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Household Production, Expenditure and Savings in Rural Areas
: Based on the Rural Survey of Vientiane Province in Lao PDR**

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Effects of Road Access on Household Production, Expenditure and Savings in Rural Areas
: Based on the Rural Survey of Vientiane Province in Lao PDR ⁽¹⁾

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Abstract

Rural areas in developing countries play an important role not only as suppliers of food to urban areas but also as consumers to consume industrial products produced in urban areas. Increasing income in rural areas will accelerate the growth of the industrial sector in urban areas. Poverty in rural areas results from low incentives for production expansion beyond subsistence agriculture because of the poor accessibility to market. We estimated the effects of road access to urban markets on household production, expenditure and savings in rural areas.

The result of the estimation implies that accessibility to urban markets has a significant impact on agricultural production by improving productivity in rural areas, and impacts positively on consumption and savings as well. Many villages are not linked to the main road network and have limited access to urban markets. Better road access would allow farmers all season access to urban markets and expand agricultural production by improving productivity. We found that there was a close correlation between the transport infrastructure and poverty alleviation especially for remote rural areas.

However, there is a serious shortage of funds to develop infrastructure due to the budget deficit. This survey found that over 85% of households kept money in their home and more than half of households paid money to the community. Also, over 20% of households invested their money in gold in rural areas. Therefore, a financial intermediation function which collects money from households and lends it to encourage the expansion of agricultural production, new businesses and investment in infrastructure is important for poverty alleviation in rural areas.

Key words: Lao PDR, rural development, poverty alleviation, infrastructure

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1. Introduction

Lao People's Democratic Republic (Lao PDR) has been promoting a rural development policy to achieve the goal of poverty eradication, which is one of the Millennium Development Goals (MDGs). According to NGPES, the long term national development goal is to be achieved through sustained equitable economic growth and social development including building up the needed infrastructure throughout the country¹. The government has endeavored to develop economic and social infrastructure for the 47 poorest districts where minorities are engaged in subsistence agriculture.

Rural areas isolated from the city have a serious problem with the shortage of infrastructure. However, in large cities many international organizations such as UNDP, World Bank, and the Asian Development Bank and many private companies from Japan, Korea, China, and Australia are promoting social and economic infrastructure development, and natural resource development. Rural areas with insufficient capital and human resources still remained a serious social problem in Lao. The development gap between urban and rural areas is expanding the income inequality between those areas as well as inducing the movement of population to urban areas.

About 67% of the population dwells in rural areas engaged in agriculture, but agricultural production value is only about 30% of the gross domestic product (GDP)². There is room to expand production in the agricultural sector through improvement of agricultural productivity as land-labor ratio in Lao PDR is high. However, we can't expect a high level of improvement in the productivity of farmers due to significant delays in rural infrastructure development such as road access to urban markets and irrigation facilities.

The lack of rural roads that allow farmers access to markets in urban areas has become a major obstacle to the improvement of labor productivity and improving farmers' willingness to produce in rural areas. The development of rural roads might have a significant impact on poverty reduction by increasing income as well as improving access to educational and health services. World Bank (2006) and IMF (2004) insist that the lack of infrastructure such as road and electricity is hindering the economic development in Lao and many other countries. Ranis and Fei model (1961) assumes that the wages in rural area is close to subsistence level and food shortages can be an obstacle to economic development.

In this paper, we analyze the impacts of infrastructure such as rural roads and irrigation on farmer's activities based on the rural survey conducted in Vientiane Province. We focus particularly on the effects of accessibility to urban markets on household production, income, consumption and savings.

¹ See The National Growth and Poverty Eradication Strategy (NGPES), IMF (2004).

² According to ADB, urban population is 33.2% and rural population is 66.8% in 2010.

2. Agricultural production and infrastructure situation

2.1 The migration from rural to urban areas

The agricultural sector has important roles not only to provide foods for urban workers, but also to earn foreign currency through exporting crops. It is difficult to solve the problem of food insufficiency in the country because a large portion of people living in rural areas where self-sufficiency is the norm. According to the results of Lao expenditure and consumption survey (LECS), conducted by the department of statistics every five years, the number of households in Lao has increased to 985,000 in 2007/08 (LECS 4). The ratio of urban households increased to 30.7% in 2007/08 from 27.7% in 2002/03, while the ratio of rural households decreased. This is the result of people moving to urban areas in search of employment opportunities and a higher standard of living.

Harris-Todaro model (1960) assumed that the migration decision is based on expected income differentials between rural and urban areas. It is considered that this movement occurs steadily if the expected income in urban exceeds the expected income in rural areas and the living standard in urban areas is higher. The income gap between urban and rural areas has increased gradually because capital and human resources for development are concentrated in areas with high population density while development in rural areas with decreasing people tends to be postponed.

The poverty situation in urban areas has been improved significantly, the poverty headcount index (poverty incidence)³ dropped to 17.4%, but the index is still at a high level of 42.6% in rural areas without all season roads in 2007/08 even though rural development policies have been implemented by the government.

2.2 Crops production and agricultural productivity in rural areas

The climate of Laos is divided between dry and wet season clearly. The main crop of the agricultural production is ordinary rice and glutinous rice. In the dry season there is low rainfall crop production is significantly reduced. Agriculture area operated for rice in the dry season is very little compared to the wet season, but rice production per 1ha is higher than the wet season because farmers cultivate rice in only arable land with well-equipped irrigation.

In rural areas without roads, the area operated for rice is only about 2.7% of the wet season as can be seen from Table 1. Productivity of rice farming in this region is significantly

³ Poverty headcount index is proportion of the population living below the poverty line. Absolute poverty line is often based on estimates of the cost of basic food needs that is the cost of nutritional basket considered minimal for the health of a typical family, to which a provision is added for non-food needs. See IMF (2004) Annex 1, World Bank (2006) and JICA (2010) appendix 2.

lower compared with that of the national average and other regions. Production of rice has decreased in the dry season, but productivity was higher than the wet season. According to the results of the LECS 4, income generated from the market sale of crops and vegetables in rural areas was very small. Farmers spent only 2.2 hours daily tending crops, vegetables and livestock in 2007/08⁴.

Table 1 Harvested areas and production of rice in 2007

	wet season			dry season		
	harvested area	production	productivity	harvested area	production	productivity
Lao PDR	1,029	2,244	2.18	80	218	2.73
Urban	178	400	2.25	22	63	2.86
rural with road access	739	1,628	2.20	54	148	2.74
rural without road access	112	218	1.95	3	7	2.33

Notes: 1000ha, 1000ton, productivity is divided production by harvested area

Source: Author's calculation based on LECS 4

2.3 Empirical studies on Infrastructure and poverty alleviation

Barrios (2007) defined a rural road as an access from the main road network to the rural communities and production areas. IMF (2004) provided some evidence that rural transport improvements decrease transport costs for the poor and generates farm and non-farm income. And rural energy improvements improved the quality of education and health care for the poor, and increased information flow to the poor. They also found that both rural transport and energy improvements increased employment and wage rates, and the aggregated impact of transport and energy improvements has a greater poverty reduction effect.

Peter (2005) analyzed that the relationship between poverty incidence and road development. Between 1997-98 and 2002-03, rural poverty incidence in Lao declined by 9.5% of the rural population. He suggested that about 13% of decline in rural poverty can be attributed to improved road access alone. Other factors included a massive public investment in irrigation facilities.

World Bank (1994) emphasized that there is a close relationship between infrastructure and economic growth. This is seen in the lack of infrastructure development hindering the economic growth in China and in many case studies, such as those on the

⁴ Rural areas with road, farmers spend 2.5 hours daily for cultivating crops and vegetables, and tending animals.

direct and indirect economic impact of infrastructure in farming sector in India. World Bank (2006) also insisted that improving rural producer's agricultural productivity and expanding their market orientation is constrained by their paucity of physical assets and human capital. Ownership of productive assets is strongly correlated with road access, and is 70% higher for households with access to permanent roads compared with no road access.⁵

2.4 Infrastructure situations in rural areas

According to the LECS 4, farmers living in rural areas with roads cited the lack of irrigation as the most important restriction influencing the generation of household income while farmers living in rural areas without all season roads cited lack of market access (LECS 4:69-70). This implies that households in rural areas have incentives for expanding production and increasing the productivity of crop production when infrastructure such as irrigation and rural roads to urban markets are improved.

As can be seen from Table 2, the prevalence of electricity and roads in urban areas is almost 100%. On the other hand, there is inadequate infrastructure in rural areas. More than half of villages with roads have electricity but only 26% of villages without roads. Almost all villages in Lao have access to urban markets in the dry season in 2007/08. The infrastructure situation in rural areas has been improved, however a large number of villages still don't have adequate roads. 84% of all villages have access to market during the wet season in 2007/08, while only 54% in 2002/03. And 83% of villages without roads had access to urban market during the dry season but only 17% during the wet season. The situation of rural areas without all season roads remained unchanged from the LECS 3 in 2002/03.

There is a close correlation between the absence of transport infrastructure and poverty, especially for remote rural areas. Income generated by selling crops and vegetables is significantly lower because many villages are not linked to the main road access to urban markets. Road construction has additional effects for the inhabitants of rural areas. Cynthia et al (2000) estimates that railway and road construction had substantial direct and indirect employment effect in China, Thailand, and India case studies. Prevalence of infrastructure in rural areas especially without road access is important for expanding production through the improvement of agricultural productivity.

⁵ Sawada (2000) insists that infrastructure, including roads and irrigation, has a role to play in relation to transient and structural poverty. In addition to increasing economic opportunities and to reduce structural poverty, infrastructure helps minimize the risks of agricultural production, which is the main cause of transient poverty in Asia. See Barrios (2007), Peter (2005), Srinivasan (1986), and Kim (2007).

Table2 Infrastructure situation in Lao

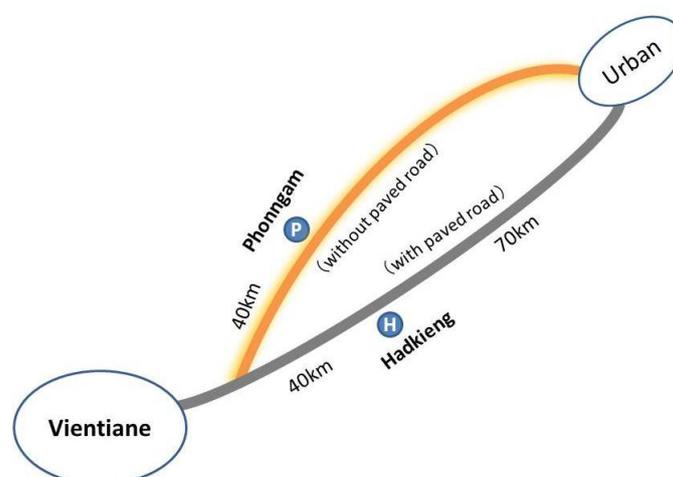
	LECS 3 (2002/03)	LECS 4 (2007/08)
electricity Lao PDR	33%	61%
urban	95%	99%
rural with road access	33%	53%
rural without road access	13%	26%
reachable in dry season Lao PDR	71%	100%
urban	100%	100%
rural with road access	84%	100%
rural without road access	35%	83%
reachable in wet season Lao PDR	54%	84%
urban	97%	98%
rural with road access	65%	80%
rural without road access	17%	17%

Source: LECS 3 and LECS 4

3. Household survey in Vientiane province

We conducted a household survey which consisted of household production, income, expenditure and savings, and infrastructure conditions in Vientiane province in March 2008. The survey was carried out with cooperation of the faculty of economics and management of national university of Lao. The surveyed villages were Hadkieng village and Phonngam village about 40km from Vientiane. Phonngam village has no access to urban markets in the wet season because of the absence of paved roads. Unpaved roads connect this village to Vientiane and to northern cities. Farmers use these unpaved roads when they access urban markets. There are no serious obstacles to the flow of people and buses in the dry season. However, these areas are not reachable in the torrential rainfall season.

Figure1 Location of two villages in Vientiane province



Note: Author's drawing

In contrast, the paved road constructed in the late 1980s linking Hadkieng village to Vientiane and to the cities in northern districts, plays an important role carrying people and crops to urban markets in the dry season and the wet season as well. Lots of traffic and bus routes allow farmers to generate revenue from the sale of grain and vegetables throughout the year.

3.1 Sample of the survey

Phonngam village has 1,075 people in 180 households, and Hadkieng village has 1,113 people in 196 households. The average number of members per household is 6.0 and 5.7 in Phonngam village and Hadkieng village respectively. We surveyed production, expenditure and savings of 131 households in Phonngam village and 196 households in Hadkieng village.

77.9% of households in Phonngam village and 70.9% in Hadkieng village were engaged in the agricultural sector as their main job. 96.9% of households in Phonngam village owned agricultural land for rice production and 77.6% in Hadkieng village. The average area of land for rice farming was 2.3ha in Phonngam and 1.2ha in Hadkieng village. In both villages, few households grow vegetables for market sale. 14.5% and 24.6% of households in Phonngam and Hadkieng village produced vegetables, and the average area of operating land is 0.6ha and 1.3ha respectively. Many people in Phonngam village were engaged in the agricultural sector but revenue from market sale was small because the majority of the agricultural products produced are for their own consumption.

Table 3 Number of people and household in two villages in 2007

	Phonngam village	Hadkieng village
people	1,075	1,113
household	180	196
sample	131 (72.8%)	134 (68.4%)

3.2 Results of the survey

We analyzed the effects of accessibility to urban markets on household production, expenditure and savings in two villages.

3.2.1 Education

The Lao government has endeavored to achieve universal primary education which is one of the Millennium Development Goals (MDGs). As the results, net enrollment rates in primary school rose from 58% of primary school age children in 1991 to 79% in 2007/08.

The literacy rate increased nationwide, and priority districts improved more than the national average⁶. The literacy rate of the population at age of 15 and higher is 85% for men and 70% for women in 2007/08 (LECS 4: 43-46).

According to the LECS 4, 89% of the villages have a primary school and 18% have a lower secondary school also in the village in 2007/08. The number of villages with primary schools and lower secondary schools has increased by 10 % compared to the LECS 3 in 2002/03. In rural areas without roads, 88% of the villages have a primary school but only 3% of the villages have a lower secondary school. The net school enrolment ratio of children aged of 6 to 10 has increased sharply. The ratio in urban areas is 94% while 68% of children in rural areas without roads were enrolled in school in 2007/08.

Phonngam and Hadkieng village have a primary school built with Japanese aid in the village, so the correlation between accessibility to school and primary education in both villages is unclear. The ratio of people who dropped out primary school or had no schooling in Phonngam is 19.9%, and 33.6% in Hadkieng village. Table 4 shows a large number of people in Hadkieng village didn't complete their primary education. The ratio of people who completed primary school, lower secondary school and vocational training is higher in Phonngam compared to Hadkieng village. However, the percentage of people engaged in agriculture is much higher in Phonngam village.

In order to increase the number of people who complete their primary education in rural areas, support from the government is important. The prevalence of primary education is essential to alleviate poverty in rural areas.

Table 4 Education in two villages

	Phonngam vaillage	Hadkieng village
no school or dropped out of primary school	19.9%	33.6%
primary school graduates	37.4%	32.1%
secondary school graduates	17.6%	15.7%
vocational education	14.5%	5.2%
other	10.6%	13.4%

Note: Author's calculation

3.2.2 Production of rice

Since the climate of Lao is divided clearly between the dry season and the wet season, the production of rice and vegetables in the dry season is less but increase significantly in

⁶ See Millennium development goals progress report Lao PDR 2008, 29-38.

the wet season⁷. The main agricultural products of the two villages are ordinary rice and glutinous rice, and vegetables such as cucumbers and corn. 42.7% of agricultural land in Phonngam village has irrigation while 11.2% in Hadkieng village. During the dry season, the number of household cultivating rice is small. Farmers plant rice in only arable land with irrigation.

63.4% of households in Phonngam village and only 11.9% in Hadkieng village cultivated rice in the dry season of 2007. During the wet season, the number of households cultivating rice increased dramatically to 84.7% in Phonngam and to 77.6% in Hadkieng village. The area of land cultivated increased also to 1.4ha and 1.0ha from 0.1ha and 0.5ha during the dry season in both Phonngam and Hadkieng village.

Table 5 shows production and sales of rice in 2007, production in the wet season is much higher than in the dry season. Production of rice increased 1.7 times in Phonngam and 9.7 times in Hadkieng village during the wet season. The quantity for market sales in the wet season in Hadkieng village increased 4.8 times as production of rice increased. However, the quantity of market sale in Phonngam village fell to 132kg in the wet season from 216kg in the dry season.

Why does the quantity for market sales of rice decrease despite rice production being much higher in the wet season? Household model⁸ assumes that the volume of crop sales in rural areas tends to decrease even though prices rise in developing countries with the lack of goods and labor markets, underdeveloped insurance markets and asymmetry information. Farmers are producing crops not only for market sales but also for self-consumption. They want to ensure self-consumption in the dry season in case rice production decreases suddenly.

Table 5 Production and sale of rice in 2007

	Phonngam village		Hadkieng village	
	dry season	wet season	dry season	wet season
cultivated area (ha)	0.5	1.0	0.1	1.4
production (kg)	954	1,650	210	2,034
volume of sale (kg)	216	132	72	342

Note: Author's calculation based on the survey

The interesting phenomenon that sales volume decreased despite of increasing

⁷ Lao PDR has a tropical monsoon climate, with the wet season from May through October and the dry season from November through February.

⁸ See Barrios (2007) 13-15 and Kurosaki (2001) 17-44.

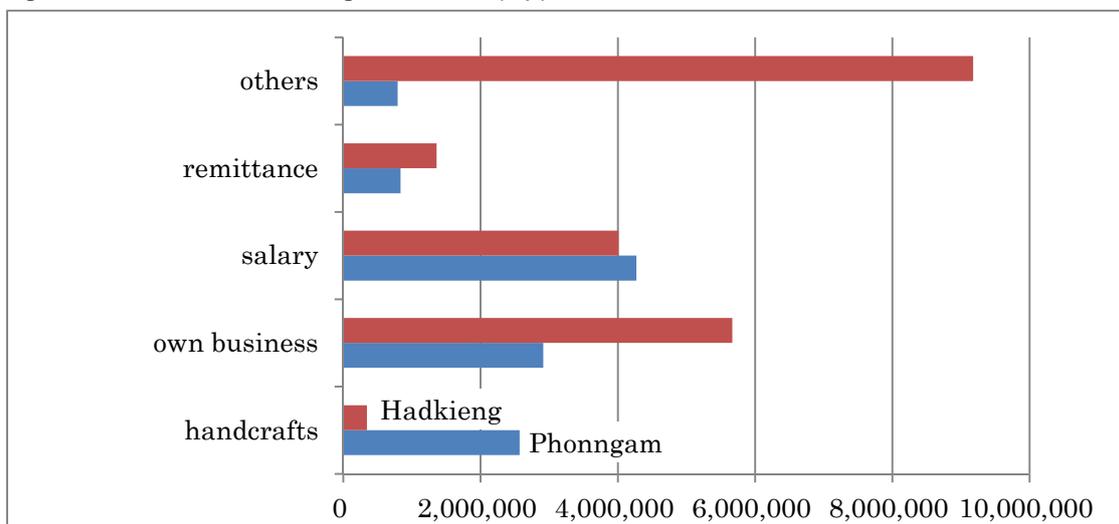
production in the wet season is shown in Phonngam village. The rate of increment of production between the dry season and wet season is very small compared with that of Hadkieng village. This phenomenon is caused by the lack of information and the inadequate road situation. As we can see from Table 5, adequate infrastructures enable farmers to increase production and market sales of crops, and to alleviate their poverty situation in the long run.

3.2.3 Income and expenditure

The income level in Hadkieng village is about twice that of Phonngam. Figure 1 shows the structure of income. Salary from government service and factories is the main income source in Phonngam village. The second largest income source is small business, followed by handcrafts. Income generated from merchants is the largest income source, followed by salaried income in Hadkieng village.

Income generated from the selling of crops is very small in both villages. Income from selling crops in Hadkieng village is much higher than in Phonngam village. There are many merchants who buy crops from farmers and sell them to the urban markets, and sell daily necessities purchased in urban markets to the farmers in Hadkieng village. We found that more transactions with urban markets enabled farmers to earn higher incomes through the increased sales of handcrafts and expanding agriculture production.

Figure 1 Income in two villages in 2007 (kip)



Note: Others include income generated from the sales of crops, vegetables and livestock.

The household expenditure in Hadkieng village was 1.6 times that of Phonngam village in 2007. Figure 2 represents the structure of expenditure in both villages in 2007. The

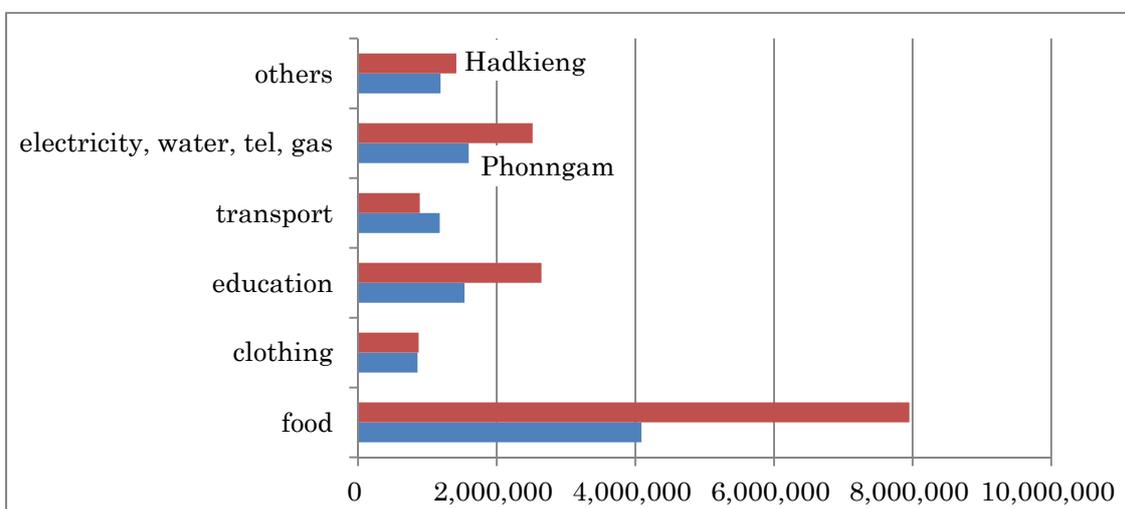
expenditure on food consumption was the biggest in both villages. 39.1% of expenditure was for food in Phonngam and 48.8% in Hadkieng village. The expenditure on food consumption would have been larger if we included self-consumption of crops into the cost of food consumption.

The trends for expenditure on food consumption are very high throughout Laos. According to the LECS from LECS 2 to LECS 4, the food consumption ratio is still high although it fell to 46.1% in 2007/08 from 64.3% in 1992/93 and 55.0% in 2002/03.

The expenditure on education was the second highest consumption after food. 16.2% of total expenditure was for education in Hadkieng and 14.7% in Phonngam village. Phonngam village spent much more money for transportation, about 11.3%, however Hadkieng village spent little money for transportation, about 5.5%. This indicates that the cost of access to urban markets may be higher in the villages without access to roads in the wet season.

We usually assume that the standard of living is measured by utility, and the level of utility is generally higher when people consume more goods and services. Therefore, utility is higher when expenditure on consumption is higher and we can say that an adequate infrastructure, especially all season roads, in rural areas will increase the standard of living.

Figure 2 Expenditure in two villages (kip)



Note: Excluding food produced for own consumption

3.2.4 Savings

Micro finance is the extension of small money to impoverished people who typically lack of collateral in developing countries. These days it helps impoverished people with supporting entrepreneurship and alleviating poverty. We can say that increasing the supply

of micro finance is important for poverty alleviation through encouraging new business and increasing agricultural production in rural areas.

There is room for expansion of agricultural production because farmland per capita of Lao is much higher compared with other developing countries with high population density. Also, many households in rural areas have savings even though they are small. Therefore, empowering villages to provide micro finance internally from their own collective savings is critical for encouraging expansion of agricultural production by enabling small business owners to become involved in the improvement of local infrastructure such as roads and irrigation facilities.

The average savings of households in Hadkieng village was about 41.2% higher than Phonngam village. 34.4% of money was kept by households, 26.8% invested to purchasing gold, 26.7% deposited in the bank and 12.1% paid to the community in Phonngam village. However, in Hadkieng village 39.7% of money was deposited in the bank, 26.0% kept by households, 22.3% invested to purchasing gold, and 10.7% paid to the community in 2007.

Number of households that deposited their money in the bank was less than 4% of all households in both villages. Most households kept money at home and paid money to the community. Table 6 shows how a financial intermediation function which collects money from farmers and lends it to new local businesses could expand agricultural production and investment in irrigation and roads in both villages.

Table 6 Category of savings in two villages

category	Phonngam village			Hadkieng village		
	amount		household	amount		household
	kip	%	%	kip	%	%
bank saving	1,202,419	26.7	3.8	2,524,000	39.7	3.7
community paid	546,048	12.1	45.0	682,046	10.7	70.9
Keep at home	1,548,468	34.4	86.3	1,656,308	26.0	85.1
purchasing gold	1,208,831	26.8	26.0	1,415,923	22.3	20.1
other	1,452	0.0	0.8	85,385	1.3	2.2
total	4,507,218	100		6,363,662	100	

Note: Household average savings

4. Effects of accessibility on household production, expenditure and savings

We here estimated effects of road access to urban markets on household production, expenditure and savings in Phonngam and Hadkieng village. We used the Cobb Douglas production function for the estimation. Equation 1 shows the Cobb Douglas production

function, and Q, A, K, L represent production, constant, capital and labor input respectively. The production function assumes constant returns to scale, thus $\beta_1 + \beta_2 = 1$.

$$Q = AK^{\beta_1}L^{\beta_2} \quad \text{equation 1}$$

$$\ln Q = A + \beta_1 \ln K + \beta_2 \ln L \quad \text{equation 2}$$

Consumption and savings based on Keynesian consumption function are defined as follows. The equation 3 represents that household consumption is influenced by disposable income. Consumption function is made up of autonomous consumption and induced consumption, and it can be written as equation 4.

$$C = f(Y_d) \quad \text{equation 3}$$

$$C = C_0 + bY_d \quad \text{equation 4}$$

Where, C is total consumption, C_0 is autonomous consumption ($C_0 > 0$), b is the marginal propensity to consume ($0 < b < 1$), Y_d is disposable income.

Household savings are also influenced by disposable income. Equation 5 denotes that increase in income will increase the savings. Savings function can be written as equation 6. S and S_0 denote total savings and autonomous savings, and (1-b) denotes the marginal propensity to save.

$$S = f(Y_d) \quad \text{equation 5}$$

$$S = S_0 + (1 - b)Y_d \quad \text{equation 6}$$

We estimated the effects of road access to urban markets on economic activities of households in rural areas using the following equations. D represents dummy variable of rural roads and ε represents error term.

$$\ln Q = \beta_0 + \beta_1 \ln K + \beta_2 \ln L + \beta_3 D + \varepsilon \quad \text{equation 7}$$

$$\ln C = \beta_0 + \beta_1 \ln Y + \beta_2 D + \varepsilon \quad \text{equation 8}$$

$$\ln S = \beta_0 + \beta_1 \ln Y + \beta_2 D + \varepsilon \quad \text{equation 9}$$

4.1 Effects of rural road access on production

We estimated the relationship between the agricultural production and capital input, labor input for agricultural production, and road access to urban markets. Table 7 shows result of this estimation, K is physical capital input including machinery and weed-killer, L is labor input. Dummy variable D represents road access to urban markets in the wet season.

The result of the estimation implies that the accessibility to urban market has a great impact on agricultural production in rural areas. Physical capital input and labor input also have a positive impact on production. The presence of roads was the strongest factor influencing agricultural production. A 1% of increase in machinery and weed-killer will result in a 0.73% increase in production. The presence of roads will result in a 0.95% production increase in Phonngam and Hadkieng village.

Table 7 Effects of rural road on agriculture production

variable	estimated coefficient	t- statistics	p- value
constant	3.01	(0.85)	0.39
ln K	0.73	(2.80)**	0.00
ln L	0.38	(2.01)**	0.01
D	0.95	(3.15)**	0.00

Notes: ** is 95 % level of significance. $\bar{R}^2 = 0.20$, F-test = 7.32

4.2 Effects of rural road access on expenditure

We estimated the relationship between expenditure and household income and road access. The result can be seen from Table 8, it shows that household expenditure is influenced by household income level and road condition. Both disposable income and road accessibility have a positive impact on expenditure level. Disposable income has a significant influence on expenditure but road access to urban markets has a slight influence.

Table 8 Effects of rural road on expenditure

variable	estimated coefficient	t- statistics	p- value
constant	11.13	(11.63)**	0.00
ln Y	0.31	(5.41)**	0.00
D	0.10	(0.71)**	0.48

Notes: ** is 95% level of significance, $\bar{R}^2 = 0.29$, F-test = 16.01

4.3 Effects of rural road access on savings

Finally, we estimated the effects of income and road access on household savings.

Table 9 shows the estimated result of the relationship between savings and income and rural roads. Income and accessibility have a significant impact on savings in rural areas. A 1% increase in income will result in a 0.43% increase in savings. And road access will result in a 0.44% increase in savings in Phonngam and Hadkieng village.

Table 9 Effects of rural road on savings

variable	estimated coefficient	t- statistics	p- value
constant	7.39	(3.56)**	0.00
ln Y	0.43	(3.43)**	0.00
D	0.44	(1.48)**	0.14

Notes: ** is 95% level of significance, $\bar{R}^2 = 0.16$, F-test = 8.07

6. Conclusions

Rural areas in developing countries play an important role not only as suppliers of food to urban areas but also as consumers to consume industrial products produced in urban areas. Increasing income in rural areas will accelerate the growth of the industrial sector in urban areas. However, the poverty problem still remains in rural areas especially where there is no access to urban markets. Poverty in rural areas results from low incentives for production expansion beyond subsistence agriculture because of the poor accessibility to market. Poverty alleviation is one of the important goals in social and economic development in Lao PDR.

We estimated the effects of road access to urban markets on household production, expenditure and savings in rural areas. The result of the estimation implies that accessibility to urban markets has a significant impact on agricultural production by improving productivity in rural areas, and impacts positively on consumption and savings as well.

Many villages are not linked to the main road network and have limited access to urban markets. Better road access would allow farmers all season access to urban markets and expand agricultural production by improving productivity. We found that there was a close correlation between the transport infrastructure and poverty alleviation especially for remote rural areas.

Social benefits exceed the private benefits in infrastructure investment in rural areas. However, there is a serious shortage of funds to develop infrastructure due to the budget deficit. This survey found that over 85% of households keep money in their home and 45% in Phonngam and 71% in Hadkieng village pay money to the community. Also, over 20% of households invest their money in gold. Therefore, a financial intermediation function which collects money from households and lends it to encourage the expansion of agricultural

production, new businesses and investment in infrastructure is important for poverty alleviation in rural areas.

References

- Asian Development Bank, *Key Indicators* various years, Manila.
- Asian Development Bank (2000), *Country Assistance Plan (2001-2003) Lao People's Democratic Republic*, Manila.
- Byoungki Kim (2007), "The Impacts of Infrastructure Investment on Rural Development: Roads and Electricity Development for Poverty Reduction in Lao PDR, *Lao Journal of Economics and Business Management*, 108-125, August, 2007.
- Cynthia et al (2005), *Assessing the Impacts of Transport and Energy Infrastructure on Poverty Reduction*, ADB, Manila.
- Erniel B. Barrios (2007), "Access to Rural Development: Household Perceptions on Rural Development", *ABD Institute Discussion Paper*, No. 61
- Harris, John R. and Todaro, Michael P. (1970), "Migration, Unemployment and Development: A Two-Sector Analysis", *American Economic Review* 60 (1), 126–142
- IMF (2004), *Lao People's Democratic Republic: Poverty Reduction Strategy Paper*. Washington.
- IMF (2006), *Lao People's Democratic Republic: Selected Issues and Statistical Appendix*, Washington.
- JICA (2010), *Lao People's Democratic Republic Study for Poverty Profiles of the Asian Region Final Report*, August, 2010.
- Kurosaki Taku (2001), *Micro economics for the development: theory and applications*, Iwanami (Japanese)
- Lao Department of Statistics (1999, 2004, 2009), *The Household of Lao PDR Lao Expenditure and Consumption Survey*.
- Lao Government (2008), *Millennium Development Goals Progress Report Lao PDR 2008*.
- Peter Warr (2005), "Road Development and Poverty Reduction: The Case of Lao PDR", *ADB Institute Discussion Paper No. 25*
- Ranis, G. and J. C. H. Fei (1961), "A theory of Economic Development ", *American Economic Review*, 51, September, 533-65
- Sawada Yasuyuki (2000), "Dynamic Poverty Problems and the Role of Infrastructure", *JBIC Review*, No.3, December, 20-40.
- Srinivasan, T.N. (1986), "The Costs and Benefits of Being a Small, Remote, Island, Landlocked or Ministate Economy" *World Bank Research Observer* 1 (2) July, 205-218.
- World Bank (1994), *World Development Report*, Oxford University Press.
- World Bank (2006), *Lao PDR: Rural and Agriculture Sector Issues Paper*, May, Washington.