to utilize is allocated to organizations or individuals are agricultural land, constructional land and forest land.

The right allocated to organizations or individuals can have been valid for three years, and during this period if land has been used according to the objective and regulations, and there is no objection and claim, or those claim have already been settled, then organizations and individuals have the right to apply to the land management authorities at provincial or city level for the issuance of title right for long term use right (Article 22).

· **The forestry law**
The forestry law was issued in 1996 and amended in 2007. Forestry law determines the basic principles, regulation and measure about forest. In forest law, forests are classified into five categories for the purpose of preservation and development; (1) protection forest to conserve watersheds, to guard against soil erosion and to protect dense forests, etc.; (2) conservation forests to conserve wild animals and plants; (3) production forests to produce wood and NWFP; (4) regeneration forest, or the young fallow to be regenerated forest, or the young fallow to be regenerated immediately; and

(5) degraded forest land or barren land.

The type of forests for which the right to utilize is allocated to organization or individual is only degraded forest. They have the right of occupation, use, the profit from it, transfer and inheritance. And, by law, they are allowed to practice on the base with local custom, that is, on the customary right, except shifting cultivation within production forest, regeneration forest and degraded forest.

2) 'Land-Forest Allocation Program'

Lao's government has implemented 'Land-Forest Allocation Program (LFAP)' since 1996 when the forest law was issued. LFAP is to make clear the ownership and the classification of the land within the country in the basis of the utilization and the ecological condition of a land, and then ensure the management and use of each land classification. The objectives of LFAP are as follow[3];

1) To manage and use natural resources in general and the land, forest and watershed resources in effective and sustainable way as well as to ensure the protection of the environment and the natural richness in perpetuity

2) To reduce and progress toward f shifting cultivation by total termination developing permanent agricultural-forestry system and occupation, in view to gradually uplifting the livelihood of pluro-ethnic population, particularly the shifting cultivators families and poor families to satisfactory level

3) To promote higher production of food and food stuff

4) To promote the investment in commodity production thus generating additional income for household

And, eight steps of the implementation of LEAP are following;

Table 4: Steps of implementation

The process	Items	Contents
Step one	Preparatory step	· Gathering of related documents such as decrees, order and regulation etc. · Preparation of forms for collection data on socio-economic matters and others · Preparation of material, equipment and budget

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[3] Namura (2008, p. 207), MAF (1996, p. 1)

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		· Preparation of detail plan of operation
Step two	Step for consultation with village	· Discussing with village organization and authority · Listening to report on socio economic situation of his village · Absorbing the decrees related to land and forest · Passing the plan of operation for land-forest allocation of the village

Step three	Step for actual data collection	· Organizing into forest allocation team and land allocation team
		  - forest allocation team: ground survey on village boundary, forest boundary, other land boundary
		  - land allocation team: collection of information and discussion with each family about agricultural production

Step four	Hold open discussion meeting for the whole village	· To come to an agreement on land use plan of the village and determination of boundary for land-forest allocation within village
Step five	Step for actual field measurement	· In actually making the measurement, it should be organized according to the Administrative units prevailing in the villager or to production groups such as: rice planting, banana planting, sugarcane can planting, fruit tree planting and others
Step six	Step for extension	· Listening to report of each working team · Passing draft rule developed in collaboration with villagers for each type of agricultural and forest land · Granting the temporary land management permit certificate to each family · Writing up contract for land-forest allocation committee of the district and village authority and the families

		depending on the type of land
		· Setting up production groups, conservation groups within the village
Step seven	Step for extension	· The agriculture forestry office of the district must make available the personnel to support and provide technical advice as well as to attract other economic agents and agricultural promotion bank to facilitate the commodity production as such: release of credit, provision of fertilizer, insecticides, necessary production equipment and deal with the making as well
		· Attention is to be given to the training of development agents at village level in each line sector, primarily agriculture, forestry, livestock sectors and others
Step eight	Step for monitoring and evaluation	· To be conducted regularly, seasonally draw lessons in to improving the working for higher and higher efficiency, up to 3 year time limit during which the land is put into actual production, the land management authority is to issue land registration and permanent land ownership title in accordance to law

Source: MAF (1996) *Instruction on Land –Forest Allocation for Management and Use*

   From the research of the interview in village, Hyakumura (2005) turned out that the process implemented with local communities is in the following: (1) to define the boundary in each village on the base with the discussion among villages in a region, (2) to decide the classification to utilize lands on the base with a customary right to utilize them within the boundary, and to draw on the map of the classification to utilize lands from the results of (2), (3) to make rules to utilize lands for each classification, and (4) to allocate the land to local people who don't have enough agricultural land from the socio economics' research for local communities.

   And, the lands are allocated to local organization and individuals, base on the slope of

the land. This is in the following table:

Table 5: Measures guiding land use for each slope

Slope from 0-12%	To be used as agricultural land
Slope from 12-25%	To be used for terraced paddy, animal raising, fruit tree planting, commercial cropping with soil protection measures
Slope from 25-38%	To be used for garden cropping, animal raising, fruit tree planting, commercial cropping with soil erosion control measures
Slope from 38-48%	To be used for garden cropping, if neseccary, fruit tree planting, agroforestry system with soil erosion control measures
Slope over 45%	To be kept always covered with forest to prevent soil erosion

Source: MAF (1996) *Instruction on Land –Forest Allocation for Management and Use*

In short, these law institutions are introduced for forestland to be efficiently utilized and sustainably managed not only by state or by individuals (privately), but also by the organization in the village (commonly). The right to utilize land is granted to organizations and individuals in these laws. That encourages them to have the incentive to manage forest, plant trees, cultivate crops and so on. This approach is the market solution though Laos is socialist state.

Also, in LFAP it is stated that the boundary of types of forest in village is classified by the administration and local communities. And, the customary right to utilize forest is allowed under these laws. This approach is only the community solution.

As the population increases more, the scarcity of resources is higher, so it is necessary that the right is reallocated in community or among communities. In terms of Ostrom's a theory, community who collectively appropriates from these resources manage them themselves under such rules as the decision of the boundary of the appropriation or the allocation of the right. In that sense, the implementation of LFAP may be effective for resolving the problem of deforestation in Laos.

So far, the study of the forest management in Laos is mainly advanced in the field of forest policy or geography. Namura and Inoue (1998) find out first to confirm the disparity between   the legal right to use land and the actual use of land and forest by local community in the basis of the research of the village before introducing LFAP and to propose a strategy to establish an effective legal system.[4] Hyakumura (2005) find out the problem about operation side of the policy on the basis of the research of the village after introduction of LFAP.

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[4] Namura and Inoue (1998, p. 23)

Although these studies are important, the approach of the economics also is important in terms of how scarcity resources are efficiently allocated to people or sustainably managed. Suzuki (1996) turn out that the deforestation by a shifting cultivation is related with the increasing of population on the terms of 'disguised employment', which means that people is engaged with the labor on the condition with marginal production is equal to zero or extremely low.

However, Suzuki (1996) doesn't approach to focus on household, not on the community. The problem to manage collectively recourses in community can be tackled on the approach of "Common-Pool Resources (CPR)" which is resources appropriated or managed collectively or commonly. In other word, because resources to be collectively managed in community have the attribute to be overexploited or not to be sustainably managed, it is necessary that this problem is resolved by governance voluntarily designed in community, not by government intervention.
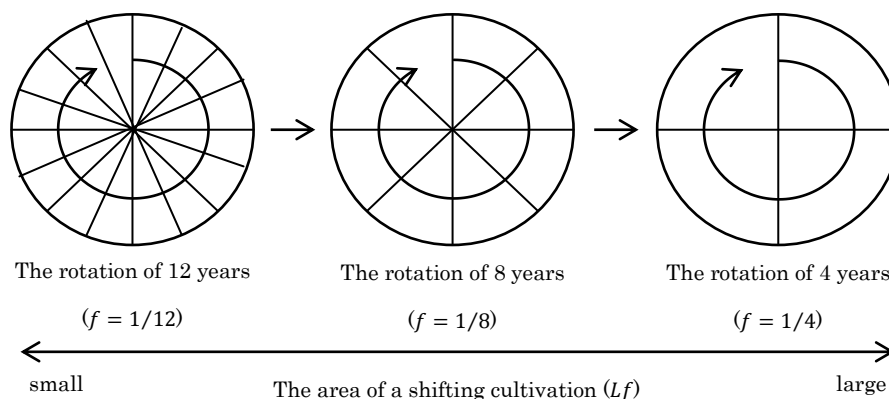
3. The management of forest as 'Commons'
1) Model analysis of a shifting cultivation

Because if individuals independently decide to use CPR to maximize his interest, the negative externality happens, CPR is overexploited, that is, resources are not allocated efficiently. Is the case of a shifting cultivation similar to one of CPR? In the following, that is confirmed by the simple model analysis.

It is assumed that there are some households ($i = 1, 2, \ldots, n$) in a village, and they earn by shifting cultivation in their own forest land. These forests are neighboring each household. This situation is similar with one of the commons. Where, it is assumed that the land which he possesses is same quality ($L_1 = L_2 = \cdots = L_n$) and constant value ($\bar{L}$). Each household i decide to divide its own land (L) into any parts (K) per year, and he practices shifting cultivation in $1/K$ parts of it per year.

For example, if household i divides ten parts ($K = 10$), he do in one-ten parts ($1/10$) of it a year, that is, the rotation of a shifting cultivation is for 10 year. If $K = 5$, he do one-fifth parts ($1/5$), that is, the rotation is for 5 year. So, as the division (K) increases more, he cultivates more parts of land (refer to figure 7).

Figure 7: The change of a shifting cultivation's rotation

| The rotation of 12 years | The rotation of 8 years | The rotation of 4 years |
| ($f = 1/12$) | ($f = 1/8$) | ($f = 1/4$) |

small   The area of a shifting cultivation (Lf)   large

Source: Researcher's own construction

Where, any divided parts ($1/K$) are regarded as the frequency of a shifting cultivation (f). So, the area of a shifting cultivation per year is Lf. As the frequency rise more, Lf expands more. The yield by a shifting cultivation per units (Y) depends on Lf;

(1) $Y = y(Lf)$ $(y' > 0, y'' < 0)$

Because much of labor input is needed to practice a shifting cultivation, especially slashing and harvesting, threshing and carrying to the village, when a household practices a shifting cultivation (refer to table 3), other households help do it. And also, it is likely to happen that shifting cultivation leads to a forest fire to neighboring forest of other households.
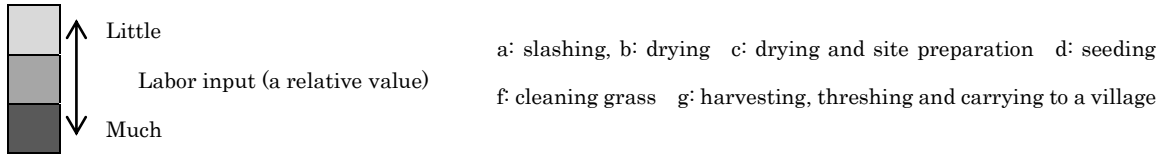
It is assumed that all household ($i = 1,2,\dots,n$) help a shifting cultivation by other household in a whole village. So, the cost function of household i depends on Lf_{-i}[5] of others. If $w(> 0)$ is the cost of cultivating Lf, then total cost of a shifting cultivation (C) is described by the equation;

(2) $C = wLf_i + wLf_{-i}$

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[5] $f_{-i} = f_1, f_2, \dots, f_{i-1}, f_{i+1}, \dots, f_n$.

Table 5: The schedule of a shifting cultivation in a year

months	1	2	3	4	5	6	7	8	9	10	11	12
seasons	Dry season			Rainy season							Dry season	
		a					F					
Upland rice			b							g		
(a shifting				c								
cultivation)					D							
						E						

Little

Labor input (a relative value)

Much

a: slashing, b: drying   c: drying and site preparation   d: seeding

f: cleaning grass   g: harvesting, threshing and carrying to a village

Source: Yokoyama (2012)

It is assumed that there two households in a village, and each household independently decides the frequency (f_i for $i = 1, 2$). If a price of the yield is 1 ($p = 1$), the profit of each household is described by the equation;

$$(3) \quad \begin{cases} \pi_1 = y(Lf_1) - wLf_1 - wLf_2 \\ \pi_2 = y(Lf_2) - wLf_1 - wLf_2 \end{cases}$$

The profit is maximized when the derivative $\partial \pi_i / \partial f_i$ is equal zero. At that time, each household decides the frequency (f_i) to maximize his own profit, and don't consider the action of other household.

$$(4) \quad \begin{cases} \partial \pi_1 / \partial f_1 = Ly'(Lf_1^*) - wL = 0 \\ \partial \pi_2 / \partial f_2 = Ly'(Lf_2^*) - wL = 0 \end{cases}$$

$$(4)' \quad \begin{cases} y'(Lf_1^*) = w \\ y'(Lf_2^*) = w \end{cases}$$

The equation (4)' is the first order condition, that is, the profit is maximized when marginal revenue is equal to marginal cost.

Next, it is thought that two household is merged into one organization, and then this organization decides the frequency (f). In this case, the frequency of two household has

the same value. The profit function is one which each of equation (3) is sum up into;

(5) $\Pi = \pi_1 + \pi_2 = 2y(Lf) - 2(wLf + wfL) = y(Lf) - 2wf$

And, the profit is maximized;

(6) $\partial \Pi / \partial f = Ly'(Lf^{**}) - 2wL = 0$

(6)' $y'(Lf^{**}) = 2w$

When the equation (4)' is compared with the equation (6)', the value of marginal production in the equation (6)' is higher than one in the equation (4)'. That means that the frequency of the equation (4)' is higher than one in the equation (6)', so the value of Lf^* is larger than one of Lf^{**}.

To generalize this result, the equations are following;

$Ly'(Lf_i^*) = wL$ (Nash equilibrium)
$Ly'(Lf^{**}) = nwL \ (n > 0)$ (Pareto efficiency)

In short, the privately cultivated lands are more overexploited than the jointly cultivated lands because of the negative externality, that is, private marginal cost is not consistence with social marginal cost. The implication of above discussions is that because forests which were commonly used in the village is separated by the introduction of the forest policy in Laos, forests are more overexploited in a sifting cultivation than before. Traditionally, Local people have voluntarily set up the mechanism and rules of a decision-making, the allocation of resources, conflict-resolution, and so on, that is, a community-governance for long time in a community in order not to lead to the situation to be overexploited. They have managed to appropriate resources from the commons in the basis of community-governance.

2) Common-Pool Resources

The most famous thesis about commons may be ***The Tragedy of the Commons***, in *Science* (1968) written by Garrett Hardin. This thesis is that the commons will necessarily be overexploited because individual to appropriate it pursed own interest. This problem is related with the attribute of the commons. The commons is regarded as '**Common-Pool Resources** (CPR)' which is related with appropriation (=consumption) for

the commons. These attributes are the difficulty of excluding individuals from benefiting a good, that is, open to all ('**open-access**') and the subtractability ('**rivalness**') of the benefits consumed by one individual from those available to others.

These attributes make appropriators overexploit CPR. If a single owner manages resources, he decide to appropriate them until the point that marginal cost is equal to marginal revenue, that is, to maximize a profit. But, in the case of CPR, open to all, he decide to withdraw from them until the point of marginal cost to appropriate CPR equal not to marginal revenue but to average revenue, that is, the profit is zero. And, because CPR has the high subtractability, as the appropriator increase more, the field of CPR is more likely to be on the condition of congestion, and occurs to negative externality that the action of one agent adversely affects the profits of the other agent without appropriate compensation being paid.[6]

Since *The Tragedy of the Commons* suggested by Hardin, there is controversy about commons problems. That happens between those who argue 'private resolution' on one side and 'government's resolution' on the other side. The former argue that the commons is divided, privatized because it is efficiently managed through the exchange in the market. The latter argues that it is managed by government or national authorities.

However, both arguments may lead to either 'market failure' or 'government failure'. 'Market failure' occurs when the allocation of goods and service in market is not efficient, and results from externality, free ride, or information asymmetry. 'Government failure' occurs when the intervention of government makes the allocation of goods and service in market inefficient. Ostrom (1990) argues that CPR has been managed not only by market or government but also by self-governance which is voluntarily organized by appropriators for long time, that is, **community-governance** [7]approach.

3) Community-Governance of CPR

Ostrom researches the some fields where CPR has been successfully managed and not done in the basis of these field researches, discovers a set of eight design principles that characterize all of these robust CPR institutions (refer to table 4).

Table 6: Design principles illustrated by Ostrom (1990, p.90)

Rules	Contents
1. Clearly defined	Individual or households who have rights to withdraw

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[6] Leach (2004, p. 126)
[7] Bowles and Gintis (2002) regard it as one to complement a market or a state, and point out the importance of it.

	boundaries	resources units from the CPR must be clearly defined, as must the boundaries of the CPR itself.
2.	Congruence between appropriation and provision rules and local condition	Appropriation rules restricting time place, technology, and/or quality of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.
3.	Collective-choice arrangements	Most individuals affected by the operational rules can participate in modifying the operational rules.
4.	Monitoring	Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
5.	Graduated sanctions	Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense), by other appropriators, by officials accountable to these appropriators, or by both.
6.	Conflict-resolution mechanism	Appropriators and their officials have rapid access to low-cost local arena to resolve conflicts among appropriators or between appropriators and officials.
7.	Minimal recognition of rights to organize	The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
For CPRs that are parts of larger systems:		
8.	Nested enterprises	Appropriation, provision, monitoring, enforcement, conflict, resolution, and governance activities are organized in multiples layers of nested enterprises.

Source: Ostrom (1990, p.90)

Ostrom (1990, p.51) defines the "institutions" as the sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what provided, and what payoffs will be assigned to individuals dependent on their actions. And Ostrom (1990) categorizes informal (local) rules into the three levels of analysis; constitutional choice, collective choice, operational choice.

Table 7: The level analysis of institution

Arena	The processes

Operational choice	The processes of appropriation, provision, monitoring, and enforcement
Collective choice	The processes of policy-making, management, and adjudication of policy decision
Constitutional choice	Formulation, governance, adjudication, and modification of constitutional decisions

Source: Ostrom (1990; 2005)

Operational choice rule is the processes of appropriation, provision, monitoring, and enforcement, collective choice rule is the processes of policy-making, management, and adjudication of policy decision, and constitutional choice rule is formulation, governance, adjudication, and modification of constitutional decisions. For example of the appropriation of ground water resources, the rules that individuals withdraw water from a well is operational choice one, such institutions to manage ground water as the adoption and penalty about well digging is collective choice rule, and the decisions of the management system and governance structure about well digging is constitutional choice rule[8].

In the following, the relation between LFAP and Ostrom's theory is considered from the field research in the northern area in Laos

3) The case of Houaykhot village

I had researched Houaykhot village Xienngun district, Louangphabang prefecture for 5 and 6, September, 2011, and participated in the meeting to decide the rules of using forest in detail. The distance from Louangphabang district to this village is 4km. It takes about 1 hour to go from Louangphabang district to this village by car.

In this village, Lao Theung and Lam Lam ethnic live in this village. LFAP had already been implemented in 1996. Villagers understand the importance of the conversion from a shifting cultivation to other land-use or the conservation of forests. The main income is from lowland rice, livestock raising, income other than agriculture. The total land in the village is 946.49ha, and the categorization of the land is as the following;

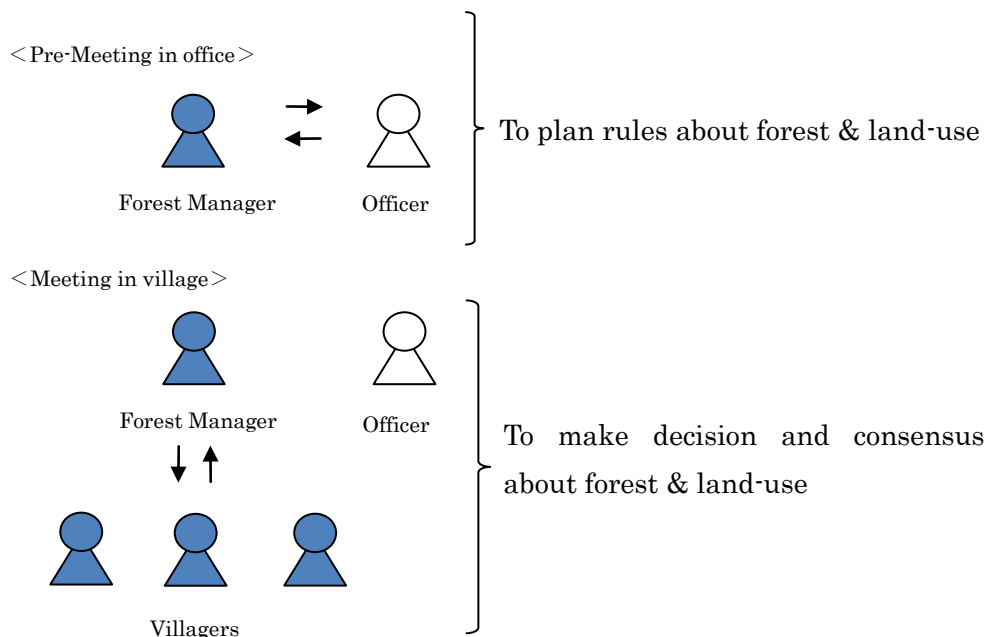Table 8: The categorization of the land

Total land (ha)	946.49
Phu Chom Ngea Conservation Forest (ha)	165.72

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[8] Yabuta (2004, p.17)

Protection Forest (ha)	282.87
Use Forest (ha)	42.26
Cemetery Forest (ha)	6.77
Paddy field (ha)	29.74
Agricultural land (ha)	204.47
Tree plantation (ha)	149.85

The purpose of this meeting is to decide the rules of using forest in detail (e.g. a penalty of the sanction). Most of villagers participated in this meeting. In this meeting, the person in the charge of forest-management in the village explained to other villagers in detail (refer to figure 8 and picture2, 3). He, the administrator and a staff of JICA (Japan International Cooperation Agency) set up the draft of these rules before the meeting, and in the meeting they were building the consensus of it one by one. The penalty is set higher than the amount to get money by selling a wood on reflection of participators' opinion. It was decided that one-third of the penalty is paid to the witness, and the two-third is stocked on the village fund to manage and conserve forests.

Figure 8: The procedure of making decision and consensus about forest & land-use

＜Pre-Meeting in office＞

Forest Manager   Officer

To plan rules about forest & land-use

＜Meeting in village＞

Forest Manager   Officer

Villagers

To make decision and consensus about forest & land-use

Source: Researcher's own construction

Picture 2: The meeting in the village   Picture 3: Forest manager in the village
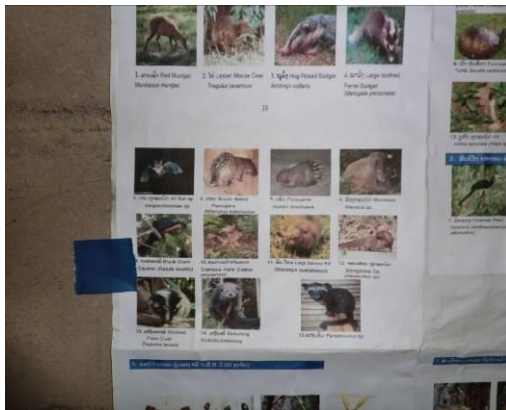
Source: Researcher's own photograph

Source: Researcher's own photograph

Picture 4: The table of danger and scarce species

Source: Researcher's own photograph

And the table written about some non-timber forest products that is officially banned (e.g. WWF) is shown to participators, and told them not to take their products. This is important, for if local people don't know that, they may take such products on the base with local custom.

Also, in this meeting, a participator presented the opinion that the spread of a shifting cultivation and illegal logging is practiced by other villager. The problem that the consensus is made among the surrounding villages must be tackled in the future.

Next step is to adapt this case to the theory of Ostrom, and to take up the rule of a penalty in the village. Ostrom categorizes informal (local) rules into the three levels of analysis; constitutional choice, collective choice, operational choice. In the case of Houaykhot village, the rule of penalty and monitoring is set up to refrain villager from breaking the rule (e.g. illegal cutting or shifting cultivation). These rules are the 4 and 5 of 'designed principles' by Ostorm. If this case is adapted to the three levels, it can be considered in the following;

Table 8: The level analysis of institution in Houaykhot village

Level	The processes
Operational choice	To monitor the forests within the boundary
Collective choice	To decide how much th fine will be for the member to break rules in the village
Constitutional choice	To form governance about the allocation of the penalty to the witness and a village fund

That villagers actually monitor the forests within the boundary is operational choice rule, that they decide the amount of a penalty to break rules in the village is collective choice rule, and that they form the system that one-third of the penalty is allocated to the witness and two-third of it is allocated to a village fund is constitutional choice rule (refer to figure 9).

Figure 9: The system about monitoring and allocation of penalty
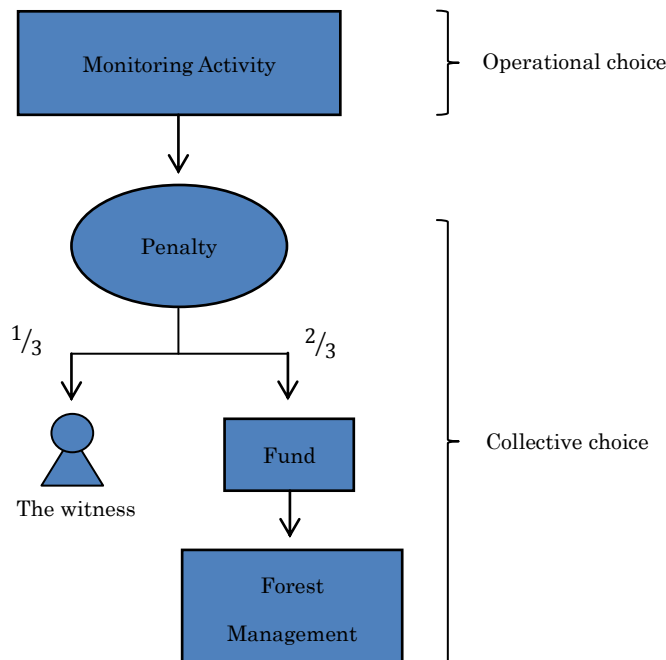
Source: Researcher's own construction

In this village, LFAP had already been implemented, and the classification and boundary of land is clearly defined (the rule 1 of clearly defined boundaries). And those affected by the operational rules can participate in modifying the operational rules (the

rule 3 of collective-choice arrangements) and such rule in operational choice as monitoring and penalty is decided by local people (the rule 4 of monitoring and rule 5 of graduated sanctions).

Conclusion

　In this paper, it is turned by the simple model analysis that the practice of a shifting cultivation in private land occurs to negative externalities like CPR. Although the costs of exclusion may be substantial, forests in a shifting cultivation are collectively governed and managed directly by those who appropriate from these resources in Laos. They have made rules to govern and manage these resources in their community for long times. 'LFAP' changes the collective land-use of local communities into the private one. That can lead land and forest to be overexploited.

　In other hands,, because of the increasing of the population in Laos, local people can't help but raising the frequency of shifting cultivation and expanding the cultivated area to get more income. That is why the appropriation of forestland comes to be inefficient and unsustainable especially in upland. Because the increasing of the population makes the scarcity of resources higher, the right for resources needs to be reallocated in community or among communities.

　In other hands,

　'LFAP' has the possibility to be theoretically effective for reallocation of the right for resources and sustainable management of forest in that it clearly defines the classification and boundary of land-use, and allows local community to govern and manage forest on the customary way.

　In this paper, 'LFAP' is analyzed in terms of Ostrom's theory, and then the result is confirmed from the field research. However, in this paper, it is turned out that these systems are not quantitatively or qualitatively functioned. This point need to be tackled in next step.

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