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A Structural Analysis of Communal Forest Management
in the Low-lying Areas of Lao PDR

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This paper shows empirically how local communities in the low-lying areas of Lao PDR manage the common-pool resources of the communal forest. Previous studies showed that the local community participates in forest management. However, they did not address the question of whether local communities can appropriately manage communal forests. This question pertains to the management of common-pool resources. According to Ostrom (1990), common-pool resources are excessively appropriated, due to the negative externalities, and insufficiently managed, due to the free rider problem. This paper focuses on the institutions that local communities establish in efforts to prevent or mitigate these problems and on the communities' social capital. According to Inoue (2009), Ostrom (2003), and Ostrom and Ahn (eds.) (2003), social capital plays a role in encouraging the members of local communities to contribute to the management of common-pool resources. In this paper, we use structural equation modeling (SEM) to analyze quantitatively the structure of communities' social capital with regard to forest management. We reach three conclusions. First, villages have institutions to prevent the problem of forest overuse. Second, local residents do not always manage the communal forest well, due to the free rider problem, but if they create and maintain long-term social capital, they tend to manage the forest better than if they do not. Third, combining reciprocity with other social capital factors—trust and the social network—may mitigate the problem of overuse without the community having to establish a formal institution.

Keywords: Communal Forest, Free Rider, Social Capital, Common-Pool Resources

1. Introduction

The aim of this paper is to analyze the role played by *social capital* in *communal forest* management in the low-lying areas (altitude of less than 400m) of Lao PDR. In these low-lying areas, villagers can gather some materials (e.g., firewood, food, and timber) from the communal forest.

Forest land area in the low-lying areas of Lao PDR has been shrinking and deteriorating as a result of population growth and the influence of the market economy. This population growth consists of not only natural growth but also migration from

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mountainous areas, because in the 1980s and 1990s the Lao government implemented policies to encourage the migration from mountainous areas to low-lying areas. In addition, after the Lao government adopted a market system, as part of *chin tanakan may*, some people voluntarily migrated to urban areas and suburban areas (e.g., the Vientiane capital, Vientiane province, and Bolikhamxay province). The market economy also has influenced land-use patterns: for example, people have converted forest land to agricultural land in order to cultivate cash crops and harvesting increasing volumes of material from the forests to sell at market). In addition, some companies have developed forestland and closed it off to local residents.

Although residents of the mountainous areas mainly utilize forestland to produce some foods by a slash-and-burn technique, residents of low-lying areas take some materials (e.g., firewood, food, and timber) from the forest for life. Moreover, in the low-lying areas, as a source of water, flood control, and so on, the forest also plays a role in protecting residents' lives.

The Lao government's forest policy permits local residents or organizations to use the land by allocating use rights to them (although the government retains property rights to the land, because Lao PDR is a socialist nation. The aim of the government's forest policy is to utilize efficiently the lands and resources by delineating land boundaries and categorizing forests.

In addition, the Lao government permits villagers to exercise the use right of *communal forestry*, based on the national land management authority No. 564 "Adjudications Pertaining to Land Use and Occupation for Land Regulation and Titling," enacted in 2007. Based on that forestry policy, the communal forest program issues to a village the right to appropriate and manage the communal forest on behalf of the villagers. For the purposes of this paper, we define the village's management of the communal forest as *community governance*.

Resources, such as a communal forest, that are appropriated by a community can be regarded as common-pool resources. Common-pool resources have as attributes non-exclusion and rivals. These attributes cause negative externalities for the community. In other words, common-pool resources are appropriated inefficiently and unsustainably (the problem of *overuse*). Furthermore, free riders benefit from the common-pool resources without having to participate in or contribute to their management. The existence of these free riders prevents the appropriators who co-manage the resources from improving the efficiency and sustainability of use even if they attempt to do so; this is the problem of *undermanagement*.

Most previous studies of communal forests were based on *forestry sociology* (Inoue, 2000, 2003; Inoue and Hyakumura, 2000; Namura and Inoue, 1998). Specifically, they focused on the participation of local communities. They did not discuss the free rider problem or whether local residents participate in or contribute to the management of the communal forest and what problems they face if they participate.

Inoue (2009), Ostrom (2003), and Ostrom and Ahn (eds.) (2003) mentioned that whether local residents participate in or contribute to the management of the communal forest depends on the social capital of the community. Previous studies mentioned that social capital represents social relationships and plays a role in restraining the emergence of free riders. Many studies have defined social capital, generally as being comprised of the societal factors *trust*, *reciprocity*, and *social networks*. However, few studies have quantitatively analyzed social capital.

In this study, we use a common-pool approach to quantitatively analyze whether social capital in community governance restrains the emergence of free riders.

This paper is organized as follows: Section 2 presents the empirical data based on the author's field research in the Sangthong district, Vientiane Capital. First, the institution that was established in order to manage the communal forest is described. Then, the analysis method—ANOVA, t-tests, and structural equation modeling (SEM)—is summarized. In section 3, the results of the analysis are presented. Section 4 summarizes the results and their implications.

2. Empirical Survey in the Sangthong district, Vientiane Capital

2-1. Basic Information

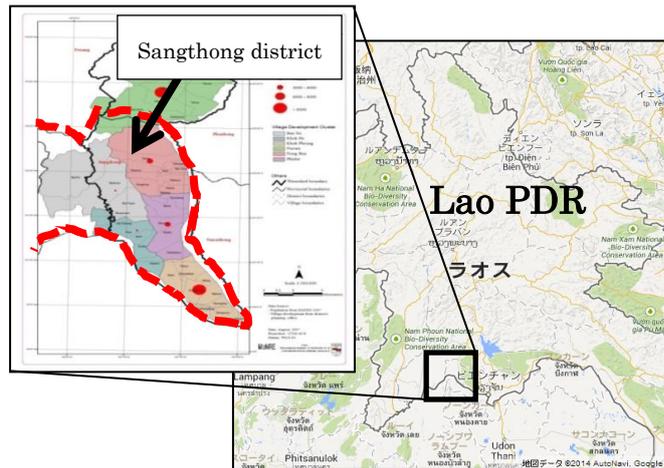
The Sangthong district is located approximately 60 km west of Vientiane capital, along the Mekong River (see Figure 1). This district is surrounded by mountains and includes Phou Phanang National Biodiversity Conservation Area (NBCA) as well as residential areas at altitude of less than 200 m. The district covers a land area of approximately 800,000 ha and consists of approximately 40% agricultural land, 50% forestland, 6% wetland and 4% others.

Migrants from other area, especially Luang Phanbang province, entered the Sangthong district in increasing amounts during 1995–2002 (Sayalath et al., 2011). The increasing migration inflow resulted in the conversion of forestland to agricultural land and the development of plantations such as rubber tree cultivation. Such development have encourage forests degraded and decreasing. Forest degradation and deforestation have led to disasters, such as soil erosion and landslides.

Some villages in this district have obtained communal forest rights, supported by the

Netherlands Development Organization (SNV), the World Bank Gender and Development Group (GDG), and the (World Wide Fund for Nature (WWF)). This paper uses three villages in the Sangthong district (Napo, Kouay, and Houytom) as the field research sites. Napo and Kouay have already obtained communal forest rights, but Houytom has not.

Figure 1: Site of Sangthong district



Source: Author's own construction based on data from MONRE and Google Earth.

Table 1: Basic information of three villages

Village name	Items				
	Population (Person)	Household (HH)	Nuai (Group)	Area (ha)	The Beginning of village
Napo	476	97	10	2,591	1961
Kouay	660	142	13	6,035	1897
Houytom	577	111	8	2,100	1993

Source: Author's own construction based on Sayalath et al. (2011) and Mori (2015).

Table 1 summarizes basic information about the three villages.¹ The population of each of the villages is relatively small—only approximately 100 households and 400–600 people.

Table 2 and Figure 2 show that Houytom was established in 1993 and thus is a relatively new village. Furthermore, over 80% of Houytom's households are migrants

¹ Please see Sayalath et al. (2011) for information about the ages of the villages. Houytom's age is estimated based on interviews. However, it is clear from interviews of the village elders that Napo and Kouay have longer histories than those villages' strict ages. The estimates in Table 2 are based on when administrative villages were established in those locations, but some households lived in those locations earlier, when they were natural villages.

from other areas. In contrast, Kouay, has existed for more than 100 years. Kouay also has fewer migrant residents than do the other two villages.

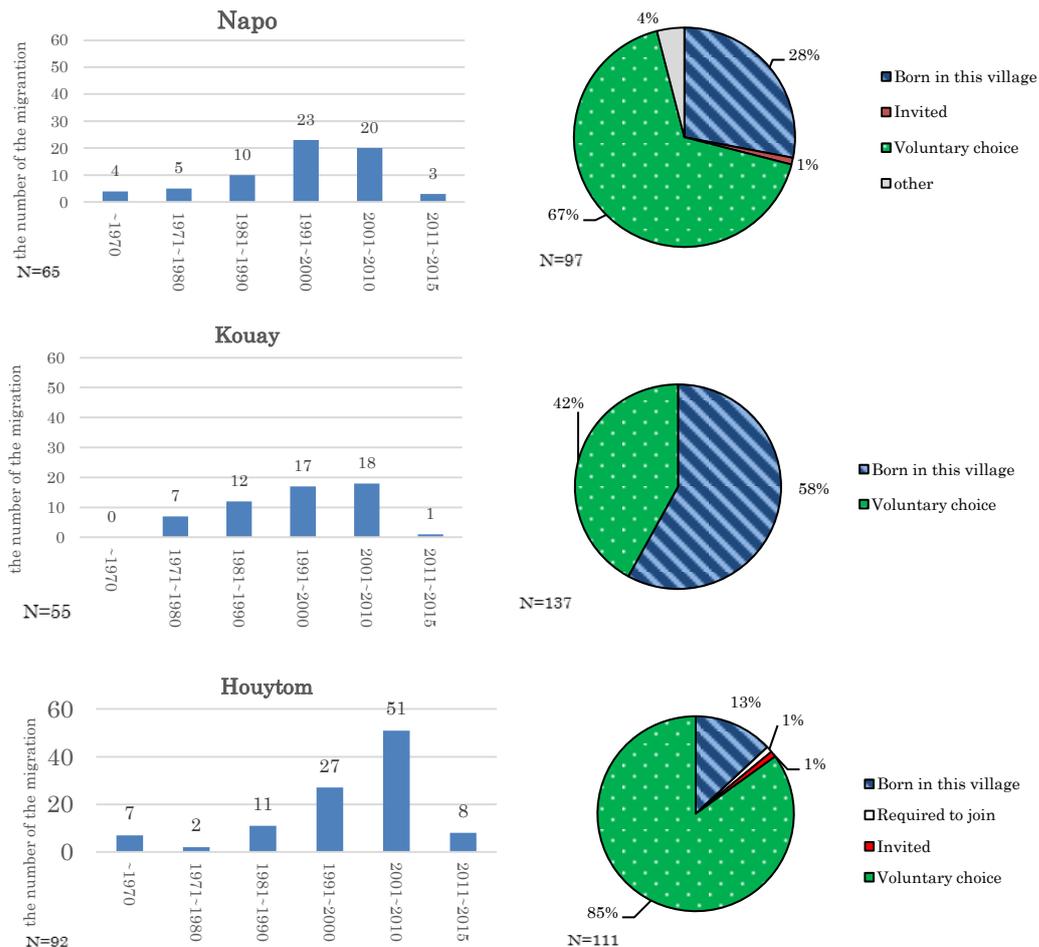
Table 2: Proportion of the forest

Village	Total Area (ha)	Proportion of Forest				
		Protection (ha)	Conservation (ha)	Production (ha)	Burial (ha)	Communal (ha)
Napo	1,356.2	0.00 (0%)	1,122.40 (83%)	168.11 (12.3%)	14.77 (1.0%)	50.94 (3.7%)
Kouay	2,434.11	670.00 (27.5%)	1,453.00 (59.7%)	168.11 (6.9%)	8.00 (0.3%)	135.00 (5.6%)
Houyтом	401.6	n.a	n.a	n.a	n.a	3.5 (0.8%)

Source: Author's own construction based on Sayalath et al. (2011) about Napo and Kouay, field survey about Houyтом.

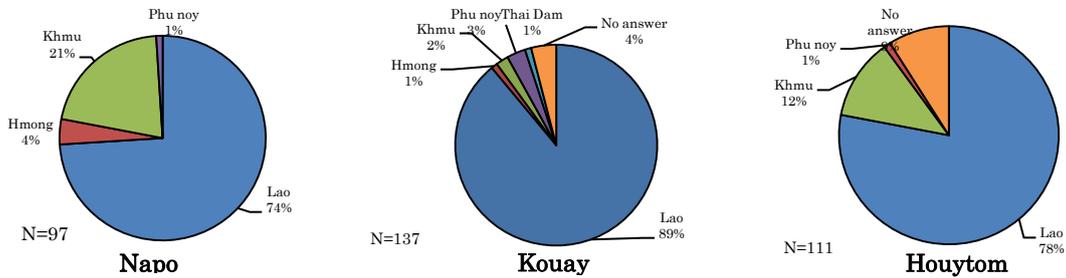
* However, in Houyтом, the information about Protection, Conservation and Production forest is unclear because local people don't have the information in detail and there are no their materials.

Figure 2: Situation and reasons of the migrant in each village



Source: Author's own construction based on the questionnaire survey and Mori (2015).

Figure 3: Proportion of ethnic group

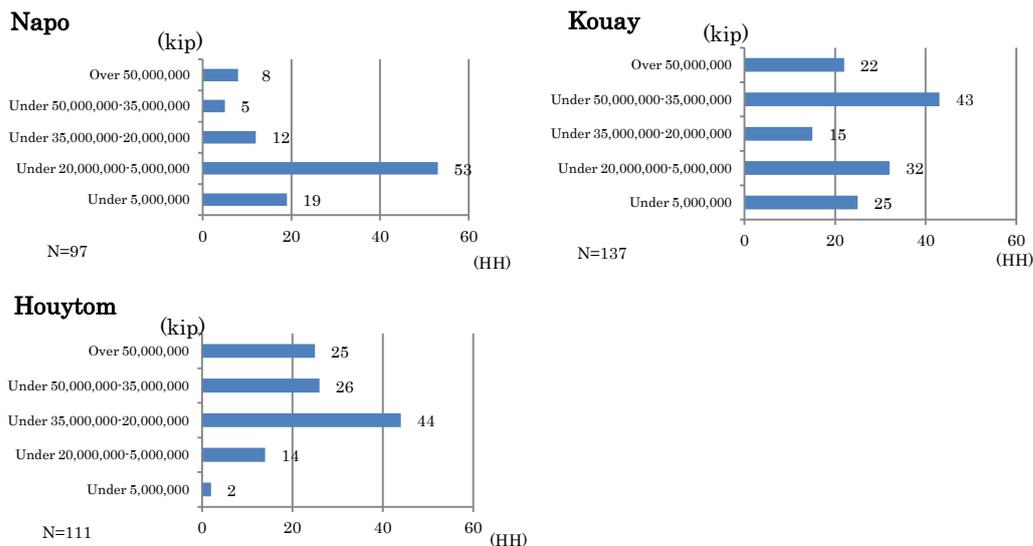


Source: Author's own construction based on the questionnaire survey and Mori (2015).

The ethnicity of the population of Napo is 74% Lao, 21% Khmu, 4% Hmong and 1% Phu noy. Kouay consists of 89% Lao, 3% Phu noy, 2% Khmu, 1% Thai dai, 1% Hmong, 4% unanswered. Houytom consists of 78% Lao, 12% Khmu, 1% Phu noy and 9% unanswered. The Lao government categorizes ethnic groups into three broad groups based on altitude: Lao lum, Lao sung, and Lao Thong.

In short, Napo and Houytom were established later than was Kouay and their populations include more migrants than does Kouay's. This is especially true for the Khmu ethnic group, which generally lives in hillside areas. In contrast, Kouay has a longer history, has a lower proportion of migrants, and consists of over 90% Lao.

Figure 4: Distribution of income per year in households



Source: Author's own construction based on the questionnaire survey and Mori (2015).

Figure 4 reports the average annual household income for each of the three villages. Napo, contains the fewest low-income households. Houytom contains the most high-income households. Kouay has two groups of low income households and high income households.

2-2. The Institutions That Manage the Communal Forest

Studies by Terade (1993), Ostrom (1990), and Yabuta (2004) have described the institutions that manage communal forests. Those studies detailed the community governance of the common-pool resources by focusing on the boundary rule (which specifies the membership and the boundary of the resources), the allocation rule (which restricts the use of the resources), and monitoring and penalty rules (which monitor use of the resources and imposes penalties on rule breakers). In Laos, the boundary rule is defined by Land Forest Allocation Program. Therefore, this paper focuses on the allocation rule and the monitoring and penalty rules.

All three of the villages studied can make and modify allocation, monitoring, and penalty rules in village meetings. The purpose of village meetings is not only to inform villagers of decisions made by the district's administration but also to discuss village issues and reach agreement about potential solutions to them. Table 3 provides detail. Meeting topics are discussed by the village leader and deputies in advance of the meeting. In Napo and Houytom, Nuai's leaders also participate in the advance discussion of topics. In a village meeting, if 60% of the meeting participants agrees with a proposal, it is passed. At least one person from each household must participate in the meeting. In Napo and Houytom, the first time a household misses a meeting without the permission of the village leader, it is cautioned; and the second time, the household must pay 30,000 kip. Kouay does not impose such a penalty for missing village meetings.

Table 3: Details of the village meeting

Village	Contents			
	Frequent (times/month)	Participators (person)	Chairmans	Decision
Napo	2	<ul style="list-style-type: none"> · least one person per a household. * If one doesn't participate in the meeting, he has to pay 30,000 kip. 	<ul style="list-style-type: none"> · a village leader and deputy (three persons) · the topic in the meeting is discussed by a village leader, deputy and Nuai's leaders. 	<ul style="list-style-type: none"> · an agreement of 60% participators
Kouay	1	<ul style="list-style-type: none"> · least one person per a household. * If one doesn't participate in the 	<ul style="list-style-type: none"> · a village leader and deputy (three persons) 	<ul style="list-style-type: none"> · an agreement of 60% participators

		meeting, he doesn't have to pay the penalty		
Houytom	1	· least one person per a household. * If one doesn't participate in the meeting, he has to pay 20,000kip.	· a village leader and deputy (three persons) · the topic in the meeting is discussed by a village leader, deputy and Nuai's leaders.	· an agreement of 60% participators

Source: Author's own construction based on field survey and Mori (2015).

2-3. Analysis of the Institutions That Manage the Communal Forest

Based on information obtained from the field survey, the allocation rules, monitoring rules, and penalty rules of the three villages have both similarities and differences. Tables 6, 7, and 8 report the details of each rule. The similarities are that villagers' use of the communal forest is limited to house use, meaning that the villagers are prohibited from gathering materials from the communal forest for sale at market. The three villages limit the instrument for gathering forest materials to human labor. Napo and Houytom limit transportation of forest materials to human labor. In order to conserve forest resources, private roads and cultivation are prohibited in the communal forest. However, in Houytom and Kouay, one can do so, if agreement is obtained in a village meeting. Basically, a villager can appropriate non-timber forest products without agreement in a village meeting, but the villager cannot appropriate bamboo from a communal forest. This restriction on bamboo is limited to zones of degraded forest, specifically, the site of the SNV's project in Kouay. In Napo and Houytom, in order to cut down trees in the communal forest, a villager must request and obtain approval from the village leader. On the other hand, during any season, a villager can use other resources from the communal forest, can graze livestock there, and can enter it.

As shown in Table 4, Kouay's allocation rule is less stringent than the allocation rules of the other two villages. According to Kouay's village leader, its villagers do not compete for forest resources, because its communal forest is larger than those of the other two villages. In contrast, Houytom prohibits its villagers from cutting down any *Azelia Xylocarpa*.²

Table 4: Details of allocation rules

	Village
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² *Azelia Xylocarpa* is a southeast Asian tree that grows in Myanmar, Thailand, Lao PDR, Vietnam, and China. A hardwood, it is used in construction, including homebuilding. However, it is on the International Union for Conservation of Nature's (IUCN) red list of threatened species. (<http://www.iucnredlist.org/details/full/32811/0>, last accessed on June 28, 2014)

Rules	Napo	Kouay	Houytom
Request of the appropriation	If one cuts down tree of DBH over 20cm, one has to request village leader and pay money; > 100,000kip (20-30cm per a tree. > 120,000kip (over 30cm per a tree. * The tree of DBH under 20cm is free until 5 trees.	None	If one cuts down tree, one has to request village leader.
Use restricted	Villagers can appropriate communal forest for only home use. If he appropriates it for sales, he has to pay the penalty.	Villagers can appropriate communal forest for only home use. If he appropriates it for sales, he has to pay the penalty.	Villagers can appropriate communal forest for only home use. If he appropriates it for sales, he has to pay the penalty.
Trees prohibited to be cut down.	None	None	Azelia Xylocarpa
Period and part permitted to be appropriated	One must not appropriate a whole bamboo clump ³ and bamboo in a year.	One must not appropriate a whole bamboo clump and bamboo in a year in SNV project site, but can do in other site.	One must not appropriate a whole bamboo clump and bamboo in a year.
Grazing prohibited	None	None	None
Cultivation prohibited	Existence	Existence	Existence
Opening the way in communal forest	The prohibition	If one can get the permission in village meeting, he can open the way.	If one can get the permission in village meeting, he can open the way.
Available seasons	All seasons	All seasons	All seasons
Entrance	Village can enter anywhere.	Village can enter anywhere.	Village can enter anywhere
Places restricted in communal forest	Villagers must not appropriate in the place where the sustainable condition is bad. * SNV staffs judge the condition, but forest manager hopes to judge in future. * SNV staff remark trees as the sign in the restricted place.	One must not appropriate a bamboo and cut down tree in a year in SNV project site, but can do in other site.	Villagers must not appropriate in the place where the sustainable condition is bad. * Village leader judges the condition.
Transportation restricted	Villagers can carry by only manpower.	Villagers can carry by a track.	Villagers can carry by only manpower.

³ Whole bamboo clump is the population composed of some clumps.

Instrument restricted	Villagers can appropriate with only manpower.	Villagers can appropriate with only manpower.	Villagers can appropriate with only manpower.
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Source: Author's own construction based on field survey and Mori (2015).

Table 5 shows the village leader, deputies, police group, soldier group or land manager that participate in the monitoring activity with the forest manager. The monitoring activity is not done frequently during the rainy season, because it is difficult to do so.

Table 5: Details of a monitoring rule

Village	Contents		
	Forest manager (person)	Monitoring member (person)	Frequency
Napo	2	Police group, soldier group and forest manager (2). * If necessary, land manager participate in the monitoring. * Members in police group and soldier group participate in a rotation. * Soldier members have some arms in monitoring.	One time per two months * There are some differences in each season: less in rainy season and more in dry season.
Kouay	3	Police group (2), soldier group (1), land manager (1) and forest manager (3). * If necessary, village leader and deputy participate in the monitoring. * Soldier members have some arms in monitoring.	One time per a month * There are some differences in each season: less in rainy season and more in dry season.
Houytom	2	Village leader, Police group (1), soldier group and forest manager (3). * If necessary, land managers participate in the monitoring. * Soldier members have some arms in monitoring. * Members in soldier group participate in a rotation.	two times per one month * There are some differences in each season: less in rainy season and more in dry season.

Source: Author's own construction based on field survey and Mori (2015).

Table 6 lists each village's prohibitions and penalties with regard to the gathering of bamboo and non-timber forest products for sale at market and cutting down trees for any purpose. Houytom prohibits cutting down one specific type of tree (*Azelia Xylocarpa*). The rules in Kouay are less stringent than those in the other two villages.

Table 6: Details of penalty rule

Village	The contents
Napo	<ul style="list-style-type: none"> ·Rule breaker to cut down illegally must pay 2,000,000kip per tree in the case of tree of DBH 20-30cm, and 3,000,000kip per tree in the case of tree of DBH over 30cm. ·If one appropriates bamboo in a year, one must pay 5,000kip per a bamboo. ·If one appropriates bamboo roots for sales, one must pay 5,000kip per a bamboo root.

	<ul style="list-style-type: none"> ·If one clears trees or some resources for cultivation or the open of the way, one must pay the sum. ·Rue breaker must be asked by other villagers in the village meeting.
Kouay	<ul style="list-style-type: none"> ·If one appropriates bamboo in a year in SNV project site, one must pay 1,000kip per a bamboo. * Kouay has not decided the value of the penalty because rule breakers have not appeared ever. If they appear, the value will be decided in the village meeting.
Houytom	<ul style="list-style-type: none"> ·Villager must not cut down illegally trees, but can appropriate freely non timber forest products. ·Villagers must not cut down tree without the permission from village leader. Houytom has not decided the value of the penalty because rule breakers have not appeared ever. If they appear, the value will be decided in the village meeting.

Source: Author's own construction based on field survey and Mori (2015).

3. Quantitative Analysis

3-1. Method

In this study, questionnaires were collected from 335 households in the three villages. However, the factors of social capital (trust, reciprocity, and network) cannot be easily observed as variables. In order to incorporate such factors in a statistical model, latent variables are better than observed variables. Therefore, in this paper, we use structural equation modeling (SEM), a type of covariance structure analysis, to analyze the social capital factors. SEM is a methodology for deriving latent variables from observed variables and analyzing the correlations among the latent variables.

Table 7 summarizes the three latent variables, the observed variables from which the latent variables are derived, and their components. The latent variables are created based on Linkert's scale with five stages, from (1) very good to (5) very poor and from (1) very often to (5) never.

Table 7: Latent and Observed Variables in this model

Latent variable	Observed Variable	Contents
Reciprocity (η)	Communal Forest Management (x_1)	How often do you voluntarily participate in community forest management?
	Group Work (x_1)	How often do you voluntarily participate in group work in this village? Please choose one in the following words.
	Mutual Aid (x_3)	How often do you voluntarily participate in mutual help in this village?
	Ceremonial occasions (x_4)	How often do you voluntarily participate in ceremonial occasions in this village?
	Village Meetings (x_5)	How often are the meetings about community management held?
Network (ξ_1)	Acquaintances (x_6)	How many persons outside this village do you interact with?
	Friendships (x_7)	Do you often communicate with friends in village?
	Relatives (x_8)	Do you often communicate with relatives in village?
Trust (ξ_2)	Trust for insider (x_9)	How strong do you have trust for members in this village?
	Trust for outsider (x_{10})	How strong do you have trust for the people outside this village?
	Strength of relationships (x_{11})	Do you agree that the relationship in this village is good?

Source: Author's own construction.

Based on Ostrom's studies (1998, 2003), we assume that trust and network enhance reciprocity and, therefore, that enhanced reciprocity encourages villagers to participate in collective actions.⁴ Furthermore, we assume that the network and trust are interrelated. Namely, because a person is connected to other people, he or she trusts them, and because a person trusts other people, he or she is connected to them.

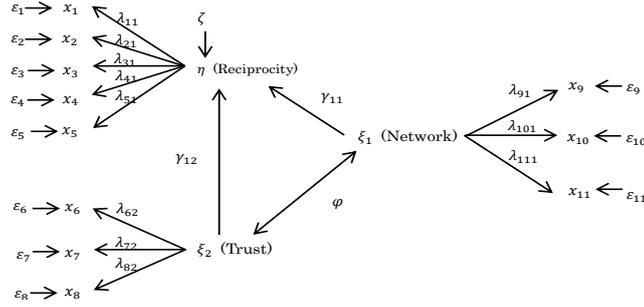
See the model diagram shown in Figure 5.

First, we assume that the latent variable for reciprocity (η) enhances villagers' level of participation. Then, we set the variables for communal forest management (x_1), group work (x_1), mutual aid (x_3), ceremonial occasions (x_4), and village meetings (x_5) as describing the village's collective actions and construct the latent variable for reciprocity from these variables. Second, we assume that the latent variable for the network (ξ_1) is composed of the human relationships within a village and influences the villagers' actions. We set the variable for acquaintances (x_6), friendships (x_7), and relatives (x_8) and construct the latent variable for the network from these variables. Third, we assume that the latent variable for trust (ξ_2) represents how a villager expects other villagers to cooperate with him or her. We set the variables for trust in insiders (x_9), trust in outsiders (x_{10}), and strength of relationships (x_{11}) and construct the latent variable for trust from these variables.

⁴ Ostrom (1998, 2003) did not use the term *network* but rather used the term *reputation*. However, because the terms have similar meaning and scale, in this paper we treat reputation as the network.

In addition, we define the variables $\varepsilon_i (i = 1, \dots, 11)$ and ζ as error terms. The factor $\lambda_{ij} (j = 1, 2, 3)$ is the correlation coefficient between η and of x_i , and the values of $\lambda_{21}, \lambda_{62},$ and λ_{91} are fixed at 1 due to normalization. Finally, in this model there is assumed to be a covariance (φ) between trust and network.

Figure 5: Path diagram of this model



Source: Author's own construction.

The purpose of the SEM analysis is to determine the path and the degree of influence from trust and network to reciprocity. However, the history and social background varies among the three villages. Therefore, the differences among the villages, in terms of the observed variables, must be considered. So, we analyze the variables, both across villages and within each village, by use of ANOVA and t-testss.

3-2. Results of the ANOVA and t-testss

Tables 8 and 9 report the results of the ANOVA and t-testss. The main effects of the differences across villages, in terms of observed variables related to reciprocity other than ceremonial occasions are clear. Kouay villagers are more likely than Napo or Houytom villagers to voluntarily participate in communal forest management. Kouay and Houytom villagers are more likely than Napo villagers to voluntarily participate in group work. Napo villagers are more likely than Kouay or Houytom villagers to voluntarily provide mutual aid and participate in village meetings. There is no significant difference between Houytom and Kouay in terms of participation in village meetings. However, Houytom villagers are more likely than Kouay villagers to voluntarily provide mutual aid.

With regard to observed variables related to trust, the main effects of the differences across villages are as follows. Napo and Houytom villagers have more trust in insiders than do Kouay villagers. There is significant difference across the three villages in terms of trust in outsiders, with Houytom villagers trusting outsiders the most and Kouay villagers trusting outsiders the least. Napo villagers have stronger human

relationships than do Kouay or Houytom villagers.

Table 8: Result of ANOVA for observed variables in each village

items	Village	Vake	SE	F	Items	Village	Vake	SE	F
Communal Forest Management	Napo	2.87	1.124	4.60**	Group Work	Napo	3.18	1.561	8.63***
	Houytom	2.76	0.561			Houytom	2.72	0.94	
	Kouay	2.53	0.877			Kouay	2.56	0.895	
	Total	2.70	0.886			Total	2.78	1.163	
Mutual Aid	Napo	1.88	1.166	9.57***	Ceremonial occasions	Napo	2.28	.100	1.51
	Houytom	2.19	0.741			Houytom	2.20	.071	
	Kouay	2.42	0.905			Kouay	2.40	.083	
	Total	2.19	0.966			Total	2.30	.049	
Village Meetings	Napo	1.8	0.571	29.87***	Acquaintances	Napo	1.79	1.035	2.83*
	Houytom	2.34	0.742			Houytom	1.71	0.911	
	Kouay	2.5	0.739			Kouay	1.47	1.261	
	Total	2.25	0.753			Total	1.64	1.103	
Friendships	Napo	1.59	0.955	21.4***	Relatives	Napo	1.27	0.638	20.36***
	Houytom	1.96	0.719			Houytom	1.55	0.739	
	Kouay	2.33	0.884			Kouay	1.93	0.906	
	Total	2.00	0.906			Total	1.62	0.828	
Trust for insider	Napo	2.07	0.696	7.04***	Trust for outsider	Napo	2.58	0.643	31.22***
	Houytom	2.16	0.496			Houytom	2.35	0.5	
	Kouay	2.38	0.729			Kouay	3.00	0.748	
	Total	2.22	0.666			Total	2.68	0.705	
Strength of relationships	Napo	2.01	0.685	14.93***	SE: Standard Error. ***p<.01, **p<.05, *p<.1 N=97~137				
	Houytom	2.43	0.567						
	Kouay	2.48	0.768						
	Total	2.33	0.714						

Source: Author's own construction based on the questionnaire survey

Table 9: Multiple comparison between three villages by HSD method

	Village I	Village J	Difference (I-J)	SE		Village I	Village J	Difference (I-J)	SE	
Communal Forest Management	Napo	Houytom	0.102	0.123	Group work	Napo	Houytom	.456**	0.160	
		Kouay	.337**	0.117			Kouay		.620***	0.151
	Houytom	Napo	-0.102	0.123			Houytom	Napo	-.456***	0.16

		Kouay	.235*	0.114		Kouay	0.164	0.147
	Kouay	Napo	-.337**	0.117		Napo	-.620***	0.151
		Houytom	-.235*	0.114		Houytom	-0.164	0.147
Mutual aid	Napo	Houytom	-.311*	0.132	Village meetings	Napo	-.535***	0.098
		Kouay	-.547***	0.125		Kouay	-.700***	0.092
	Houytom	Napo	.311*	0.132		Houytom	.535***	0.098
		Kouay	-0.236	0.122		Kouay	-0.164	0.09
	Kouay	Napo	.547***	0.125		Napo	.700***	0.092
		Houytom	0.236	0.122		Houytom	0.164	0.09
Acquaintances	Napo	Houytom	0.081	0.154	Friendships	Napo	-.376***	0.12
		Kouay	.325*	0.146		Kouay	-.741***	0.114
	Houytom	Napo	-0.081	0.154		Houytom	.376***	0.12
		Kouay	0.243	0.142		Kouay	-.365***	0.11
	Kouay	Napo	-.325*	0.146		Napo	.741***	0.114
		Houytom	-0.243	0.142		Houytom	.365***	0.11
Relatives	Napo	Houytom	-.282**	0.109	Trust for insider	Napo	-0.085	0.092
		Kouay	-.657***	0.105		Kouay	-.307*	0.087
	Houytom	Napo	.282**	0.109		Houytom	0.085	0.092
		Kouay	-.375*	0.101		Kouay	-.222*	0.084
	Kouay	Napo	.657*	0.105		Napo	.307*	0.087
		Houytom	.375*	0.101		Houytom	.222*	0.084
Trust for outsider	Napo	Houytom	.225*	0.091	Strength of relationships	Napo	-.416*	0.096
		Kouay	-.423*	0.086		Kouay	-.471*	0.091
	Houytom	Napo	-.225*	0.091		Houytom	.416*	0.096
		Kouay	-.648*	0.084		Kouay	-0.056	0.088
	Kouay	Napo	.423*	0.086		Napo	.471*	0.091
		Houytom	.648*	0.084		Houytom	0.056	0.088

N=97~137

***p<.01, **p<.05, *p<.10

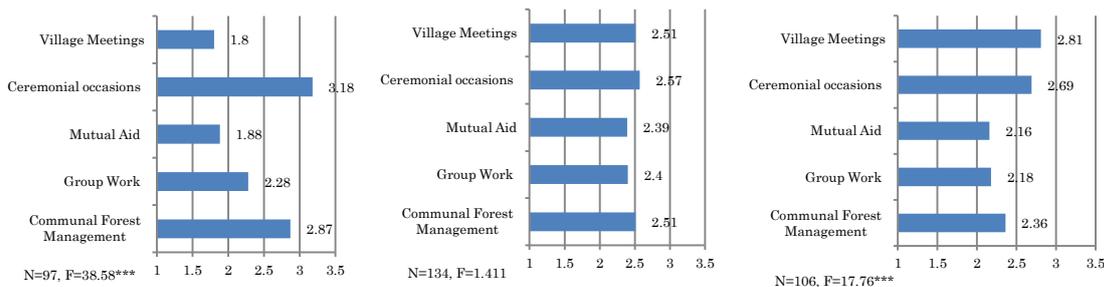
Source: Author's own construction based on the questionnaire survey

The results also demonstrate the main effects of the differences across villages in terms of observed variables related to the social network. Kouay villagers communicate more frequently with other people than do Napo or Houytom villagers. The frequency of villagers' communication with friends and relatives can be ranked, in descending order, as Kouay, Houytom, and Napo.

In summary, Napo and Houyтом villagers provide more mutual aid, communicate more with their friends and relatives, and trust insiders more than do Kouay villagers. In contrast, Kouay villagers participate more in communal forest management than do Napo or Houyтом villagers. In addition, Kouay villagers participate more in group work than do Napo villagers, although there is no significant difference in the group-work participation of Kouay villagers and Houyтом villagers.

Next, we show the results of the ANOVA of collective action in each village and a multiple comparison (using the Bonferri method) of collective action in each village. Figure 6 shows no significant differences across villagers with regard to factors related to collective action in Kouay. On the other hand, Napo and Houyтом have the higher level of the mutual aid than the communal forest management and group work. However, there is no significant difference about the village meeting in Napo, and the village meeting and the ceremonial occasion in Houyтом.

Figure 6: Result of ANOVA about the collective action in each village



Source: Author's own construction based on the questionnaire survey

Table 10: Multiple comparison of the collective action in Napo and Houyтом by Bonferri method

Napo				Houyтом			
Collective action (I)	Collective action (J)	Difference (I-J)	SE	Collective action (I)	Collective action (J)	Difference (I-J)	SE
Communal Forest Management	Group works	-0.309	0.145	Communal Forest Management	Group works	0.116	0.099
	Mutual aid	.990**	0.142		Mutual aid	.653***	0.09
	Ceremonial occasions	.588***	0.125		Ceremonial occasions	.632***	0.081
	Village Meetings	1.062**	0.128		Village Meetings	.453***	0.088
Group work	Communal Forest Management	0.309	0.145	Group work	Communal Forest Management	-0.116	0.099
	Mutual aid	1.299**	0.168		Mutual aid	.537***	0.111
	Ceremonial occasions	.897***	0.144		Ceremonial occasions	.516***	0.113

	Village Meeting	1.371***	0.164		Village Meeting	.337*	0.128
Mutual aid	Communal Forest	-.990***	0.142	Mutual aid	Communal Forest	-.653***	0.09
	Management				Management		
	Group works	-1.299***	0.168		Group works	-.537***	0.111
	Ceremonial occasions	-.402**	0.119		Ceremonial occasions	-0.021	0.079
	Village Meeting	0.072	0.127		Village Meeting	-0.2	0.099
Ceremonial occasions	Communal Forest	-.588***	0.125	Ceremonial occasions	Communal Forest	-.632***	0.081
	Management				Management		
	Group works	-.897***	0.144		Group works	-.516*	0.113
	Mutual aid	.402**	0.119		Mutual aid	0.021	0.079
	Village Meeting	.474***	0.101		Village Meeting	-0.179	0.105
Village Meetings	Communal Forest	-1.062***	0.128	Village Meetings	Communal Forest	-.453***	0.088
	Management				Management		
	Group works	-1.371***	0.164		Group works	-.337*	0.128
	Mutual aid	-0.072	0.127		Mutual aid	0.2	0.099
	Ceremonial occasions	-.474***	0.101		Ceremonial occasions	0.179	0.105

N=97

N=106

SE: Standard Error, ***p<.01, **p<.05, *p<.10

Source: Author's own construction based on the questionnaire survey.

Table 10 shows differences between Napo and Houytom in terms of collective action and the social network. One reason may be the higher proportion of migrants and ethnic minorities (non-Lao people) in Napo and Houytom.

Table 11 shows the cross tabulation of ethnic groups and reasons for being residents of the villages. In Napo, 35% of the Lao residents were born in Napo, 61% voluntarily migrated to Napo from elsewhere and 4% others. Most of the ethnic minority residents of Napo were invited or voluntarily migrated there.

Table 12 shows that the population of Kouay includes fewer migrants and fewer people of Lao ethnicity than do the populations of Napo and Houytom. Of the Kouay villagers, 56% were born in Kouay, 41% voluntarily migrated to Kouay from elsewhere and 4% others.

Table 11: Cross tabulation of ethnic group and history of resident in Napo

	Reasons	Total
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	Born in this village	Invited	Voluntary choice	Other	
Lao	35% (25)	0% (0)	61% (44)	4% (3)	100% (72)
Hmong	0% (0)	0% (0)	75% (3)	25% (1)	100% (4)
Khmu	0% (0)	5 (1%)	95% (19)	0% (0)	100% (20)
Phu noy	0% (0)	0% (0)	1 (0%)	0% (0)	100% (1)
Total	26% (25)	1% (1)	69% (67)	4% (4)	100% (97)

1: Adding no answer all to other.

2: The number in parentheses is one of answers.

Source: Author's own construction based on the questionnaire survey.

Table 12: Cross tabulation of ethic group and history of resident in Kouay

	Reasons			Total
	Born in this village	Voluntary choice	Other	
Lao	56% (68)	41% (50)	3% (4)	100% (122)
Hmong	0% (0)	100% (1)	0 (0%)	100% (1)
Khmu	33% (1)	67% (2)	0% (0)	100% (3)
Khmu	20% (1)	80% (4)	0% (0)	100% (5)
Thai Dam	0% (0)	100% (1)	0% (0)	100% (1)
Other	100% (5)	0% (0)	0% (0)	100% (5)
Total	55% (75)	42% (58)	3% (4)	100% (137)

1: Adding no answer all to other.

2: The number in parentheses is one of answers.

Source: Author's own construction based on the questionnaire survey.

Table 13 shows that, of the Houyatom villagers, 83% voluntarily migrated there from elsewhere, only 10% were born in Houyatom and 6% others. As in Napo, most of the ethnic minority residents were invited or voluntarily migrated to Houyatom.

Table 13: Cross tabulation of ethic group and history of resident in Houyatom

	Reasons					Total
	Born in this village	Required to join	Invited	Voluntary choice	Other	
Lao	10% (9)	1% (1)	1% (1)	84% (73)	1% (1)	100% (87)
Khmu	0% (0)	0% (0)	0 (0%)	85% (11)	0% (0)	100% (13)
Phu noy	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	100% (1)
Other	20% (2)	0% (0)	0% (0)	70% (7)	0% (0)	100% (10)
Total	10 % (11)	1% (1)	1% (1)	83% (92)	1% (1)	100% (111)

1: Adding no answer all to other.

2: The number in parentheses is one of answers.

Mutual Aid	Lao	1.92	1.264	2.291*	Ceremonial occasions	Lao	2.31	1.083	0.101
	Hmong	1.25	0.500			Hmong	2.25	0.500	
Village Meetings	Lao	1.81	0.547	1.084	Acquaintances	Lao	1.73	0.956	0.532
	Hmong	1.50	0.577			Hmong	2.00	1.414	
Friendships	Lao	1.56	0.948	4.974***	Relatives	Lao	1.25	0.599	3.540***
	Hmong	1.00	0.00			Hmong	1.00	0.00	
Trust for insider	Lao	2.07	.718	.187	Trust for outsider	Lao	2.60	.643	1.060
	Hmong	2.00	.816			Hmong	2.25	.500	
Strength of relationships	Lao	2.01	.682	.739	N=4~72				
	Hmong	1.75	.957			***p<.01, **p<.05, *p<.10			

Source: Author's own construction based on the questionnaire survey.

Table 16 shows significant differences in Kouay between members of the Lao group and members of the Khmu group in terms of participation in village meetings, communication with friends, and strength of relationships. Compared to members of the Lao group, members of the Khmu group in Kouay communicate more frequently with their friends but voluntarily participate less in ceremonial occasions and have weaker relationships.

Table 17 shows that, compared to members of the Lao group, members of the Phu noy group in Kouay communicate with more frequently with other villagers and relatives but voluntarily participate less in group work.

Table 16: t-tests between Lao group and Khmu group in Kouay

			Value	SE	t				Value	SE	t
Communal Management	Forest	Lao	2.49	0.848	0.149	Group Work	Lao	2.52	0.879	1.644	
		Khmu	2.67	2.082			Khmu	1.67	1.155		
Mutual Aid	Lao	2.42	0.889	0.803	Ceremonial occasions	Lao	2.33	0.886	1.912*		
	Khmu	2.00	1.00			Khmu	3.33	1.528			
Village Meetings	Lao	2.52	0.741	1.184	Acquaintances	Lao	1.43	1.205	0.678		
	Khmu	2.00	1.00			Khmu	2.33	2.309			
Friendships	Lao	2.32	0.855	17.041***	Relatives	Lao	1.89	0.896	0.427		
	Khmu	1.00	0.00			Khmu	1.67	1.155			
Trust for insider	Lao	2.38	0.708	0.106	Trust for outsider	Lao	2.99	0.71	0.02		
	Khmu	2.33	0.577			Khmu	3.00	0.00			
Strength of relationships	Lao	2.44	0.761	8.089***							

relationships	Khmu	3.00	0.00	N=3~122	***p<.01, **p<.05, *p<.10
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Source: Author's own construction based on the questionnaire survey.

Table 17: t-tests between Lao group and Phu noy group in Kouay

		Value	SE	t		Value	SE	t	
Communal Forest Management	Lao	2.49	0.848	1.458	Group Work	Lao	2.52	0.879	1.690*
	Phu noy	2.80	0.447			Phu noy	3.20	1.095	
Mutual Aid	Lao	2.42	0.889	0.044	Ceremonial occasions	Lao	2.33	0.886	1.136
	Phu noy	2.40	0.894			Phu noy	2.80	1.483	
Village Meetings	Lao	2.52	0.741	0.249	Acquaintances	Lao	1.43	1.205	3.905***
	Phu noy	2.60	0.548			Phu noy	1.00	0.00	
Friendships	Lao	2.32	0.855	0.717	Relatives	Lao	1.89	0.896	1.732*
	Phu noy	2.60	0.894			Phu noy	2.60	0.894	
Trust for insider	Lao	2.38	0.708	0.07	Trust for outsider	Lao	2.99	0.71	0.026
	Phu noy	2.40	0.894			Phu noy	3.00	0.00	
Strength of relationships	Lao	2.44	0.761	1.689	N=5~122	***p<.01, **p<.05, *p<.10			
	Phu noy	2.80	0.447						

Source: Author's own construction based on the questionnaire survey.

Table 18 shows significant differences in Houytom between members of the Lao group and members of the Khmu group with regard to communal forest management, communication with insiders, trust in outsiders, and the strength of relationships. In Kouay, compared to members of the Lao group, members of the Khmu group communicate more with insiders, trust outsiders more, and have better relationships but voluntarily participate in communal forest management less.

Table 18: t-tests between Lao group and Phu noy group in Houytom

		Value	SE	t		Value	SE	t	
Communal Forest Management	Lao	2.73	0.586	1.876*	Group work	Lao	2.67	0.964	0.497
	Khmu	2.92	0.277			Khmu	2.54	0.519	
Mutual Aid	Lao	2.20	0.745	1.289	Ceremonial occasions	Lao	2.21	0.753	0.904
	Khmu	1.92	0.641			Khmu	2.00	0.739	
Village Meeting	Lao	2.37	0.744	1.277	N=13~83				
	Khmu	2.08	0.669						
Trust for insider	Lao	1.75	0.909	2.640**	Trust for insider	Lao	2.16	0.457	1.116
	Khmu	1.31	0.48			Khmu	2.00	0.447	

Trust for insider	Lao	1.93	0.72	0.778	Trust for outsider	Lao	2.34	0.501	1.860*
	Khmu	1.77	0.439			Khmu	2.11	0.333	
Relatives	Lao	1.54	0.749	0.013	Strength of relationships	Lao	2.46	0.569	3.595**
	Khmu	1.54	0.519			Khmu	2.00	0.408	

N=13~85 N=9~85 ***p<.01, **p<.05, *p<.10

Source: Author's own construction based on the questionnaire survey.

Next, we analyze the difference between Lao born in these villages and those who voluntarily migrated there. Table 19 shows significant differences in Napo with regard to communal forest management, group work, mutual aid, and communication with relatives. Compared to members of the Lao group who were born in Napo, members of the Lao group who voluntarily migrated to Napo voluntarily participate less in communal forest management and group work, provide less mutual aid, and communicate less frequently with their relatives.

Table 19: t-tests for Lao group born in this village and one choosing voluntarily in Napo

			Value	SE	t				Value	SE	t
Communal Forest Management	Forest	Born in this village	2.28	0.98	3.340***	Group Work	Born in this village	2.64	1.524	2.073**	
		Voluntary choice	3.07	1.105			Voluntary choice	3.40	1.586		
Mutual Aid	Born in this village		1.52	0.823	2.115*	Ceremonial occasions	Born in this village	2.16	0.746	-0.92	
	Voluntary choice		2.00	1.279			Voluntary choice	2.34	1.081		
Village Meetings	Born in this village		1.84	0.473	0.543	Acquaintances	Born in this village	1.68	0.945	0.557	
	Voluntary choice		1.78	0.573			Voluntary choice	1.82	1.094		
Friendships	Born in this village		1.56	0.961	0.097	Relatives	Born in this village	1.08	0.40	2.113***	
	Voluntary choice		1.58	0.972			Voluntary choice	1.33	0.705		
Trust for insider	Born in this village		1.84	0.688	1.27	Trust for outsider	Born in this village	2.60	0.645	0.117	
	Voluntary choice		2.15	0.68			Voluntary choice	2.58	0.655		
Strength of relationships	Born in this village		1.88	0.781	1.026	N=25~67 ***p<.01, **p<.05, *p<.10					
	Voluntary choice		2.06	0.649							

Source: Author's own construction based on the questionnaire survey.

Table 20: t test for Lao group born in this village and one choosing voluntarily in Kouay

			Value	SE	t				Value	SE	t
Communal Forest Management	Forest	Born in this village	2.51	0.895	0.134	Group Work	Born in this village	2.54	0.847	0.242	
		Voluntary choice	2.53	0.883			Voluntary choice	2.58	0.963		

Mutual Aid	Born in this village	2.37	0.749	0.876	Ceremonial occasions	Born in this village	2.39	0.884	0.779
	Voluntary choice	2.52	1.064			Voluntary choice	2.52	1.047	
Village Meetings	Born in this village	2.52	0.742	0.289	Acquaintances	Born in this village	1.60	1.424	1.27
	Voluntary choice	2.48	0.731			Voluntary choice	1.33	1.049	
Friendships	Born in this village	2.33	0.890	0.075	Relatives	Born in this village	1.85	0.917	1.041
	Voluntary choice	2.34	0.870			Voluntary choice	2.02	0.884	
Trust for insider	Born in this village	2.43	0.738	0.506	Trust for outsider	Born in this village	3.05	0.567	0.976
	Voluntary choice	2.36	0.718			Voluntary choice	2.93	0.814	
Strength of relationships	Born in this village	2.56	0.758	1.094	N=58~75 ***p<.01, **p<.05, *p<.10				
	Voluntary choice	2.41	0.773						

Source: Author's own construction based on the questionnaire survey.

Table 20 shows no significant difference between natives of Kouay and migrants in the Lao group in Kouay. Table 21 shows significant differences between natives of Houytom and migrants in the Lao group in Houytom with regard to mutual aid, communication with friends and relatives, and trust in outsiders. Compared to natives of Houytom, members of the Lao group who voluntarily migrated voluntarily provide more mutual aid, voluntarily participate more in village meetings, more frequently communicate with their friends and relatives, and trust in outsiders more.

The results of the ANOVA and the t-testss illustrate that the villages vary in terms of the social backgrounds of their populations. First, the degree of reciprocity differs across the three villages. The SEM analysis confirms this conclusion. Second, collective action and human relationships differ between ethnic groups and between members of the Lao ethnic group who were born in the village and those who migrated there from elsewhere.

Table 21: t-tests for Lao group born in this village and one choosing voluntarily in Houytom

			Value	SE	t				Value	SE	t
Communal Forest Management	Born in this village		2.56	0.527	1.241	Group Work	Born in this village	2.5	0.527	0.762	
	Voluntary choice		2.79	0.532			Voluntary choice	2.74	0.983		
Mutual Aid	Born in this village		2.60	0.699	2.051**	Ceremonial occasions	Born in this village	2.18	0.405	0.277	
	Voluntary choice		2.11	0.714			Voluntary choice	2.22	0.761		
Village Meetings	Born in this village		3.00	0.816	3.005***	Acquaintances	Born in this village	1.7	0.823	0.069	
	Voluntary choice		2.29	0.694			Voluntary choice	1.72	0.941		

Friendships	Born in this village	2.55	0.688	2.964**	Relatives	Born in this village	2.00	0.447	3.355**
	Voluntary choice	1.89	0.694			Voluntary choice	1.48	0.738	
Trust for insider	Born in this village	2.10	0.316	0.332	Trust for outsider	Born in this village	2.70	0.483	2.478**
	Voluntary choice	2.16	0.517			Voluntary choice	2.30	0.485	
Strength of relationships	Born in this village	2.7	0.483	1.519	N=10~90	***p<.01, **p<.05, *p<.10			
	Voluntary choice	2.41	0.579						

Source: Author's own construction based on the questionnaire survey.

3-3. Results of the SEM Analysis

Table 22 shows the result of the SEM analysis. For this analysis, questionnaire data for which even one value is missing is eliminated, according to listwise deletion.⁵ The goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), the root mean square residual (RMR) and the root mean square error approximation (RMSEA) are used as fit indices in this model. The model's fit is better if the values of GFI, AGFI, and CFI are near 1.00 and worse if the values of RMR and RMSEA are greater than 0.10.

Table 22: Result of SEM

		Napo		Kouay		Houytom	
		Normalized	SE	Normalized	SE	Normalized	SE
		Estimation Value		Estimation Value		Estimation Value	
Reciprocity (η_1)	← Trust (ξ_2)	0.209	0.175	0.345*	0.144	-0.253	0.235
Reciprocity (η_1)	← Network (ξ_1)	-0.079	0.226	0.643***	0.233	0.558***	0.114
Trust (ξ_2)	↔ Network (ξ_1)	0.04	0.028	0.654***	0.055	0.171	0.028
Communal Forest Management (α_1)	← Reciprocity (η_1)	0.592***	0.325	0.529***	0.173	0.397**	0.302
Group work (α_2)	← Reciprocity (η_1)	0.722***	0.520	0.491***	0.177	0.370**	0.043
Mutual aid (α_3)	← Reciprocity (η_1)	0.490 [†]	—	0.619 [†]	—	0.509 [†]	—
Ceremonial occasions (α_4)	← Reciprocity (η_1)	0.690***	0.317	0.473***	0.207	0.837***	0.672
Village Meetings (α_5)	← Reciprocity (η_1)	0.195	0.120	0.508***	0.162	-0.107	0.379
Acquaintances (α_1)	← Network (ξ_1)	0.602***	0.465	0.175*	0.180	0.723***	0.151
Friendships (α_2)	← Network (ξ_1)	0.627***	0.467	0.798***	0.177	0.829***	0.111
Relatives (α_3)	← Network (ξ_1)	0.639 [†]	—	0.762 [†]	—	0.937 [†]	—
Trust for insider (α_4)	← Trust (ξ_2)	0.707 [†]	—	0.638 [†]	—	0.633 [†]	—
Trust for outsider (α_5)	← Trust (ξ_2)	0.790***	0.407	0.389***	0.201	0.669*	0.578

⁵ For additional information regarding listwise deletion as a method for handling missing data, refer to Toyota (ed.) (2011), pp. 110-111.

Strength of relationships (α_6)	← Trust (ζ_2)	0.289***	0.182	0.534***	0.230	0.345*	0.319
Fit Index		GFI = 0.895, AGFI = 0.831, CFI = 0.852, RMR = 0.082, RMSEA = 0.079		GFI = 0.833, AGFI = 0.892, CFI = 0.826, RMR = 0.063, RMSEA = 0.096		GFI = 0.676, AGFI = 0.780, CFI = 0.646, RMR = 0.06, RMSEA = 0.162	

***p<.01, **p<.05, *p<.10 and the coefficient with † is one when $\lambda = 1$.

Source: Author's own construction based on the questionnaire survey.

As shown in Table 25, the results for Napo and Kouay enable us to accept this paper's hypothesis, although they do not agree in terms of GFI, AGFI, and CFI. In contrast, in the results for Houytom, especially the value of RMSEA being greater than 0.10, require us to reject this paper's hypothesis.

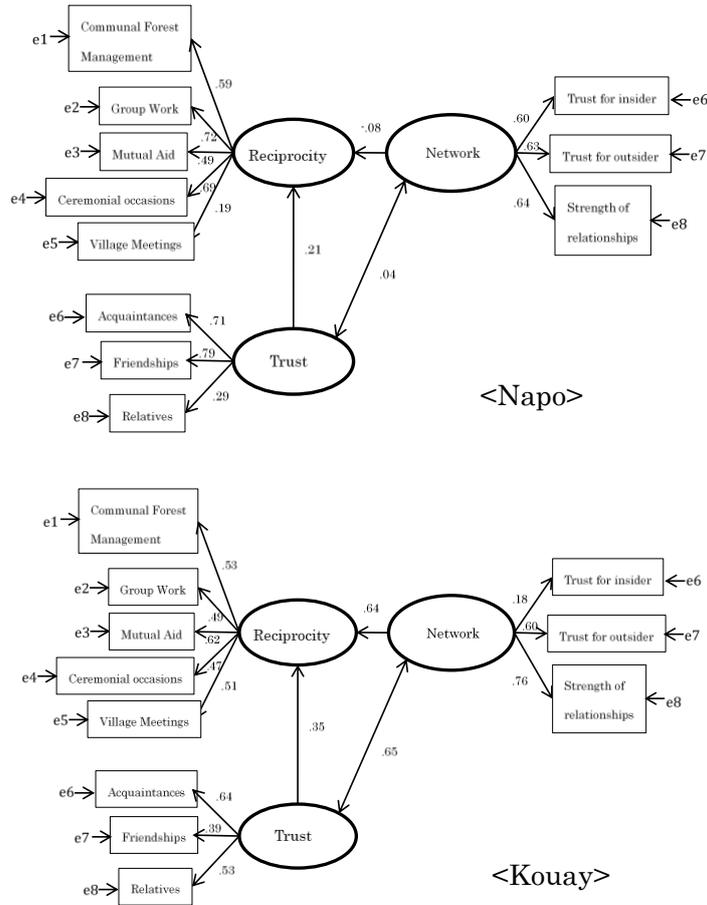
Figure 7 is the path diagram for Napo and Kouay. However, for Napo, although the correlations between the observed variables and the latent variables are significant, the differences in terms of the latent variables are not significant. In other words, although the three factors of social capital can be modeled as latent variables, there is no significant relationship among the factors of social capital. In contrast, for Kouay, the correlation coefficients between network and reciprocity and between network and trust are high, and the correlation coefficient between trust and reciprocity is low.⁶

The relationship between each observed variable and the corresponding latent variable is statistically significant at the 10% level. For Kouay, these results show that the latent variables representing trust and the social network influence reciprocity, as was the hypothesis. The influence of the network on reciprocity is especially large.

Figure 7: Path diagram in Napo and Kouay

⁶ The degree of correlation between two variables can be characterized as follows (Yonekawa and Yamazaki, 2010, p.77):

- 0.7 < |r| < 1.0: High degree of correlation
- 0.4 < |r| < 0.7: Medium degree of correlation
- 0.2 < |r| < 0.4: Low degree of correlation
- 0.0 < |r| < 0.2: No degree of correlation



Source: Author's own construction.

4. Final Remarks

As discussed in sections 2-2 and 2-3 of this paper, the three villages have institutions such as those described by Terade (1993), Ostrom (1990), and Yabuta (2004), but the institutions vary across villages. For example, Kouay's allocation rule and penalty rule are less stringent than those of Napo and Houytom.

The results of the quantitative analysis can be summarized as follows. We have analyzed differences in collective action within and across villages. The results of the ANOVA show that Kouay villagers are more active in terms of participation in the village's work, such as forest management and group work, and communicate more with insiders than do residents of the other two villages. However, Napo and Houytom villagers voluntarily provide more mutual aid to their friends and relatives than do Kouay villagers. The reason for the difference in terms of mutual aid (reciprocity) may be that Kouay has a longer history than do the other villages, and most of the Kouay villagers are members of the Lao ethnic group and were born in Kouay. In contrast,

Napo and Houytom have shorter histories than does Kouay, and many of their residents are migrants from elsewhere. Because in the populations of Napo and Houytom include many migrants, a sufficient reciprocity norm does not exist and, therefore, cannot motivate collective action for forest management and group work.

The ANOVA results are consistent with the SEM results. Although the SEM results for Houytom do not enable us to accept the hypothesis, the SEM results for Napo and Kouay are more fruitful. For Napo, the relationships among three factors of social capital are not statistically significant. However, for Kouay, trust and network influence reciprocity, as was hypothesized earlier in this paper.

Based on the statistical analyses, we have demonstrated that in a village that has a relatively long history, social capital plays a role in restraining the emergence and existence of free riders. In contrast, in a village that has a relatively short history or has heterogeneous attributes (e.g., various ethnicities or migrants from other areas), social capital fails to play such a role.

Although Kouay's institutions are less stringent than those of the other two villages, reciprocity in Kouay is influenced positively by trust and the social network; thus, the reciprocity restrains the emergence of free rider. In other words, the combination of reciprocity and other factors of social capital encourages villagers to contribute to community governance without the need for a strict institution.

This study has reached three conclusions. First, the three villages analyzed have established institutions, as described in previous studies of common-pool resources, to mitigate or even prevent the problem of overuse of the communal forest. Second, residents cannot always manage the communal forest well, due to the presence of free riders, but if they create and maintain long-term social capital, they can do so. Third, combining reciprocity with other factors of social capital may mitigate the problem of overuse without the community having to establish a strict institution.

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