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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

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ABSTRACT

Rural areas in developing countries play an important role not only as suppliers of food to urban areas but alsoas consumersof 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 markets. Therefore 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 networksand 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 goldin 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 National Growth and Poverty Eradication strategy (NGPES).

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 country[4]. The government has endeavored to develop economic and social infrastructure for the47poorest districts where minorities are engaged in subsistence agriculture.

Rural areas isolated from the city have a serious problem with the shortage of infrastructure; rural areas with insufficient capital and human resources still remain a serious social problem in Lao. 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. The development gap between urban and rural areas is expanding 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)[5]. 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. The World Bank(2006) and the IMF(2004) insist that the lack of infrastructure such as roads and electricity is hindering the economic development in Laos and many other countries. The Ranis and Fei model (1961) assumes that wages in rural areas are close to subsistence level and food shortages can be an obstacle to economic development. In this paper, we use a rural survey conducted in Vientiane Province to analyze the impacts of infrastructure such as rural roads and irrigation on farmer's activities. We focus particularly on the effects of accessibility to urban markets on household production, income, consumption and savings.

2. AGRICULTURAL PRODUCTION AND INFRASTRUCTURE SITUATION

2.1 The migration from rural to urban areas

The agricultural sector has important roles not only in providing food for urban workers, but also in earning foreign currency through exporting crops. It is difficult to solve the

[4] See The National Growth and Poverty Eradication Strategy (NGPES), IMF (2004).
[5] According to ADB, urban population is 33.2% and rural population is 66.8% in 2010.

problem of food insufficiency in the country because a large portion of people are living in rural areas where self-sufficiency is the norm. According to the results of the Lao expenditure and consumption survey(LECS)conducted by the department of statistics every five years, the number of households in Lao had increased to 985,000 by 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.

The Harris-Todaro model (1960) assumes that migration decisions are based on expected income differentials between rural and urban areas. It anticipates 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 populations tends to be postponed.

The poverty situation in urban areas has been improved significantly and the poverty headcount index (poverty incidence) [6] has dropped to 17.4%,. but even though rural development policies have been implemented by the government, the index is still at a high level of 42.6% in rural areas without all season roads in 2007/08.

2.2 Crops productionand agriculturalproductivityin rural areas

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

In rural areas without roads, the area used for rice is only about 2.7% in the wet season as can be seen from Table 1.The productivity of rice farming in this region is significantly lower compared with that of the national average and other regions. Production of rice 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 2007/08[7].

[6] 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.

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

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 rural communities and production areas. The IMF (2004) provided some evidence that rural transport improvements decrease transport costs for the poor and generate farm and non-farm income. Moreover, 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 had a greater poverty reduction effect.

Peter (2005) analyzed 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.

The 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 direct and indirect economic impact of infrastructure on the farming sector in India. The World Bank (2006) also insisted that improving rural producers' 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.[8].

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

[8] 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).

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 in adequate infrastructure in rural areas. More than half of villages with roads have electricity but only 26% of villages without roads do. Almost all villages in Lao had 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. By 2007/08, 84% of all villages had access to markets during the wet season, while only 54% did in 2002/03.But while83% of villages without roads had access to urban markets during the dry season, only 17% did during the wet season. The situation of rural areas without all season roads remained unchanged from the LECS3 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 case studies from China, Thailand, and India. The prevalence of infrastructure in rural areas especially without road access is important for expanding production through the improvement of agricultural productivity.

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 seasonLao PDR	54%	84%
urban	97%	98%
rural with road access	65%	80%
rural without road access	17%	17%

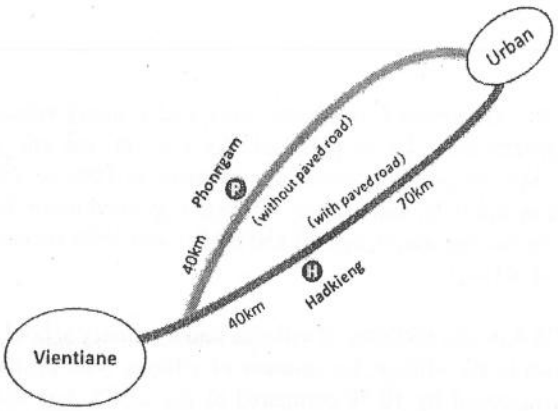
Source: LECS 3 and LECS 4

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 at the National University of Laos. The surveyed villages were Hadkieng village and Phonngam village, which are located about 40 km from Vientiane city. 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, and farmers use these unpaved roads when they access urban markets. While there are no serious obstacles to

the flow of people and buses in the dry season, these areas are not reachable in the season with torrential rainfall.

Figure1 Location of two villages in Vientiane province



Note: Author's drawing

In contrast, the paved road constructed in the late 1980slinkingHadkieng village to Vientiane and to the cities in northern districts plays an important role in 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 villageand 77.6% in Hadkieng village owned agricultural land for rice production. 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 sales 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 tourban 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 a result, 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 average[9].The literacy rate of the population age 15 and higher was 85% for men and 70% for women in 2007/08 (LECS 4: 43-46).

According to the LECS 4,in 2007/0889% of villages had a primary school and 18% had a lower secondary school also in the village; the number of villages with primary schools and lower secondary schools increased by 10 % compared to the LECS 3 in 2002/03. In rural areas without roads, 88% of the villages had a primary school but only 3%of the villages had a lower secondary school. The net school enrolment ratio of children aged of 6 to 10 has increased sharply. In 2007/08 the ratio in urban areas was 94%, while68% of children in rural areas without roads were enrolled in school.

Phonngam and Hadkieng villagesboth have primary schools 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 of primary school or had no schooling is 19.9% in Phonngam and 33.6% in Hadkieng. 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

	Phonngamvaillage	Hadkieng village
no school ordropped 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 increases significantly in

[9] See Millennium development goals progress report Lao PDR 2008, 29-38.

the wet season[10]. 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 Phonngamvillage has irrigation while only 11.2%of land in Hadkieng village does. During the dry season, the number of households cultivating rice is small as farmers plant rice only where there is arable land with irrigation.

In200763.4% of households in Phonngam village and only 11.9% in Hadkieng village cultivated rice in the dry season. 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, from 0.1ha and 0.5ha during the dry seasonto1.4 ha and 1.0ha during the wet seasonin both Phonngam and Hadkieng.

Table 5 shows the production and sales of rice in 2007; production in the wet season is much higher than in the dry season, with the production of rice increasing 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 from 216 kg in the dry season to 132 kg in the wet season.

Why does the quantity for market sales of rice decrease despite rice production being much higher in the wet season? The household model[11] assumes that the volume of crop salesin rural areas tends to decrease even though prices rise in developing countries with a lack of goods and labor markets, underdeveloped insurance markets and asymmetrical 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 sales 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 of sales volume decreasing despite increasing 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 enables farmers to increase production and market sales of crops, and to alleviate poverty in the long run.

3.2.3 Income and expenditure

The income level in Hadkieng village is about twice that of Phonngam. Figure 2 shows the structure of income. Salaries from government service and factories is the main income source in Phonngam village.The second largest income source is small business, followed by

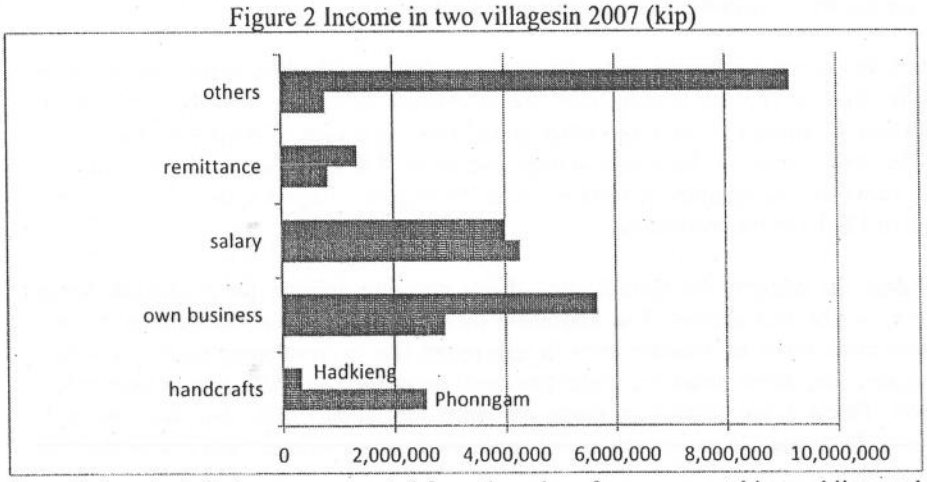
[10] Lao PDR has a tropical monsoon climate, with the wet season from May through October and the dry season from November through February.

[11] See Barrios (2007) 13-15 and Kurosaki (2001) 17-44.

handcrafts. In Hadkieng village income generated from merchants is the largest income source, followed by salaried income.

Income generated from the selling of crops is very small in both villages, but income from selling crops in Hadkieng village is much higher than in Phonngam village. In Hadkieng 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. 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 2 Income in two villagesin 2007 (kip)



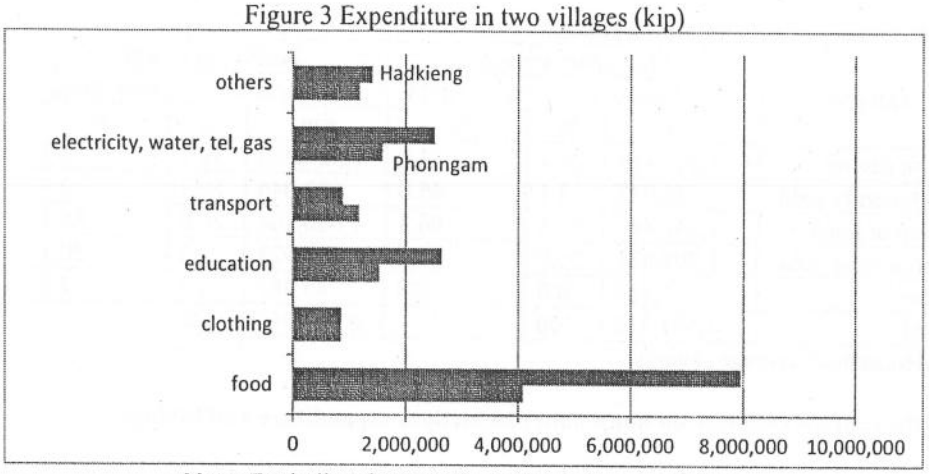
Note: Others include income generated from the sales of crops, vegetables and livestock.

The household expenditure in Hadkieng village was1.6 times that of Phonngam village in 2007. Figure 3 represents the structure of expenditure in both villages in 2007.Expenditure on food consumption was the largest in both villages; 39.1%ofexpenditure 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 in the cost of food consumption.

The trends for expenditure on food consumption are very high throughout Laos. According to data 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. 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 3 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 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 farm land per capita of Lao is much higher compared with other developing countries with high population density. Also, many households in rural areas have saving seven 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. In Phonngam village34.4% of money was kept by households, 26.8% invested in purchasing gold, 26.7% deposited in the bank and 12.1% paid to the community. However, in Hadkieng village39.7% of money was deposited in the bank, 26.0% kept by households, 22.3%investedinpurchasing gold, and10.7% paid to the community in 2007.

In both villages the number of households that deposited their money in the bank was less than 4% of all households. Most households kept money at home and paid money to the community. Table 6showshow 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 6Category 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 $\beta_1 + \beta_2 = 1$.

$$Q = AK^{\beta_1}L^{\beta_2} \quad (1)$$

$$\ln Q = A + \beta_1 \ln K + \beta_2 \ln L \quad (2)$$

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

$$C = f(Y_d) \quad (3)$$

$$C = C_0 + bY_d \quad (4)$$

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 increases in income will increase the savings. The 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.

$$S = f(Y_d) \quad (5)$$

$$S = S_0 + (1 - b)Y_d \quad (6)$$

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 u represents error term.

$$\ln Q = \beta_0 + \beta_1 \ln K + \beta_2 \ln L + \beta_3 D + u_1 \quad (7)$$

$$\ln C = \alpha_0 + \alpha_1 \ln Y + \alpha_2 D + u_2 \quad (8)$$

$$\ln S = \S_0 + \S_1 \ln Y + \S_2 D + u_3 \quad (9)$$

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 the result of this estimation. K is physical capital input including machinery and weed-killer; L is labor input. The dummy variable D represents road access to urban markets in the wet season. The result of the estimation implies that accessibility to urban markets 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% 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 in Table 8, which shows that household expenditure is influenced by household income level and road conditions. 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 ofrural 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, while 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 of industrial products produced in urban areas. Increasing income in rural areas will accelerate the growth of the industrial sector in urban areas. However, poverty 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 of 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% of household in Phonngam and 71% in Hadkieng 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.

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