MAKING A VILLAGE INPUT-OUTPUT TABLE FROM HOUSEHOLD SURVEY DATA

A CASE STUDY OF A VILLAGE INPUT-OUTPUT TABLE FOR A POOR RURAL VILLAGE IN NORTHERN LAO PDR

Abstract

This research examines inter-dependency among households in a poor rural village in northern Lao PDR, employing a Village Input-Output Table (VIOT). The VIOT can be usefully applied to trace physical and monetary flows within and between households in disadvantageous villages in both developed and developing nations. This study works on a VIOT with a matrix form of 1240 x 1240 sizes, capturing the purchase-sale relationship of 10 products based on a household survey conducted in Phonxay village of Ngoi district of LuangPrabang province. The analysis finds a total output multiplier of 1.767, which is relatively small compared to results in IO analysis at the national level. This implies that the production and livelihoods of the villagers depend more on the external economy than on the internal economy. In addition, the backward-linkage analysis finds that most poor households tend to purchase products from other non-poor counterparts, while the forward-linkage analysis indicates that richer households are inclined to sell to poorer households. To the best knowledge of the authors, this study is the first application of the VIOT based on a micro-household survey data of a poor rural area in Lao PDR.

Keywords: Household survey data, Village Input-Output Table; Backward and Forward linkage analysis.

JEL classification: D57; R15; I32; D13; O13.

1. Introduction

It is now widely recognized that the poor are not a homogenous group, and that complex social relationships can both enable and hinder the poor in their efforts to overcome barriers to sustainable livelihoods. In the past, researchers interested in understanding rural economies used Village Input-Output Tables, or VIOT, as part of the Social Accounting Matrix (SAM) approach to capture (mainly economic) transactions of goods and money within villages (Taylor, Adelman, and Vogel, 1988); Taylor and Adelman (1996); Shiferaw and Holden (2000); Subramanian and Qaim (2009); and FaBe and Grote (2014). As well know, Input-Output table is fundamental statistics of inter-industry transaction including value added and final demand information. Our VIOT is rather similar with an international or inter-regional Input-Output (IO) table as Izard type of table because each household is playing the role like each country or each region. The VIOT is an appropriate tool for analyzing micro-level economies because a significant proportion of trade is taking place within the village, both informally (for example, in-kind or labour exchanges) and formally. Each household in the village is therefore not only a producer but also a consumer. By accounting for every transaction, the VIOT can provide a detailed picture of the structure and patterns of household production and consumption. This, in turn, can help deepen our understanding of the inter-household interdependencies and collective productive capacities of the village, and thereby identify potential areas for development interventions.

However, in recent years it appears that VIOT has fallen out of favor among academic researchers, no doubt due to the very detailed information and data on transaction flows between actors in the village which is required in its construction. However, few other tools can provide the depth of empirical data for recording and analyzing inter-household economic relations within a micro-economy such as a village. The current study presents the results of a VIOT constructed from primary data gathered through a household survey conducted in a poor rural village in Ngoi district

of LuangPrabang province, northern Lao PDR, in February and March 2016.[1] Face-to-face interviews using a structured questionnaire were conducted with all 124 households in the village, representing a population of 720 people. The VIOT was constructed based on a product list of ten major types of products, resulting in a matrix form of 1240 x 1240 dimensions. Additional information was also collected, including demographical characteristics, household debts and loans, and remittances.

The data collected for this VIOT was not only used for assessing the repercussion effect of the village's production, but it also yielded directional pair data which could be analyzed to estimate causal effects of particular treatment in micro-econometric method. This approach may therefore be useful for collecting data and analyzing the internal and external economic dependencies of village communities in isolated or disadvantageous areas, where it is usually difficult to obtain relevant socio-economic data.

The remainder of this paper is divided as follows. Section 2 reviews relevant literatures on village social accounting matrix (SAM) approaches which use household survey data. Section 3 presents the background of the study village and the main results of household survey data. Section 4 describes the process of making the Village Input-Output table (VIOT) for Phonxay village. Section 5 presents the IO models derivation from transaction table. Section 6 shows the main results of VIOT analysis, namely the total output multiplier, backward and forward linkages effects. The last section summarizes the main results and concluding remarks.

2. Inter-household relations in rural area: Some relevant Literatures

The theoretical basis for this approach is found in the village Social Accounting Matrix, or SAM approach, developed in the 1970s. The SAM approach was originally developed by Stone (1978),

[1] While the Lao PDR Government conducts national household census every 5 years at the village level, the data collected in the census does not include detailed information on inter-household relations and transactions at the household level.

and comprised of national income and product accounts with input-output (IO) analysis. Later, this approach was developed and applied to the village level in many developing countries (Table 1). One of the earlier uses of a village SAM is in Adelman, Taylor, and Vogel (1988), which used 1982 household data from a major migrant-sending village in central Mexico in order to analyze the economic structure of a migrant-sending rural economy. The village input-output (IO) matrix in the Mexican village SAM composed of five main sectors: farming (principally maize), livestock, renewable resources (fishing and wood gathering), construction, and retail activities. The resulting analysis showed that the largest linkages are the trading activities of the village, through the retail sector, followed by the livestock sector. Meanwhile, the production linkages within the village economy are weak, though there were strong consumption and investment linkages, especially for food and livestock.

Katherine Ralston (1989) used a village SAM framework to analyze the relationship between household nutrition and economic linkages in a West Javan village, Indonesia. The input-output matrix for this village consisted of eighteen sectors, ranging from different types of products (wet rice, dry rice, wood products) to services such as transportation and traditional health providers. She found few linkages between activities: for example, while crop activities purchase seeds from themselves and a small amount of dung from livestock, they involve no other purchases from other activities. Similarly, livestock purchases animals from itself and a small amount of medicine from local retail sector (Ralston, K. 1989). Adelman and Ralston, K. (1992) also used a SAM for the same village in West Java to compare the implications for growth and distribution of market-oriented changes and targeted government programs. They employed a SAM multiplier to account for constraints on crop production. The results suggest that, on average, the market-oriented policies produce higher levels of growth in the village value added and total household income, but increase the gap between incomes of low calorie households and other groups.

Meanwhile, Lewis, B. and E. Thorbecke (1992) employed a SAM approach to explore the nature and extent of economic linkages in a small regional economy in Kenya in order to assess (1) the impact of production activities on regional value added and employment, (2) the influence of sectoral production on the level of household income and the impact of household expenditure on regional value added, and (3) the relative significance of production and consumption linkages in terms of stimulating aggregate income. Their analysis demonstrated the general superiority of agricultural sectors in generating regional income growth. Livestock, coffee, and food crops predominate in terms of generating value added. Conversely, the analysis showed that non-agricultural sectors, the service and non-farm sectors, perform best by the regional wage employment criterion. Furthermore, the analysis also found that, at the household level, agricultural activities have a bigger impact on income generation, while at the district-level, town-based households with higher educational levels benefit relatively more from all types of production activities in the region than lesser educated town-based households and small farmers.

Subramanian and Qaim (2009) developed a micro-social accounting matrix (SAM) to analyze the economy-wide effects of agricultural biotechnology application on cotton production for rural households in India using village census data from four states. The analysis showed that total household income effects are larger for large farms. This is mostly due to differential opportunity incomes of saved family labor in cotton production. Tadele Ferede Agaje (2008) also developed a SAM for a cereal dependent village economy in rural Ethiopia and examined relevant growth options in terms of their impact on output, household income, investments in human capital, and environmental capital. Shiferaw and Holden (2000) extended their village SAM to capture household income losses due to soil degradation. San Martin and Holden (2004) built a small

village SAM from their own household survey conducted in rural Mozambique in order to capture tree resources and assess the multiplier effects of charcoal production.

FaBe and Grote (2014) also developed an environmentally extended SAM at a rural village in Tanzania in order to explore the integration of agroforestry systems in rural smallholder systems, and to analyze the income effects of agricultural biomass production for bioenergy purposes in comparison to firewood production. The entire input-output relationships (monetary and physical) were modeled both within one household as well as between the households in order to cover the transactions of the entire village economy. Concerning the input-output relationships within a household, emphasis was put on the utilization (consumption for subsistence, input use, or processing) of agricultural cash and food crops, including all by-products and their uses (FaBe and Grote, 2014). A summary of the studies which is relevant to village IO table construction from household survey data is given in Table 1.

As the objective of the present study was to understand the inter-dependencies within the village, the approach of Taylor and Adelman (1996) was found to be useful for assessing the impacts of policy, market, and environmental changes on rural economies in less-developed countries as well as to examine the interactions among policies, institutions and economic activities in the village economy. In our study, a village Input-Output table (VIOT) was constructed using household survey data for a rural poor village in northern Lao PDR. In order to capture both the income economy and informal transactions, special attention was paid to matching the sales and purchases of households, as well as account for other sources of household income and expenditure, such as loans and remittances from household members working outside the village.

Table 1: Some relevant studies related to village IO table framework from household survey data

Authors	Country	Data Sources	Research Objectives	Main results
Adelman et al. (1988)	Mexico	Household survey	To employ the SAM to analyze the economic structure of a migrant-sending rural economy.	The results showed that external trade and migration are larger components of the village economy. The input-output linkages are minimal and the village economy is very open, SAM linkages within the village are substantial.
Adelman & Katherine (1992)	Indonesia	Household survey	To use a SAM to compare the implications for growth and distribution of market-oriented changes and targeted government programs.	The results suggest that, on average, the market oriented policies produce higher levels of growth in village value added and total household income, but increase gap between incomes of low calorie households and other groups.
Taylor & Adelman(1996)	Indonesia, Mexico & some African	Household surveys	To examine the interaction among policies, institutions, and economic activities in the village economy.	Both international and internal migration plays a central role in the village economy.
San Martin & Holden (2004)	Mozambique	Household survey	To use a SAM to investigate the impacts of policy-induced and exogenous changes on production activities (maize and charcoal), value added and income distribution.	The SAM analysis illustrates on the role of the different factors of production in overall village economy and the different household groups incomes. The multiplier decomposition showed that agricultural-led and forest resource-led economic growth has different effects on the income distribution of the 4 household groups.
Tadele Ferede Agaje (2008)	Ethiopia	Household survey	To develop a SAM and examine the relevant growth linkages and policy effects in the village economy	The results showed that the effects of income transfer to households on village production, investment in human and environmental capital are mixed and heterogeneous.
Subramanian & Qaim (2009)	India	From 4 states and village census	To develop a SAM to simulate the village-wide effects of agricultural biotechnology (cotton adoption)	Overall, the technology is employment generating, family labor in cotton production is saved. Total household income effects are bigger for large farms.
FaBe & Grote (2014)	Tanzania	Household survey	To explore the integration of agroforestry systems in rural smallholder systems and to analyze income effects of agricultural biomass production for bioenergy purposes in comparison to firewood production.	Findings indicate the importance of including common firewood production as a reference point. The highest income effect for the poorest households derives from agroforestry, which households use as a source of firewood and fruits for sale or home consumption, followed by J. *curcas*, sugarcane and finally cassava.

Source: Author's compilation.

3. Study location and Household survey Summary

Study Location

Phonxay village, located in the Ngoi District, is one of several poor rural villages of the Khmu ethnic group in northern part of LuangPrabang province. Phonxay covers a total area of 560

hectares and has 124 households with a total population of 720 people (368 females). In the past, the village was covered by a massive forest, but today the households are scattered along the main road passing the village to Phonthong District and the Lao-Vietnam border (Figure 1). The village is situated at the altitude between 1,000 meters and 1,800 meters above sea level. It is about 50 Km from the Lao-Vietnamese border market in Phonthong District; 70 Km from Ngoi district market; and 200 Km from markets in the capital city of the province, LuangPrabang city. The long distance from these markets and poor access due to the condition of road infrastructure may have an impact on production relations and consumption patterns in the village.

Phonxay village shares borders with five other villages: Thong Thai village to the north, Ban Don Village to the south, Shop Lan village of Vieng Kham district of LuangPrabang province to the east, and Ban Phon village to the west. In the 1970s, at the same time, many households were both opium producers and consumers, several people, especially, men smoked opium and many were addicted to opium. As a result, they faced serious problems for securing their livelihoods. Poverty was the main issue, followed by health care problem. In early 2000s, the Lao government decided to take strong actions to eliminate opium poppy cultivation, leading the villagers to converting forests into farmland, growing more rice, other field crops, selling their livestock, cutting firewood, harvesting timber and selling various non-timber forest products. Nodaway, agriculture still dominates the key sources of household income and it is also a main source of food provider for this village, followed by forestry activity.

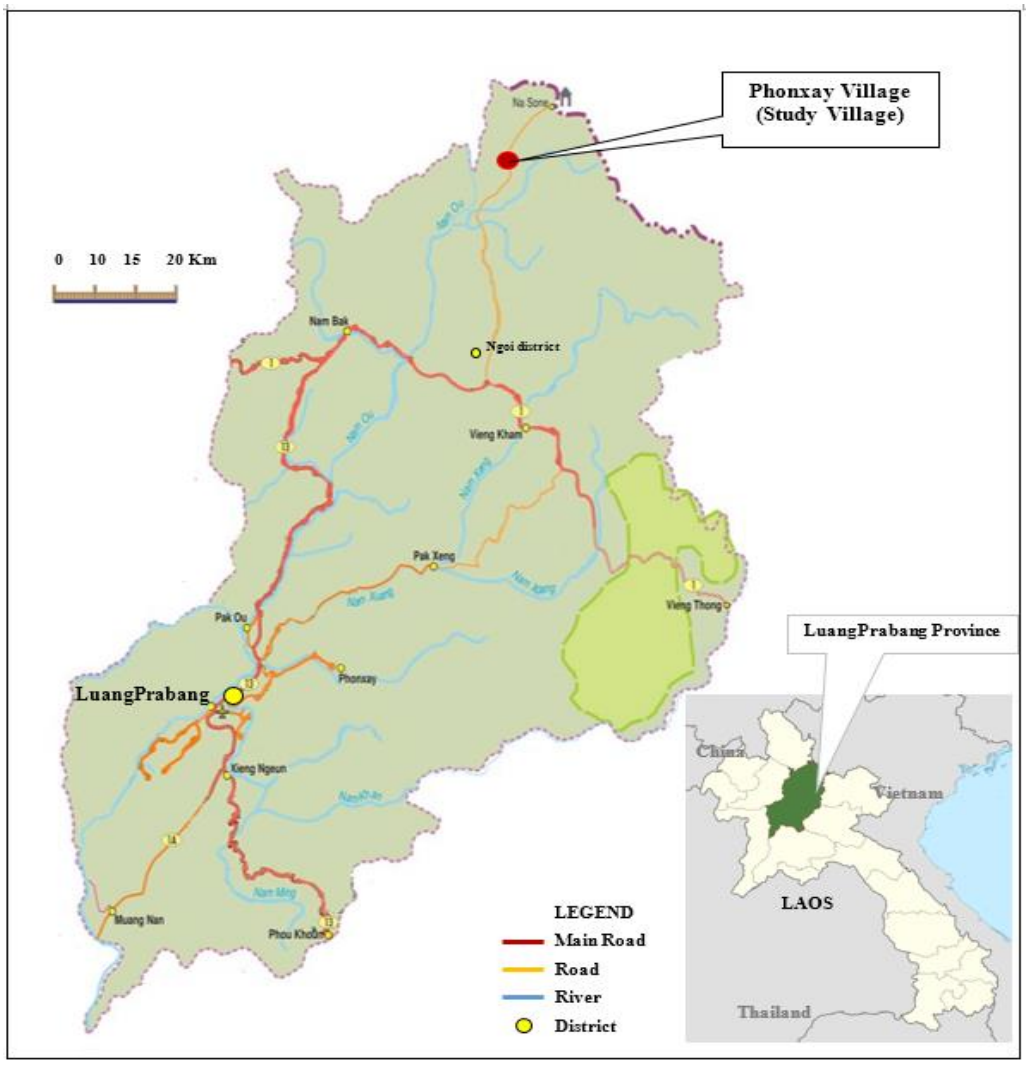


Figure 1: Map of LuangPrabang province and Phonxay village.

The survey was carried out between February 29 and March 18, 2016 by the authors and five (5) local government officials from the Trade and Industry Office of Ngoi district, who were employed for the study and are well-known by local people.

The survey covered all households (124) living in Phonxay and was done through direct face-to-face interviews using a structured questionnaire. Respondents were the household head.

Overall, the questionnaire was based on the data requirements for constructing a village input-output table (see major variables in Table 2). Transaction information on the sales and purchases

relationships within one household as well as between the households were essential parts because they correspond to the intermediate input and intermediate demand in the VIOT. Data collected include household expenditure and income spending on food, non-food items, and incomes received by household members in the last 12 months, which also included goods bought and sold, home produced goods, goods given away to other households, and goods received from other households. Other relevant information such as the demographic characteristics of population, household debts and borrowings (loans) and remittances were also included.

Table 2 shows a summary of the socio-economic characteristics of Phonxay village in 2015. From our survey, we found that female population accounts for 51 % of total population while 86 % of all households had male household heads. The average household size is 5.8 persons. About 25 % of total household heads had no formal education. About 8% of total households are landless household. Female labor account for over a half (51 %) of the total labor force in the village.

Table 2: Socio-economic characteristics of the Phonxay village, 2015

Characteristics	**Frequency**	**Percentage (%)**	**Characteristics**	**Frequency**	**Percentage (%)**
Total population	720	100	Household size	124	100
Female	*368*	*51.12*	*3 - 5*	*64*	*51.61*
Male	*352*	*48.88*	*6 - 8*	*57*	*45.96*
Gender of HH head	124	100	*9 - 12*	*3*	*2.43*
Female	*17*	*13.7*			
Male	*107*	*86.3*			
HH head Married Status	124	100	Farm size (Hectares)	124	100
Married	*107*	*86.3*	*0.0 - 1.0*	*78*	*62.9*
Widowed	*17*	*13.7*	*1.0 - 2.0*	*20*	*16.12*

Characteristics	Frequency	Percentage (%)	Characteristics	Frequency	Percentage (%)
Age of HH head	124	100	*> 2*	*26*	*20.98*
20 - 30	*10*	*8.06*			
31 - 40	*30*	*24.19*	Land ownership	124	100
41 - 50	*31*	*25*	*Owned and operated*	*114*	*91.93*
51 - 60	*35*	*28.23*	*Borrowed and lent*	*10*	*8.06*
> 60	*18*	*14.52*	Labor force	272	100
HH head Education Level	124	100	*Male*	*132*	*48.52*
No formal education	*31*	*25*	*Female*	*140*	*51.48*
Primary education	*77*	*62.1*	Primary Occupation	124	100
Secondary education	*15*	*12.1*	*Farming*	*122*	*98.38*
Higher education	*1*	*0.8*	*Civil Service*	*2*	*1.62*

Source: Field survey data, March 08, 2016.

Table 3 presents the main sources of household income in Phonxay village. The survey showed that the total annual household income of the village is 1,878,260.000 Kip (about 234,783 USD).[2] The major source of income came from rice, contributing 778,640,000 Kip or 41% of the total annual household income, followed by Non-timber Forest Products (NTFPs) with 428,010,000 Kip (22%); livestock with 330,580,000 Kip (17%); others including loans with 203,030,000 Kip (10.81%), wages-salary with 99,630,000 Kip (5%), and remittances (1.08%). The average monthly per capita income is 217,391 Kip which is above the Lao's national poverty line for rural areas (180,000 Kip/person/month or US$ 22,5 /person/month). Gini coefficient of the per capita income in this village was 0.6607, which means income disparity among households is extremely high.

[2] Lao Kip and US dollar exchange rate at the time of the study is 8000 Lao Kip/ 1 US dollar.

Table 3: Annual Household Income by sources in 2015

Source of Income	Household Income (in 1 Kip)	
	Annual	Share (%)
Rice	778,640,000	41.46
NTFPs	428,010,000	22.79
Livestock	330,580,000	17.60
Others*	203,030,000	10.81
Wages and salary	99,630,000	5.30
Remittances	20,350,000	1.08
Other crops	18,020,000	0.96
Total	**1,878,260,000**	**100**

Source: Field survey data, March 08, 2016;

Note: ***** *includes agricultural land lent and loans.*

The Lao National Poverty and Development Standard (2010-2015) classifies households in rural areas of Lao PDR as poor when income levels are lower than 180,000 Kip (approximately 22,5 US dollar at March 2016 rates) per person per month.[3] Table 4 shows that the village is relatively poor, with 89.51 percent of households (poorest and poor) having an average monthly per capita income below the poverty line of 180,000 Kip. Forty-four (44) households with an average monthly per capita income of less than 50,000 Kip were designated as the poorest group. Sixty-seven (67) households with an average per capita income between 50,001 and 179,999 Kip

[3] The Prime Minister of Lao PDR: Decree on Poverty and Development Standard 2010 to 2015, No. 285/PO, dated 13.10.2009, identified that a standard to measure the poverty at individual level has three levels: (1) at country level: 192,000 Kip/person/month; (2) in rural area: 180,000 Kip/person/month, and (3) in urban area: 240,000 Kip/person/month, respectively. However, in our paper, we accepted 2nd level (180,000 Kip/person/month) due to our study village is located in a poor rural area in northern Lao PDR.

were considered as poor group. Nine (9) households with an average monthly per capita income of more than 180,000 Kip were identified as the non-poor group. Only four (4) of 124 households in this village could be considered as belonging to the rich group, having an average per capita income of more than 1,000,000 Kip. The rich households are working as not only farmers but also traders of products from other households. They are getting their profits from sales of products outside the village with market prices, while other households are getting money from selling to these four families at village prices (village prices are lower than market prices).

Table 4: Households by wealth status, as measured by income level, 2015 (1 Kip)

Income Level (Kip)	No. of Household	Share (%)	Wealth status
<50,000	44	35.48	poorest
50,001-179,999	67	54.03	poor
180,000-999,999	9	7.26	non-poor**
>1,000,000	4	3.23	rich
Total	**124**	**100**	

Source: Author's calculation. March 20, 2016.

From our household survey data, the distinction of several household different income groups is a unique characteristic of a village Input-Output table (VIOT). Households belonging to the same group are assumed to have similar livelihoods regarding income generating activities, sources of incomes and their income level, as well as the market participation. Four different groups were identified in Table 5. Poorest and poor households get income from selling non-timber forest products (NTFPs), borrowing (loans), and labor services, whereas non-poor and the final rich four households in this village get income mainly from livestock and rice activity, respectively.

Table 5: Total Annual Household (HH) Income Sources, by HH wealth groups (million Kip)

Income Source	All HH (N=124)		4 HH (N=4)		Non-poor (N=9)		Poor (N=64)		Poorest (44)	
	Value	(%)	Value	(%)	Value	(%)	Value	(%)	Value	(%)
Rice	778.64	41.46	706.32	**57.83**	20.10	13.90	43.93	11.34	8.30	6.64
NTFPs	428.01	22.79	326.13	26.70	8.16	5.64	60.93	15.73	32.80	26.26
Livestock	330.58	17.60	185.15	15.16	72.57	**50.19**	59.33	15.31	13.53	10.83
Others	203.03	10.81	0	0	34.30	23.72	30.35	**33.65**	38.38	**30.72**
Wages & salary	99.63	5.30	0	0	7.50	5.19	64.52	16.66	27.61	22.10
Remittances	20.35	1.08	0	0	0.20	0.14	19.65	5.07	0.50	0.40
Other crops	18.02	0.96	3.77	0.31	1.77	1.22	8.67	2.24	3.80	3.04
Total Income	1878.26	100	1221.37	100	144.6	100	387.37	100	124.92	100

Source: Household Survey Data, (March 8, 2016)

Figure 2 shows the location of poor and non-poor households in the village. The red mark represents a rich household with monthly per capita income of more than 1,000,000 Kip per person, the orange mark indicates the non-poor household with monthly per capita income of above 180,000 Kip, the yellow mark represents the poor household with monthly per capita income between 50,001-179,999 Kip, and the green mark shows the poorest household with monthly per capita income of less than 50,000 Kip, respectively.

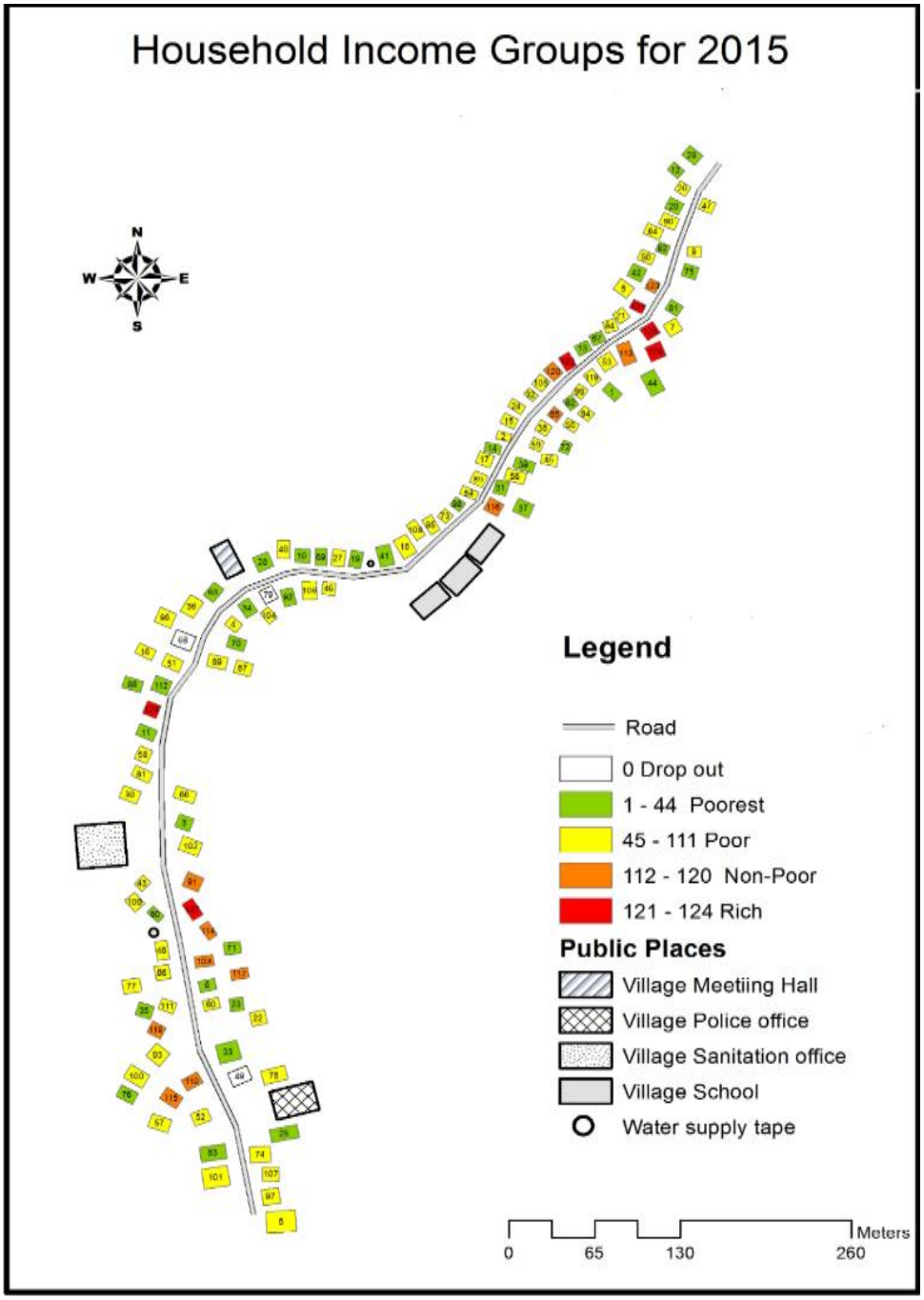


Figure 2: The wealth status and position of individual household in Phonxay Village.

Table 6 shows that 35 %, 32%, and 27% of total expenditures in poorest, poor and non-poor groups, respectively, go to food consumption expenditure (mainly rice), while 69 % of total

expenditures of the four (4) rich households go to non-food items consumption, mainly buying vehicles (cars, trucks and motorbikes).

Table 6: Total Household Expenditures by Wealth Groups, 2015 (million Kip)

Products	Total (124)		Rich (4)		Non-poor (9)		Poor (67)		Poorest (44)	
	Total	(%)	Total	(%)	Total	(%)	Total	(%)	Total	(%)
Livestock	37.41	2.2	8.97	2	4.95	4.32	14.67	2.09	8.82	2.02
NTFPs	6.8	0.4	0.45	0.1	0.63	0.55	3.12	0.44	2.61	0.6
Crops (rice)	446.22	26.22	38.4	8.57	31.13	27.14	223.06	31.77	153.64	35.14
Food	299.2	17.58	18.5	4.13	22.6	19.71	151.35	21.55	106.75	24.42
Clothing	81.6	4.79	5	1.12	5.5	4.8	40.4	5.75	30.7	7.02
Education	64.4	3.78	5.1	1.14	5.1	4.45	31.95	4.55	22.25	5.09
Health	140	8.23	42.9	9.58	13.8	12.03	44.7	6.37	38.6	8.83
Land tax	21.1	1.24	1.13	0.25	1.65	1.44	11.1	1.58	7.23	1.65
Electricity	19	1.12	0.99	0.22	1.57	1.37	9.8	1.4	6.64	1.52
Drinks	14.3	0.84	2.3	0.51	0.75	0.65	6.9	0.98	4.35	0.99
Vehicles	316	18.57	311	69.44	0	0	5	0.71	0	0
Loans	173.03	10.17	0	0	20.5	17.88	122.45	17.44	30.08	6.88
Others	82.85	4.87	13.1	2.93	6.5	5.67	37.7	5.37	25.55	5.84
Total	1701.92	100	447.84	100	114.68	100	702.2	100	437.21	100

Source: Field survey data, March 08, 2016.

Table 7 summarizes all transactions data used in a village input-output table (VIOT) for Phonxay village in 2015. It shows that rice and cattle/buffaloes are the main economic products that are traded in the village. In principle, the total sales should be equal to purchases, but as can be seen the figures are sometimes different because some households refused to provide information on certain income sources, such as total sales of products, which form an important part of the household income in this village. In contrast, the household expenditure account in our questionnaire gave us very rich information on each household consumption expenditure. We therefore, assumed that the purchase information of each household was reliable for the purpose of constructing the VIOT.

The prices used for the estimation in VIOT are in thousands of local currency (Lao Kip) at the village prices and market prices for the year 2015. The list of prices of each product in this village is reported in Table 8. Village prices and market prices were collected from the Phonxay Village Office and the Trade Office of Ngoi district during our household survey at the base year 2015, respectively. Village prices or agreed prices are based on the agreement between farmers and buyers in the village yearly meeting, while market prices are based on the real market prices, together with trade and transport margins at Ngoi district of LuangPrabang province, Lao PDR. This gap between village prices and market prices generates a big profit for four rich households, who are not only farmers but also traders of products from other households in this village. As they are profiting from the sales of products outside the village (at market prices), this is a fundamental factor underlying income inequality in this village.

Table 7: All product transactions in VIOT for Phonxay Village (1,000 Kip)

All products	Sales	Purchases	Import/inflow	Export/outflow	Consumption	Investment	Giving in kind
Rice	72,325	629,265	354,595	706,319	318,595	16,050	2,475
Other crops	8,530	45,329	25,480	18,018	67,079	3,730	0
Cattles/buffalo	57,900	89,930	7,500	178,000	13,830	790,000	58,500
Goat/pigs	1,200	112,650	4,900	70,775	19,940	171,610	0
Duck	5,280	20,050	3,640	12,200	15,750	5,265	900
Chicken	1200	45,700	4,525	21,190	15,705	43,205	0
Bamboo shoots	34,430	47,383	1,430	53,150	7,192	0	0
Broom Grass	51,735	71,275	158,450	300,500	0	0	0
Other NTFPs	23,210	46,420	21,945	100,110	0	0	0
Others	0	0	467,015	0	82,850	0	0
Total	**254,730**	**1,108,002**	**1,049,480**	**1,460,262**	**540,941**	**1,029,860**	**61,875**

Source: Field survey data, March 08, 2016.

Table 8: Prices of each product used for VIOT

Products	2015		Unit
	Village prices*	Market prices**	
Rice	2,500	5,000	Kip/Kg
Other crops	3,000	5,500	Kip/Kg
Cattle	63,000	65,500	Kip/Kg
Buffaloes	60,000	64,500	Kip/Kg
Goats	35,000	38,500	Kip/Kg
Pigs	37,000	40,500	Kip/Kg
Duck	45,000	65,000	Kip/Kg
Chicken	30,000	36,000	Kip/Kg
Bamboo shoots	6,000	10,000	Kip/Kg
Broom Grass	6,500	9,000	Kip/Kg
PongPeng (herbal roots)	12,000	15,000	Kip/Kg
Rattan shoots	6,500	10,000	Kip/Kg
PeukMeuk (tree bark)	7,000	9,500	Kip/Kg

Source:* *Village prices information are collected from village office based on the agreement between farmers and buyers in the village yearly meeting and ** Market prices information are collected from the Trade Office of Ngoi District, 2015.*

4. The Construction of the Village Input-Output Tables for 2015

This section will discuss how we build a VIOT using our own household survey data. As mentioned above, our household survey data captured all economic activities carried out in the

study village. Each household in this study village produces nine main products, namely such as (1) rice (upland rice), (2) other crops such as sweet corn, maize, chili, eggplants, cucumber and so on, (3) cattle/ buffaloes, (4) goat/pigs, (5) duck, (6) chicken, (7) bamboo shoot, (8) broom grass, (9) non-timber forest products (NTFPs) such as tree barks, rattan shoots and herbal roots. In addition to these products, we set 'Others' as an another sector (10) including goods such as durable goods (motor vehicles), fertilizer, food for livestock and other equipment of each household, which are mainly imported from outside the village.

In this village economy, the use of products in households has to be supplied from either domestic output or imports from outside. In a balanced VIOT, the total supply of products must be equal to the use of products. Equation (1) shows the simplified identity on product balance in each household at village prices and market prices:

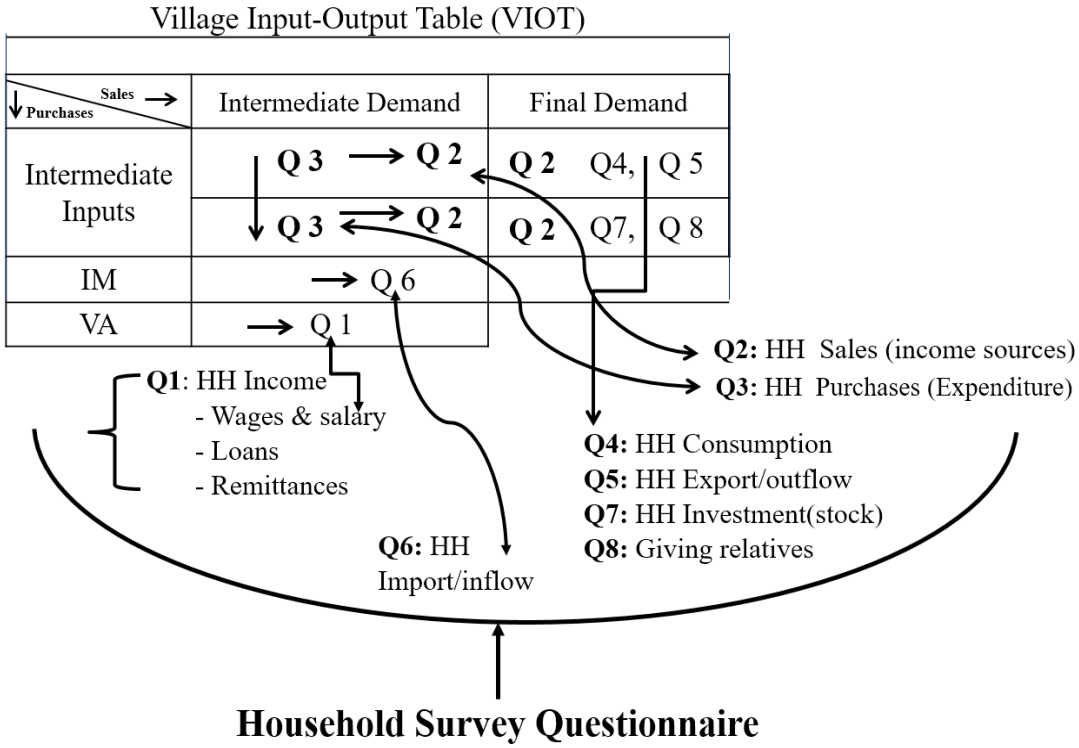
$$\text{Production} + \text{Purchases} + \text{Inflow/Import} = \text{Consumption} + \text{Outflow/Export} + \text{Investment} + \text{Sales}. \quad (1)$$

"Production" includes all commodities produced by households, for own consumption, investment, export and import or inflow from outside and giving in kind to others. "Purchases" is the commodity purchased by individual household within the village, this includes not only intermediate inputs, but also final demand parts (their own consumption), and commodity receiving from others. "Inflow or import" is the commodity bought from outside the village. "Consumption" is the commodity consumed by each household, including commodity or goods giving to others. "Outflow/export" is the commodity sold outside the village by each household. "Sales" is the commodity sold within the village, and "Investment" (stock data) is the accumulated products of each household.

Figure 3 shows the household data flows and its allocation into VIOT. As can be seen, the sale of each product in each household to other households **(Q2)** has been allocated into intermediate

inputs (along the main diagonal matrices) and final demand (consumption, investment, export and giving in kind to others). The purchase of each product in each household from other households **(Q3)** has only been allocated into intermediate inputs parts in the main diagonal line in each row of the VIOT. **Q4, Q5, Q7 and Q8** have been directly allocated into final demand. The imports and inflows of each product by each household from outside the village **(Q6)** has been allocated into the intermediate inputs and final demand of VIOT. **Q1,** which includes wages-salary, loans and remittances have been allocated in the value added area of the VIOT as they form part of the household income.

Figure 3: Data flows and allocation into the Village Input-Output Table (VIOT)



From the VIOT framework mentioned above, the outline of our VIOT can be constructed as illustrated by Table 9. This table is similar with an international IO table. It has been split into three main parts: intermediate demand; final demand, and value added part. The table is of the product by product type and contains all 124 households ranked from the poorest to the richest household (HH 1 to HH 124) with 9 goods plus others as mentioned above. As a result, our VIOT for Phonxay village consists of 9 plus 1 item of 124 households, and has a matrix size of 1240 x 1240.

Assume that all transactions recorded in this VIOT at village prices and market prices are in thousand (1,000) Kip, as illustrated by Table 9. Each row vector (reading from left to right) shows the output (products) of each household sold to other households. Each column vector (reading from top to bottom) shows the purchases made by each household to other households. The final element in each column and row, indicate total input and total output, respectively. An important identity in VIOT is that total output must be equal to the total input.

Table 9: Definition of Products and Household Code in VIOT

HH No.	Products	Definition of products
1	1	Rice (mainly upland rice)
2	2	Other crops (chili, eggplants, sweet corn/maize, cucumber, ginger, pumpkin, and other vegetables)
3	3	Cattle and buffaloes
4	4	Goats and pigs
5	5	Duck
…	6	Chicken
…	7	Bamboo shoots
…	8	Broom grass
…	9	Other non-timber forest products such as tree barks (*Peuk Meuk*), rattan shoots, *Pong Peng* (herbal roots)
124	10	Others include non-durable goods such as fertilizers, household appliances, food for livestock, motor vehicles)

The intermediate demand mainly includes the economic transaction flows within one household as well as between households in the village. This information corresponds to the intermediate input and final demand in the VIOT. This transaction involves the sales made by each household, and the purchases made by the same household. However, the total amount of transaction between households does not include any information on how much they used them as intermediate inputs and how much they consumed them as final goods. We therefore calculated a consumption ratio by using the initial survey data for each household. According to this ratio, transaction between households for each is allocated into intermediate inputs and consumption.

The final demand mainly comprises of household consumption (C), investment (I), and outflow or export (E), but we added one more column called "giving in kind (G)" to others as another item. The detail of each part is briefly described as follows:

Consumption (C): represents purchases of commodity (product) or any finished goods and services by each household for own consumption. Some parts of total household outputs are consumed by other households. However, the intersection of consumption and inflow/import in VIOT shows the final consumptions as inflow from outside the village, for example: food, drinks, education, sanitary (healthcare) services, clothes, and so on are treated as others; these have been allocated to final consumption.

Outflow/Exports (O/E): shows the amount of sales in each household to outside the village. For example: rice, cattle, chicken and NTFPs are sold at the weekly market outside the village, these products are treated as exporting to the rest of the village.

Investments (stock data): This column vectors represents the inventory/stock data of each household. It has been allocated to the final demand. The intersection of inflow or import and investment in VIOT show the investments as inflow from outside the village; for example: cars, truck, motorbikes, fertilizer are treated as others and have been allocated to the final demand.

Giving in kind (G) to others: Giving in kind to others means each good is given directly by each household to other households in the village

Inflow/Import: This represents the purchases of each household from outside the village. It is actually not a value added part, but it is placed in the value added section as a row. This means that the VIOT is Izard type or non-competitive import type, similar to an international input-output (IO) table or inter-regional IO table; because inflow or import matrix is treated as vector row and is excluded from domestic transactions when making the VIOT.

Table 10: Outline of a Village Input-Output Table (VIOT) of Phonxay village

		Intermediate Demand																					Final Demand									Total output
	Sale[1]	HH1											HH124										HH1					HH124				
Purchase[2]		Rice	Crops	Cattle	Goat	Duck	Chicken	Bamboo	Broom	NTFP	Others	....	Rice	Crops	Cattle	Goat	Duck	Chicken	Bamboo	Broom	NTFP	Others	Cons.	Invest.	Outflow	Giving..	....	Cons.	Invest.	Outflow	Giving..	
HH1	Rice	1,350	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	1,150	100	1,100	-	....	1,095	-	-	-	6,150
	Crops	-	75	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	215	20	-	28	....	-	-	-	-	513
	Cattle	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-
	Goat	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-
	Duck	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-
	Chicken	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	150
	Bamboo	-	-	-	-	-	-	5	-	-	-	....	-	-	-	-	-	-	-	-	-	-	40	-	-	-	....	247	-	-	-	665
	Broom	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	300	-	-	-	770
	NTFP	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	250	-	-	-	450
	Others	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
HH124	Rice	279	-	-	-	-	-	-	-	-	-	....	175	-	-	-	-	-	-	-	-	-	921	-	-	-	....	3,000	500	750	280,500	651,635
	Crops	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	3,716	150	-	3,080	13,895
	Cattle	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	4,125	230,000	58,500	86,000	444,280
	Goat	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	3,900	21,200	-	37,800	146,550
	Duck	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	220	-	-	3,750	7,020
	Chicken	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	1,000	2,375	-	2,900	21,865
	Bamboo	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	400	-	-	15,000	37,065
	Broom	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	132,000	321,355
	NTFP	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	61,100	118,675
	Others	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	-
VA	Inflow	-	250	-	-	-	-	-	-	-	-	....	250	125	-	-	-	45	-	-	-	-	-	-	-	-	....	52,250	198,900	-	-	1,673,380
	wages	-	150	-	-	-	-	-	-	-	200	....	-	-	-	-	-	-	-	-	-	150	-	-	-	-	....	-	-	-	-	98,180
	Loans	-	-	-	-	-	-	-	-	-	1,100	....	-	-	-	-	-	-	-	-	-	100	-	-	-	-	....	-	-	-	-	173,030
	remittances	-	-	-	-	-	-	-	-	-	150	....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	....	-	-	-	-	33,500
	surplus	4,242	30	-	-	-	150	658	770	450	(200)	....	3,883	382	250	-	320	150	568	1,350	800	(150)	-	-	-	-	....	-	-	-	-	3,416,648
	adjustment	-	-	-	-	-	-	-	-	-	(1,250)	....	(200)	-	(250)	-	-	-	-	(400)	(400)	(100)	-	-	-	-	....	-	-	-	-	(304,710)
Total Input		6,150	513	-	-	-	150	665	770	450	-	....	6,300	695	-	-	500	390	590	950	400	-	7,701	120	1,100	28	....	292,601	453,125	59,250	622,130	11,227,853

Note: [1] *Sales to other households along the top of the table from HH1 to HH124 in each row at the left of the Table.*

[2] *Purchases (HH1) from other households at the left of the table by HH1 to HH124 in each column.*

In a usual IO table, indirect taxes less subsidies on each product and depreciation cost are placed in value added area, but due to the lack of this kind of information in our VIOT, we therefore include wages and salary; loans, remittances and gifts, surplus and adjustment row in this area.

Wages-salary is compensation paid to other households by the household to produce each good.

In addition, **loans and remittances/gifts** are also included in the value added area in the table. Usually, such information about monetary transfer from outside the village is not treated in the Input-Output table, because these are not production activities or value added creation activities. However, we put them into the table as extra information to know how much each household gained monetary inflow.

Surplus is earnings in each household for each good, including earnings by labor service to other households to help produce goods, which is not included in other categories. This labor service to other households sometimes contributes to each production, and can be thought as a kind of earnings/surplus in each household. So, in our table, this labor service is included in surplus row as additional income to surplus from producing each good. This **surplus** is a difference between the total household outputs and the sum of total intermediate inputs, inflows or imports and wage and salary. By this definition, we calculate the surplus values and set it as a row vector in the value added area.

Finally, we set an **adjustment row** in the value added area to make a balance of VIOT. This adjustment is an artificial row, which is derived from the total output minus the total intermediate input plus value added section.

5. Methodology - IO Models Derivation

After we successfully built this VIOT as shown in Table 10, a transaction table sized 1240 x 1240 was derived in order to describe and capture the relationships among households in this

village economy. The input coefficients and the Leontief inverse matrix can be also computed from this table using the following simple equations.

$$\mathbf{A} = [a_{ij}]$$

$$a_{ij} = \frac{x_{ij}}{X_j}, i = 1,2,\cdots,n,\ j = 1,2,\cdots,n \quad (2)$$

$$B = [I - A]^{-1} \quad (3)$$

Where B is the Leontief Inverse matrix, I is the identity matrix (in this case, 1240 x1240), and A is the input coefficient matrix, respectively.

The reason why we employed equation (3) to calculate the Leontief inverse matrix is that our VIOT is the Izard-type of table as mentioned above, and we don't need to calculate the import matrix. Therefore, the inflow and import matrix is treated as column vector and is excluded from domestic transactions when making the VIOT.

However, we could not, in our case, compute the Leontief inverse matrix directly from matrix A; because we find that the total output of some products is equal to the total input of those products, which produce the same coefficients with 1. Therefore, we have to replace the value of 1 by 0.90, assuming that each household gets 10 percent surplus in that product. Then, the Leontief inverse matrix could be computed. As a result, this Leontief inverse matrix table gives the same values or artificial values (5.654) of backward linkage and forward linkage of some products[4].

Then, by using the Leontief inverse matrix table, then, we can compute the total output multiplier, as well as direct backward linkage and forward linkage effects. Total output multiplier can be computed from the column sums of the Leontief inverse matrix divided by total number of

[4] For example, the result of Leontief Inverse Matrix in VIOT with the same matrix coefficient shows the same coefficient values (artificial) of backward linkage and forward linkage in any sectors, E.g. backward coefficient of cattle, goat, duck in HH 1 is the same **(5.654)** with forward linkage coefficient.

sectors in the table (in our case, 1240 sectors). Backward linkage and forward linkage measures are computed by the following equations.

$$e_j = \frac{\sum_{i=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} , \qquad \text{With j = 1, 2, 3….n.} \qquad (4)$$

$$r_i = \frac{\sum_{j=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} , \qquad \text{With i = 1, 2, 3…n.} \qquad (5)$$

6. Main results of the VIOT Analysis

From the Leontief inverse matrix table, we can examine the inter-dependency among households in Phonxay village through the total output multiplier estimation. The resulting analysis produced a total output multiplier of 1.767. This level of multiplier can indicate the degree to which an individual household depends other households for inputs for their production and livelihood in this village. At 1.767, this level of multiplier is relatively small compared with the results in the IO analysis at the national level[5] and suggests that the village economy depends more on the outside economy for trade than the internal (within village) economy. The degree of interdependency in the village is not so high that the repercussion effect would not be big if some projects for improvement of agriculture in the village were done. However, interdependency among households in the village varies, as shown by the results of the backward linkage and forward linkage analysis.

[5] For example, the multiplier of Japan's IO table (2011) with 190 sectors is 2.00 and the 2005 table of Japan is 1.99, which are higher than Phonxay VIOT. However, generally speaking, the national IO table tends to have higher multiplier than regional IO table because each region mostly depends on the outside areas for their trading, which is inflow or import and outflow or export. For example, the multiplier of Hiroshima IO table (2005) with 108 sectors is 1.40 and one of Shizuoka IO table (2000) with 188 sectors is 1.30, and the total output multiplier of Singapore IO table (2010) is 1.60, which is smaller than Phonxay VIOT.

Table 13 to 16 present selected products with strong backward and forward linkages which are greater than one in this village economy. The indices greater than one (>1) indicate a strong connection and interdependency among households in this village.

Table 13 shows the backward and forward linkages of the rice sector with indices greater than one. As we can see from the table, for example, backward linkages with indices greater than one (>1) are found in HH No. 47, 66, 86, 102, and 123, as they are rice purchasers: these households tend to buy additional rice from other households that can be used as inputs to their production. This reflects the inter-household relations of rice production in this village. Contrary to the backward linkage case, only the last four (4) rich households in the village, for example, HH No. 121, 122, 123 and 124 show the high forward linkage values. As they are rice sellers, their outputs serve as inputs to other households to produce other products. So if this rice sector increases its output, there will be increased supplies from these rich households to other households that use this product as input in their production.

Table 13: Backward and Forward linkages of rice in Phonxay Village in 2015

Backward Linkages (BLE)			Forward Linkages (FLE)		
Ranking	HH No.	Index	Ranking	HH No.	Index
1	86	1.070	1	124	4.936
2	47	1.041	2	122	3.851
3	74	1.034	3	123	3.225
4	102	1.029	4	121	2.379
5	123	1.021			
6	66	1.019			

Source: Author's calculation (March 8, 2016)

Table 14 shows the backward and forward linkages of the duck sector with high indices. The measures of backward linkages show that most poor households tend to have high backward linkages, as they are buyers who buy more inputs and other products from other non-poor and rich households. On the other hand, the measures of forward linkages show that non-poor and rich households tend to have high values of forward linkages, as they are sellers who sell their products to the poor households in the village.

Table 14: Backward and Forward linkages of Duck in Phonxay Village

Backward Linkage Effects (BLE)			Forward Linkage Effects (FLE)		
Ranking	HH No.	Indices	Ranking	HH No.	Indices
1	39	5.654	1	97	3.251
2	57	3.715	2	121	2.674
3	46	2.827	3	113	2.647
4	50	2.714	4	116	1.984
5	03	2.136	5	112	1.729
6	14	1.819	6	114	1.561
7	25	1.583	7	117	1.409
8	33	1.546	8	120	1.331
9	31	1.481	9	118	1.283
10	09	1.447	10	119	1.181

Source: Author's calculation (March 8, 2016)

Table 15 shows the results of backward and forward linkages of the chick. Findings indicate a similar direction as in the case of duck transactions. Most poor households tend to have high backward linkages, as they are buyers, whereas non-poor and rich households tend to have high forward linkages, as they are sellers, they sell their products to the poor households in the village.

Table 15: Backward and Forward linkages of Chicken in Phonxay Village

Backward Linkages (BLE)			Forward Linkages (FLE)		
Ranking	HH No.	Index	Ranking	HH No.	Index
1	20	1.696	1	124	2.717
2	47	1.593	2	113	1.964
3	77	1.535	3	119	1.687
4	57	1.522	4	116	1.600
5	56	1.508	5	117	1.577
6	37	1.478	6	120	1.485
7	58	1.435	7	121	1.368
8	44	1.388	8	115	1.308
9	18	1.358	9	123	1.239
10	43	1.176	10	112	1.171

Source: Author's calculation (March 8, 2016)

Table 16: shows a different direction of inter-household relations in bamboo shoot transaction in Phonxay village. It shows that bamboo shoot transaction in this village has a strong relation between the nearly non-poor and rich households. From the results of backward linkage analysis,

we can see that most non-poor households prefer to buy more bamboo shoots from the same groups, whereas the non-poor and rich households show high forward linkages. As sellers and NTFPs traders in the village, they collect and stock the bamboo shoots for their own consumption and sales to other households, both inside and outside the village, at weekly markets.

Table 16: Backward and Forward linkages of Bamboo shoots in Phonxay village

Backward Linkages (BLE)			Forward Linkages (FLE)		
Ranking	HH No.	Index	Ranking	HH No.	Index
1	107	5.654	1	102	5.654
2	101	2.374	2	101	2.375
3	115	2.268	3	115	2.271
4	120	1.854	4	122	1.861
5	122	1.627	5	120	1.553
6	108	1.329	6	124	1.519
7	124	1.277	7	121	1.422
8	121	1.269	8	108	1.329
9	123	1.090	9	123	1.143
10	118	1.044	10	116	1.129

Source: Author's calculation (March 8, 2016)

7. Concluding Remarks

This paper presented the main results from making a village Input-Output Table (VIOT) using the primary data collected from a household survey in a poor rural village in northern Lao PDR. It also presented the main results of the VIOT analysis.

The main objective of this research is to capture the inter-dependency among households and economic activities in poor rural villages in northern Lao PDR. VIOT can be an effective tool for such analysis, as well as provide fundamental statistics to grasp socio-economic transactions among key actors in isolated villages or disadvantageous areas in developing countries. This VIOT represented the relationships of purchases and sales of 10 products within households and between households in the village, resulting in a total of 1240 sectors.

Our household survey focused mainly on the input-output relationships within households and between households in Phonxay village for 2015. This transaction information was an essential part of making our VIOT because it corresponded to the intermediate inputs and intermediate demand in the table. Therefore, the information used in this VIOT is not only useful to capture all economic transactions, but also can be used as directional pair data, providing abundant data to estimate causal effects of particular treatments using micro-economic modelling methods. The total transactions between households does not include any information on how much they used them as intermediate inputs and how much they consumed them as final goods. To overcome this, we calculated a ratio of household consumption by using the initial survey data from each household. According to this ratio, the transaction among households for each product is allocated into intermediate inputs and consumption.

The final demand mainly consists of consumption, investment and outflow/export, but we added one more column called “giving in kind” to others as another item. Of these, investment is inventory /stock data of each household. Outflow/Export is amounts of sales in each

household to outside the village. Giving in kind represents each good given directly by each household to other households.

Inflow/Import is the amount of purchases in each household from outside the village, but it is placed in the table as a row. This means the VIOT is an Izard type or non-competitive import type, which is similar to the international or regional IO table because inflow and imports are excluded from domestic transactions. In usual IO tables, indirect taxes less subsidies on each product and depreciation cost are placed in value added area, but in the absence of this information, wages and salary; loans, remittances and gifts, surplus and adjustment row were included in this area in our VIOT.

The results of the Phonxay village VIOT gives a total output multiplier of 1.767, which is not so high, and suggests that the village economy depends on outside for its production and livelihood. However, the backward linkage analysis indicates that most poor households tend to buy more products from other non-poor households, whereas forward linkage analysis shows that, non-poor households, especially, four (4) rich households, tend to sell more products to poor households in this village.

This study found that livestock is a relatively more profitable sector, suggesting that it offers opportunities for Phonxay villagers to improve their incomes and reduce poverty. Both poor and rich households should consider what goods and services they are good at providing, and should specialize in producing and supplying to others. For example, poor households may produce chicken, duck, whereas the rich households, especially the last four rich households should specialize in rice production. This division of labor may enhance the village's productivity as a whole, and thereby raise their economic welfare. This study would be, so far, the first trial of making a village input-output table (VIOT) based on micro-household survey data from an isolated area in a developing country.

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APPENDIX

Definition of Income Source

The concept of income used in this study is fairly comprehensive, including all incomes received in cash as well as in kind. The main sources of incomes in this village are based on village prices and market prices at 2015 and these incomes are divided as follows.

1) *Livestock income* includes cash money received from selling livestock or traded livestock (cattle, buffaloes, goat, pig, and poultry-duck and chicken).
2) *Non-Timber Forest Products (NTFPs) income* includes net income from selling all NTFPs production such as bamboo shoot, rattan shoot, mulberry bark (tree bark), broom grass, *PongPeng* (herbal roots).
3) *Rice income* includes all net income received from selling all crop production, mainly from upland rice production.
4) *Other crops income:* all net income received by household member from selling crops such as chilly, corn, wheat, ginger, pumpkin, cucumber, and other vegetables.
5) *Wage & salary income* includes wage earnings from farm labor, non-farm labor and government employment.
6) *Remittance, gift and assistance income* includes internal and external remittances, cash and in kind as souvenir and gift converted into cash money.
7) *Others:* including agricultural land rental income and loans receiving from lending families both within and outside the village.