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## ENERGY, ENVIRONMENT AND LIVELIHOODS IN THE LAO PDR

Results from a 2011 Household Survey

FINLAND FUTURES RESEARCH CENTRE  
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# 1. INTRODUCTION

This report presents the main results of a household survey collected in 2011. The data was originally collected for Finland Futures Research Centre project *Interlinkages between energy and livelihoods – Data, training and Scenarios for sustainable energy planning in Laos* (INES). The questionnaire was formed on the basis of a survey conducted in Cambodia 2009 for a project called *Knowledge for Development: Creating Rural Resource Database for Sustainable Livelihoods in Cambodia* (SURVEY). Additional themes were included to serve the needs of the project and local needs. The demographic profile of the households was surveyed first. The actual questions were related to the following topics: (1) household assets, (2) livelihood activities, (3) income and liabilities, (4) food security and (5) survival strategies, (6) energy use; and (7) environment. This publication is also organized according to these research themes. While the section exploring residential energy use was fairly extensive and utilized throughout the project, the other themes received less attention. The main reason for compiling this e-book was to disseminate all the key results from the survey, especially those with little publicity so far. Similar, recent household level data from Laos is not currently available from any other sources, as far as we know. Thus, this e-Book report provides unique results on the Laotian society and economy based on the household survey findings.

## 1.1. Lao PDR

The Lao People's Democratic Republic (Lao PDR) is a landlocked country in the South-Eastern Asia with a population of almost 7 million people. It shares borders with China, Thailand, Myanmar, Vietnam and Cambodia. Laos belongs to the Least Developed Countries (LDC) with the average GNI per capita about 1050 USD in 2010 (Atlas method (current US\$), World Bank Database (2012)). The government of Laos has a target to graduate from the UN Development Programme's list of LDC by 2020 (Lao People's Democratic Republic, Ministry of Planning and Investment 2011, Lao Investors House 2012).

In Laos population density is 26 people per km<sup>2</sup>. Around 73% of the population lives in rural areas. It is slightly smaller in size than the United Kingdom with a land area of 236,800 km<sup>2</sup>. Laos has vast natural resources and 68% of the land is forest. The population was estimated to be 6.2 million in 2012. Agriculture accounts for more than half of the Lao gross domestic product. The value was estimated to be US\$5.6 billion in 2008. Electricity, garment, timber products and coffee are the major exports of the country (World Bank 2012).

In the Lao PDR, economy subsistence agriculture, which is dominated by rice cultivation in lowland areas, accounts for about 30% of GDP and provides 80% of total employment. The industrial sector has been growing fast during the last years as can be seen in the Figure 1.

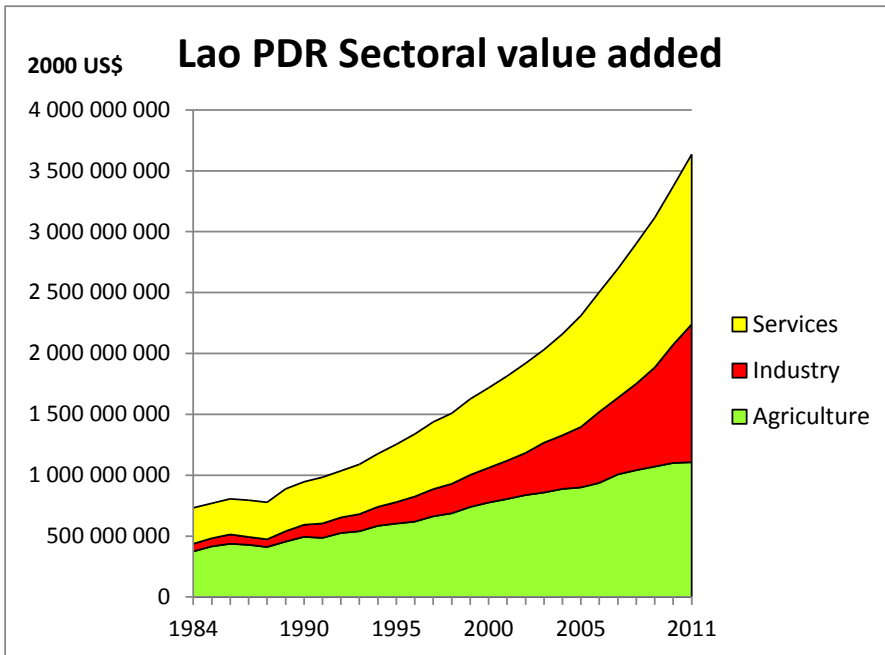


Figure 1.1. Value added in different economic sectors in Lao PDR. (Data source ADB 2012).

The shares of different economic sectors of GDP are shown in Fig. 1.2 In the 1980's and early 1990's the agricultural sector produced half of the GDP but now its share has decreased to 30%. The share of industrial production has increased to 31% in 2011 and is still fast increasing. The share of service sector has remained at about 40% of GDP even though in absolute terms it has grown considerably.

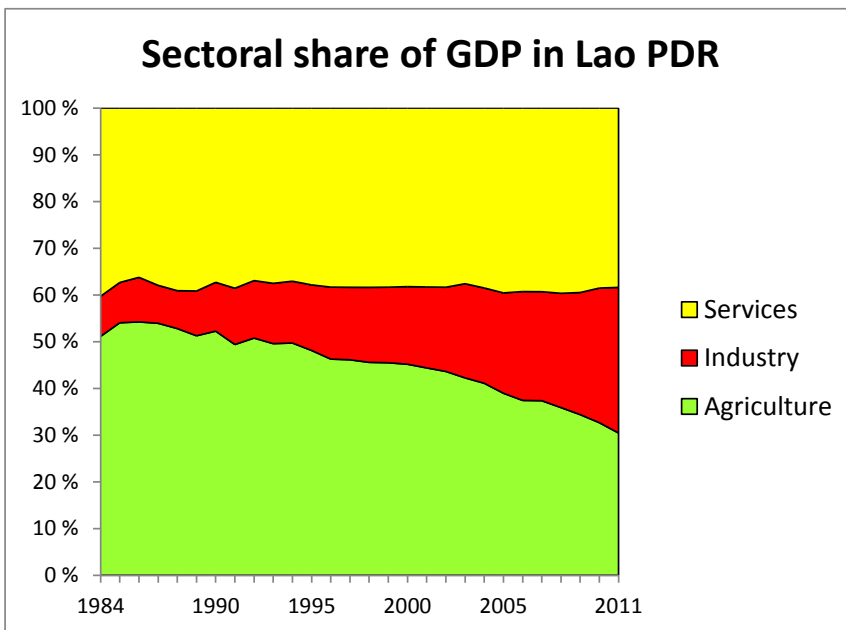


Figure 1.2. Sectoral shares of GDP in Lao PDR. (Data source ADB 2012)

A more detailed view of the sectoral economic development in the Lao PDR is shown in Fig. 1.3. (data source ADB 2012). In this figure we can see the fast growth of the value added in the mining sector. Figure 1.4 indicates that, in addition to the mining sector, only trade and finance sectors have increased their share of the GDP.

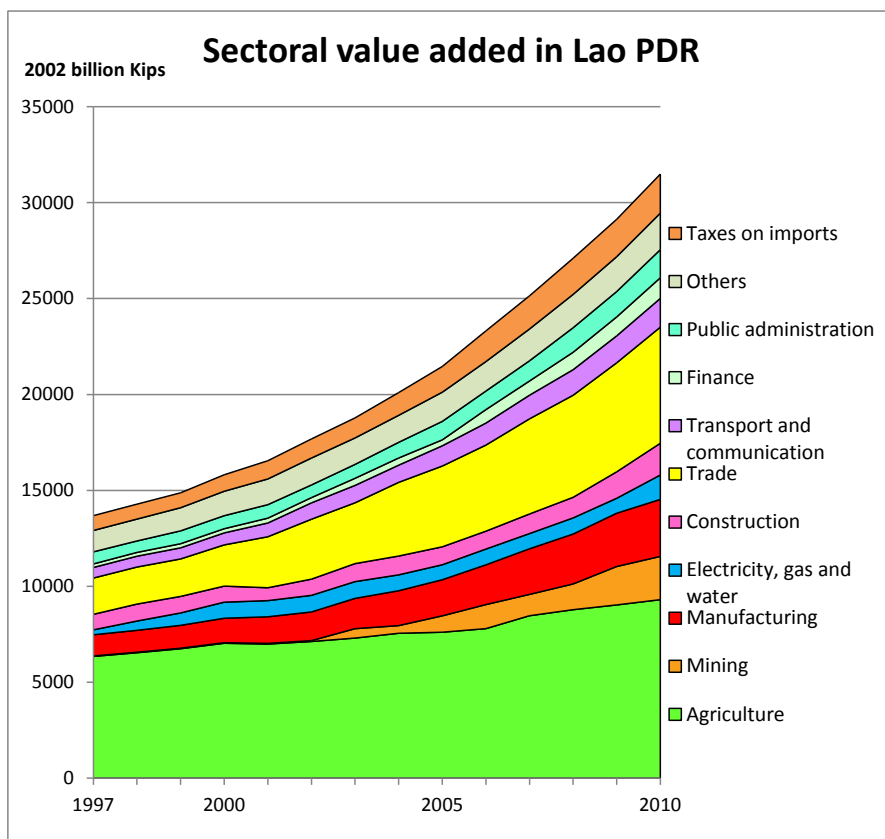


Figure 1.3. Sectoral value added in Lao PDR. (Data source ADB 2012)

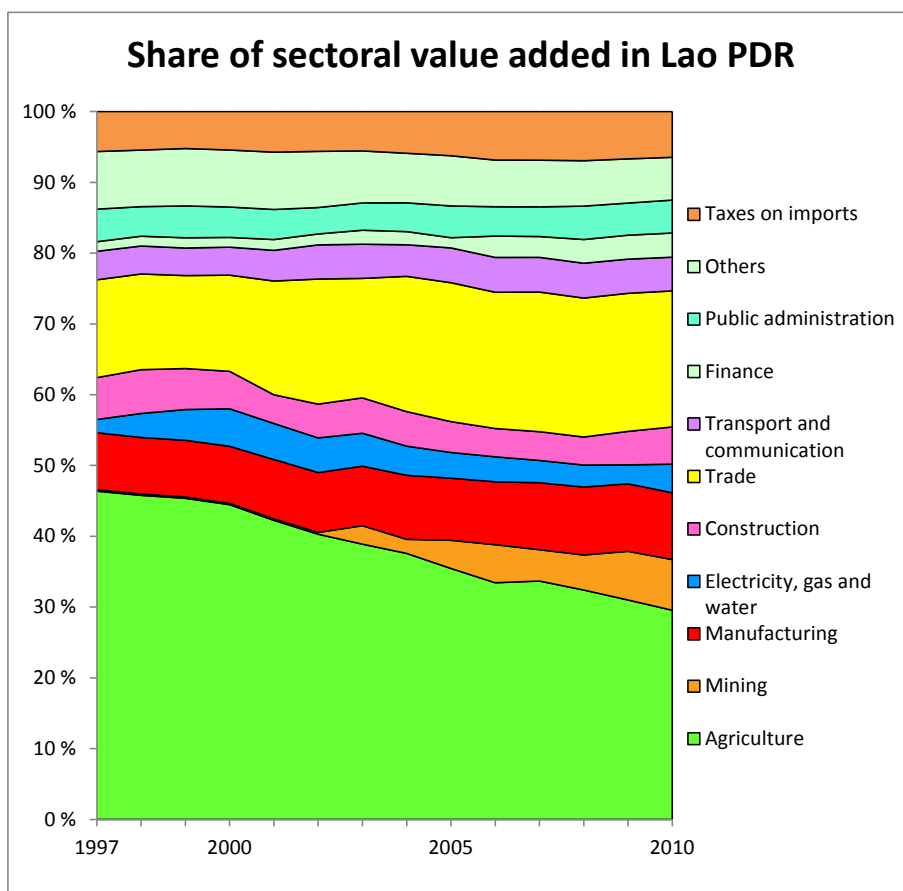


Figure 1.4. Shares of sectoral value added in Lao PDR. (Data source ADB 2012)

Since the middle 2000's, the Lao economy has grown relatively rapidly with relative stability, in particular over the last seven years (2006–2012). The average GDP growth has accounted for about 7.9% per annum, of which agriculture, industry and services sectors have grown at an average of 4%, 12.6%, 8.4% respectively. In 2011, GDP growth was about 8.2% and GDP per capita was estimated to be about US\$ 1.233. As a result, the World Bank has shifted Laos from the list of low income countries to a low middle income country (see Leebouapao 2012, ADB 2012).

The industry's share of GDP increased dramatically from 17.7% to 31% for the period 2001–2011 (see Fig. 1.2). The industrial GDP consists of 37% manufacturing share, mining 28% share, construction 20 % share and electricity 16% share (see Fig. 1.6). Especially, the mining sector has increased fast during the last years. It is estimated that the share of electricity will increase considerably in the future when the new power plants under construction will be taken in production.

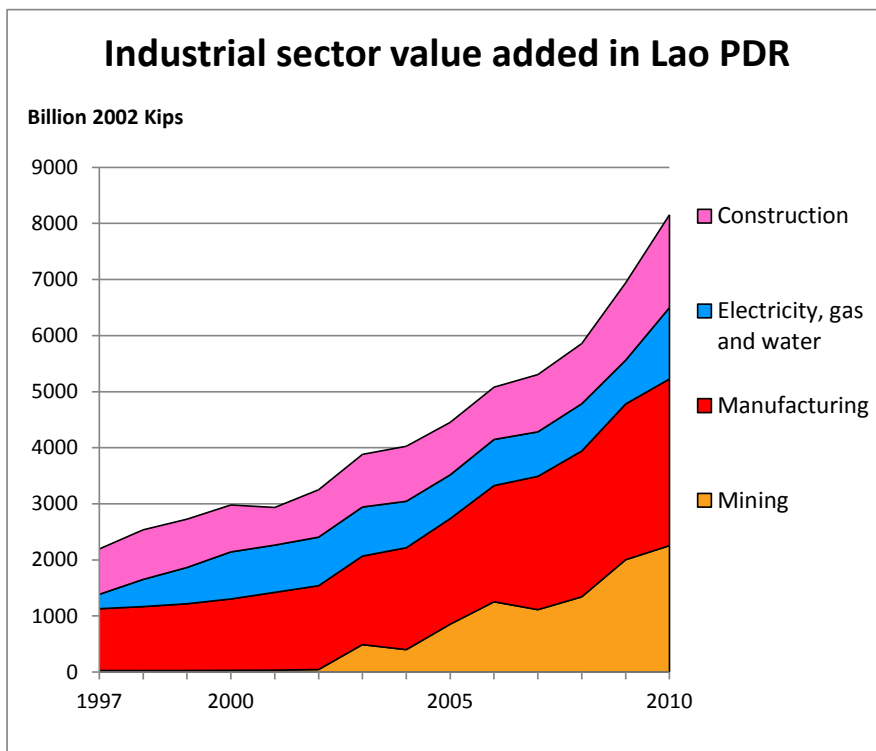


Figure 1.5. Industrial value added in the Lao PDR (Data source ADB 2012).



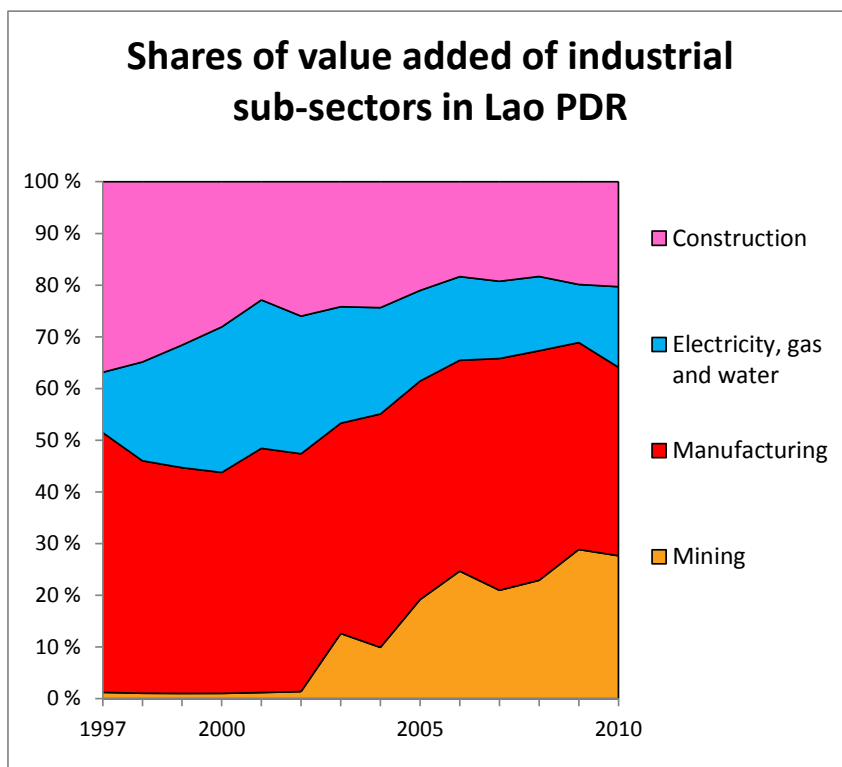


Figure 1.6. Shares of value added of industrial sub-sectors in the Lao PDR. (Data source ADB 2012)

The share of the services sector of GDP in Laos increased from 24% in 1997 to 32% in 2010. The major share of service sector is trade (wholesale and trade) covering about 60% of the services sector (see Fig. 1.7 and 1.8). Other major subsectors were, finance (11%), public service (14%) and transportation and communication (15%) (ADB 2012).

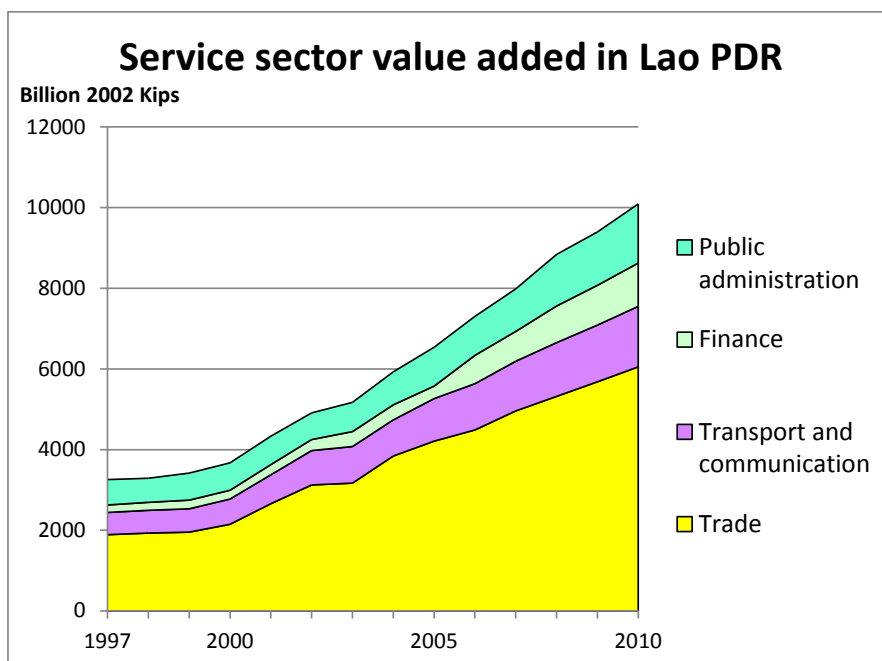


Figure 1.7. Service sector value added in Lao PDR. (Data source ADB 2012)

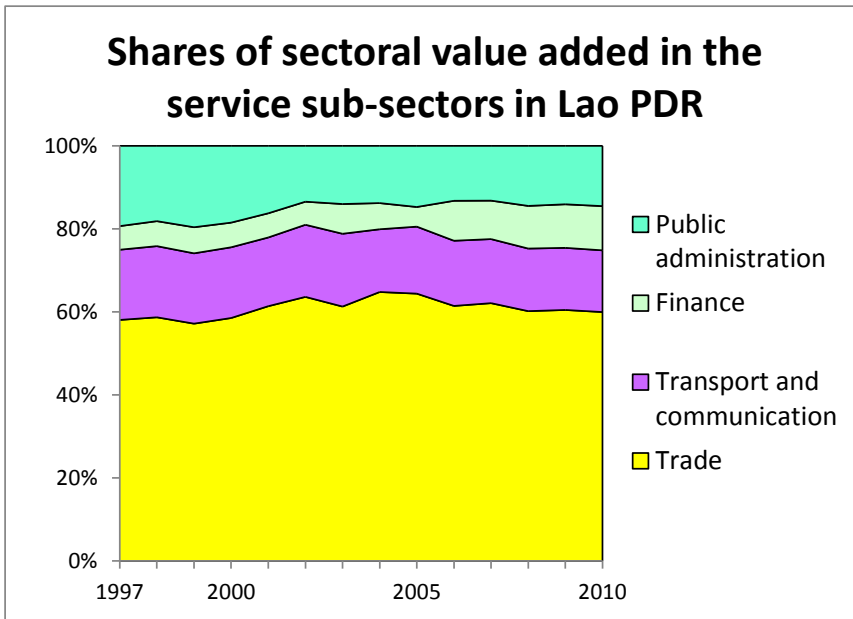


Figure 1.8. Shares of value added in the service sub-sector in Lao PDR. (Data source ADB 2012)

The Lao economy depends heavily on investment and trade with its neighbours, especially Thailand, Vietnam and China. Since 2006, major export products of Lao PDR have been mineral products and hydroelectricity. In 2010, mineral products and hydroelectricity consisted of about 73% of the total export, of which mineral products and hydropower electricity consisting for about 57% and 16% respectively. Mineral export destinations are mainly ASEAN member countries (63%), Korea (13%) and China (4%). The main hydroelectricity export destination is Thailand. The next largest exported products are textiles and agriculture products, accounting for about the same shares of 9% for both in 2010. Main export destinations for textiles are the EU (82%) due to preferential regulations for garment exports, followed by the USA (6 %) and Japan (3 %). The growth in exports in 2011 was 24 %. (Leebouapao 2012) Figure 1.9. shows the structure of the export and the World Bank estimate for 2013–2015.

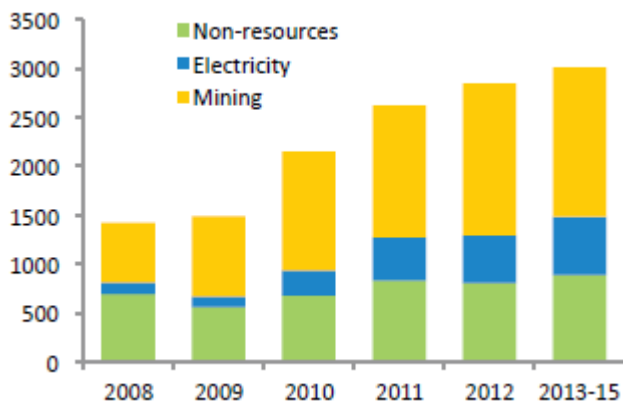


Figure 1.9. Merchandise export of Lao PRD in million USD. (Phimmahasay et al. 2012).

Gold and copper are the main mineral export commodities. Figure 1.10. shows the amount of gold and copper output and their export value.

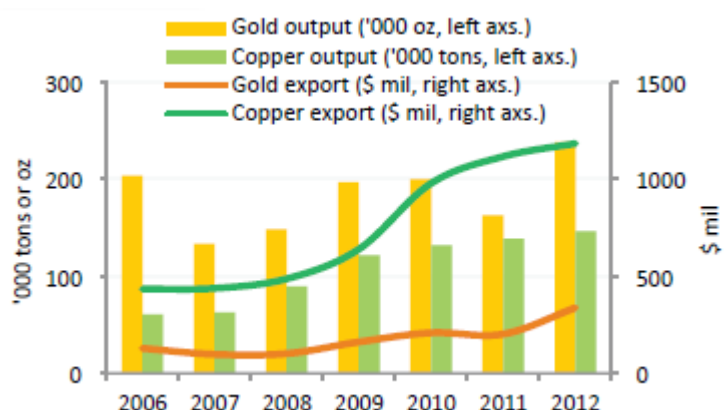


Figure 1.10. Gold and copper export from Lao PDR. (Phimmahasay et al. 2012).

Imported items are in particular fuel, machinery, electrical products, and vehicles and spare parts. Thailand represents the most significant trading partner of the Lao PDR, with a trade volume accounting for more than 50% of the Lao PDR's total trade. Viet Nam and China are the second and third largest trading partners, respectively (Leebouapao 2012). Figure 1.11 shows the main import commodity groups of Lao PDR.

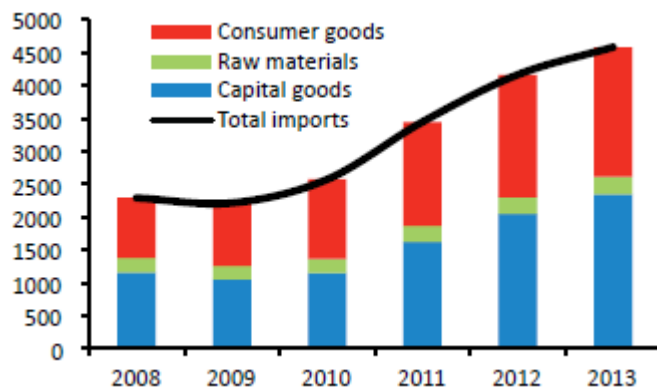


Figure 1.11. Merchandise import to Lao PRD in million USD. (Phimmahasay et al. 2012).

Foreign Direct Investments (FDI) are important for Lao economy due to the lack of local capital formation. The major FDI have concentrated in hydropower and mining sectors (see Fig. 12). During the last three years the power sector has received about 60% of FDI while the mining sector has received about 20% of the total investment (data based on Phimmahasay et al. 2012). In addition, FDI in the labour intensive sector is also significant. For instance, FDI in service sector covers about 11% of total FDI and in industry and handicraft (excluding electricity and mining) about 7%. The garment industry grew quite rapidly mainly due to the preferential access of the Lao PDR in many export markets with “least developed country” status (Leebouapao 2012).

Figure 1.12 shows the FDI in the Lao PDR for 2007–2012 and the different sectors of the investments.

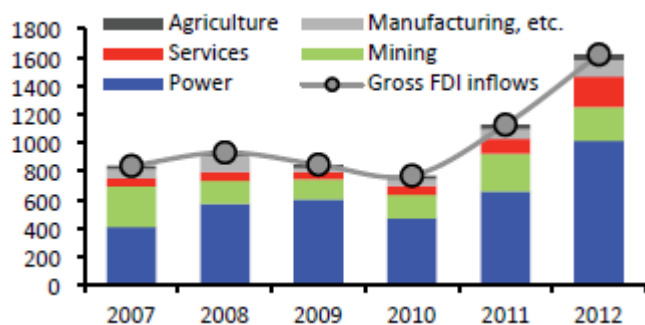


Figure 1.12. Foreign Direct Investments (FDI) in Lao PDR in million USD. (Phimmahasay et al. 2012).

The main source of FDI inflows into Laos are largely from its neighbouring countries. Over the last nine years (2001–2009), the top investors were the People’s Republic of PRC, Thailand and Vietnam, on average accounted for about 21.8%, 19.8%, and 11.4% of total FDI respectively. Other important investors include France, Japan, the Republic of Korea, India, and Australia. Over the time period 1989 to 2009, on average, FDI inflows into the Lao PDR increased at about 173% per year (Leebouapao 2012). The main Foreign Direct Investors for 2001–2010 were Vietnam (4.9 billion USD), Thailand (4.0 billion USD) and China (3.6 billion USD) (Singhalath 2012).

High credit growth in Laos has stimulated investment and consumption which has resulted in an expanded demand for imports, both of capital and consumption goods (Phimmahasay et al. 2012). Figure 1.13. shows the share of credits by sector as per cent in total lending. The growth of credits for construction and services has been especially fast.

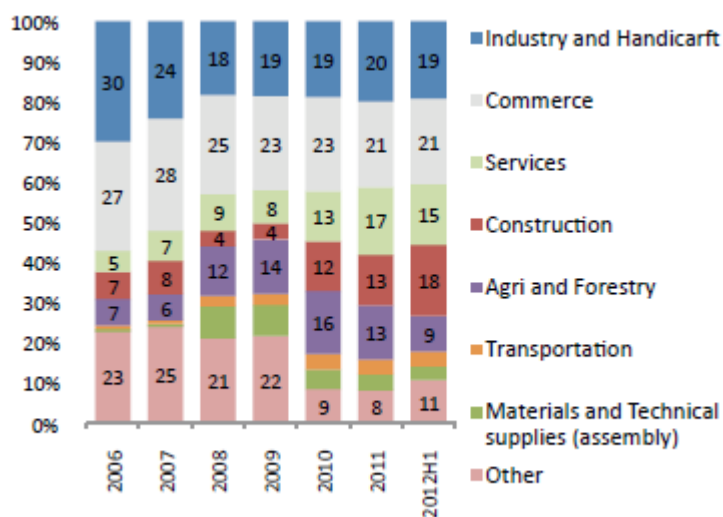


Figure 1.13. Share of credits by sector (per cent in total lending). (Phimmahasay et al. 2012).

The fast growth of mining sector and the electricity production can be seen also in the figures of government revenues. The mining sector provides almost 4% of GDP as government revenue. The electricity sector produces about one per cent of GDP as government revenue. The main government revenue, however, comes from the non-resource sectors as can be seen in Fig. 1.14.

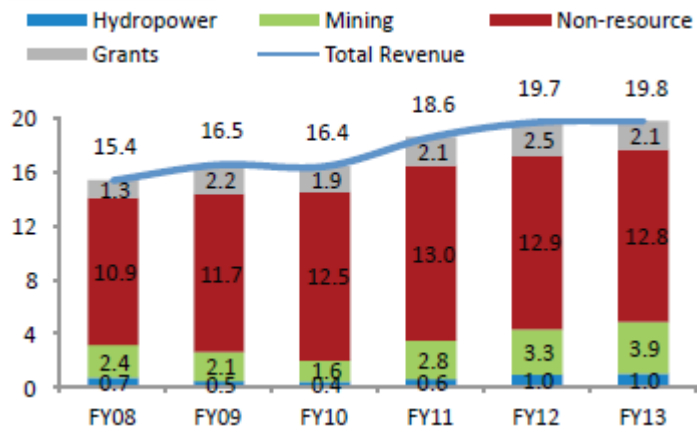


Figure 1.14. Total government revenue as % of GDP (Phimmabasay et al. 2012).

Laos has been quite successful in reducing poverty. The official poverty rates have reduced from 46% in 1992 to 26% in 2009. The economy has benefited from high foreign investment in hydropower, mining, and construction. Laos gained Normal Trade Relations status with the US in 2004. Laos has taken steps required to join the World Trade Organization, such as reforming import licensing. In October 26, 2012 the General Council of WTO accepted Laos' membership and the ratification is planned to take place in early 2013 paving the way for Laos to become a member.

This report is based on a survey carried out in different provinces in Laos in 2011. Figure 1.15 shows the provinces where the survey interviews were carried out.

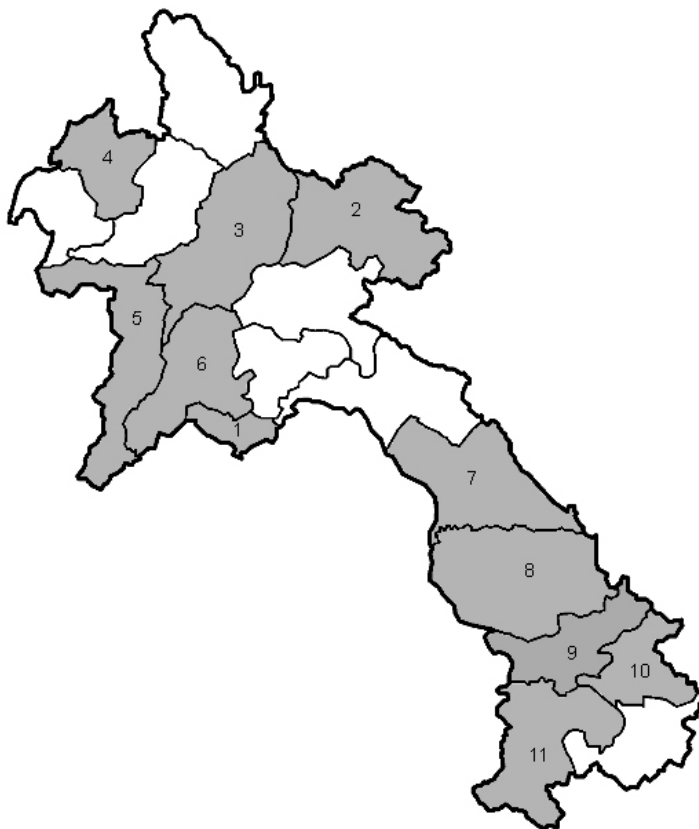


Figure 1.15. Survey sample provinces. 1. Vientiane (Capital), 2. Huaphanb, 3. Luangprabang, 4. Luangnamtha, 5. Xayaboury, 6. Vientiane Province, 7. Khammuane, 8. Savannakhet, 9. Saravane, 10. Sekong, 11. Champasak.

The data collection and the sample of the survey are presented in Chapter 1.2 and Chapter 1.3 presents the methods used in this study. The demographic profile of the sample is presented in the Chapter 2. It includes information about gender, marital status, ethnic groups, education etc.

Chapter 3 presents the households' assets, livelihood activities, income and liabilities as well as the impacts of natural and man-made events on their livelihoods. Chapter 4 discusses food security and survival strategies of households.

In Chapter 5 we present issues related to energy production and use in the households. In chapter 6 we discuss the environmental changes and their impacts on livelihoods.

## 1.2. Data Collection and sample

The data was collected in two parts. Household and village head interviews were held in the provinces in March-April 2011, and those for the Vientiane Capital were held in June 2011. There were a total of 2102 household interviews, of which 500 were conducted in Vientiane and 1602 in the rest of the country. A village head interviews were carried out in most (124 out of 132) of the villages in the sample.

Separate random samples were determined for the provincial and Vientiane surveys based on demographic statistics from 2009. The total number of households in the country was 1 026 000 in 2009, and 137 000 of those were in Vientiane Capital. Within 95% confidence level, the results in the whole country are representative with a confidence interval of +/- 2.5%. In Vientiane Capital, the confidence interval is slightly wider, +/- 4.4%. Nevertheless, the sample represents the households of Lao PDR statistically.

The sampling was conducted in clusters by a method called probability proportional to size (PPS). In addition, the sample was stratified by region in order to ensure that the three main geographical regions -north, center and south- would all be represented. The clustering was conducted in three levels: provincial, district and village levels. The probability of a unit, whether it was province, district or village, to be chosen in the sample was proportional to the population of the unit. Village type was another factor that was taken into account. The shares of the selected households in different types of villages were to match the official shares, which are as follows:

- 15% Urban,
- 55% Rural, on electricity grid, with road access,
- 20% Rural, off-grid, with road access, and
- 10% Rural, off-grid, without road access.

As for the lowest level, the number of households interviewed per village ranged from 4 to 18, depending on the population of the village. The households were randomly selected within each village.

The interviews were conducted based on structured questionnaires, and the collection method was face-to-face interviews. As a consequence, there are no unexplained missing replies in the data. In addition, with all of the interviewers having participated in a training specifically designed for this survey the validity of the responses can be considered high. The average length of an interview in the rural survey was 68 minutes.

Similar sampling, although on a smaller scale, was used for the survey in Vientiane Capital. A separate survey was conducted because the livelihoods in the capital were assumed to differ substantially from the rest of the country. For convenience, Vientiane Capital is referred to as Vientiane in this publication.

### 1.3. Methods

The data in this publication is examined by two background variables: village type and the poverty line. Villages were categorized into five types already in the sampling phase: Vientiane, other urban, rural with electricity grid, rural off-grid with road access and rural off-grid without road access. The two surveys were not entirely equivalent: some questions were asked only in the nationwide survey, some only in Vientiane, and some questions were formed differently in the two surveys, even though they were related to the same theme.

The poverty line was defined as an income lower than 1\$/day/person. Since income was originally asked in ordinal categories, the midpoint of each category was used as an estimate of the total monthly income as follows:

<100 000 LAK = 50 000 LAK

100 001-200 000 LAK = 150 000 LAK

Etc.

The estimate of the average monthly income was then divided by household size, resulting in average income per capita. Finally, an average income per capita less than 1\$ day (that is, 243,375.72 LAK/month, based on exchange rates on 15.1.2012) assigned the household to the group 'below the poverty line', while the rest were considered to be above the poverty line.

Each bivariate relationship presented was tested by the chi-square test, whose value and results were added in the figure titles. Where multiple responses were allowed, the responses were examined together and no chi-square test was performed.

## 2. DEMOGRAPHIC PROFILE

In 2007–2008, 69% of the Lao population lived in rural areas with often limited access to services and high dependence on natural resources. The number of rural household had decreased from the beginning of the millennium, and a further increase of urbanization has been expected (Government of Laos 2009). This chapter examines the latest population characteristics of the Laotian households: marital statuses, ethnicity, education and household size.

Even though Lao PDR is one of the poorest countries in the world the share of the population below the poverty line has steadily decreased since the early nineties. According to a survey in conducted in 1992–1993, 46% of the population lived below the poverty line at the time. The latest LECS-4 survey in 2007–2008 found that the share had decreased to 28% in 15 years. In Vientiane Capital, the percentage was lower than in the rest of the country, 15%. (Government of Laos and United Nations Development Program 2009).

Many characteristics of the Laotian households could be perceived as traditional. For example, 90% of the households had a male representing the household head, a recognized role within a household. Majority (63%) of the population aged 15 years and above was married in 2005. Women were more often widowed (3%) and divorced (8%) than men (1% and 2%, respectively). On the other hand, it was more common for the men to never have been married. (Government of Laos 2006).

In terms of ethnicity, according to the national census 2005, 55% of the population was estimated to belong to the Lao ethnic group. The second largest ethnic group was Kim mou (11%), followed by Hmong (8.0%), Tay (3.8%) and Phouthay (3.3%). On total, there were almost 50 recognized ethnic groups within the country. (Government of Laos 2006).

Attending formal education in Laos is becoming more common throughout the country, even though regional differences remain. 93% of children aged 11–15 years were enrolled in school in 2007–2008. For younger children, aged between 6 and 10 years, the respective figure was 79%. In urban areas it was more common for the children to attend school. (Government of Laos 2009). Concerning literacy, in 2005, 73% of the population aged 15 years and above had the ability to read and write. The male were literate more commonly than the female. Compared to 1995, the literacy rate had increased 21% in the population. (Government of Laos 2006)

The number of people residing in the same household had decreased by nearly 7% between 2002 and 2007. Average household size in 2007–2008 was 5.7 people. In urban areas the average size was lower, 5.4 people, and in rural villages it was 5.8 people. (Government of Laos 2009)



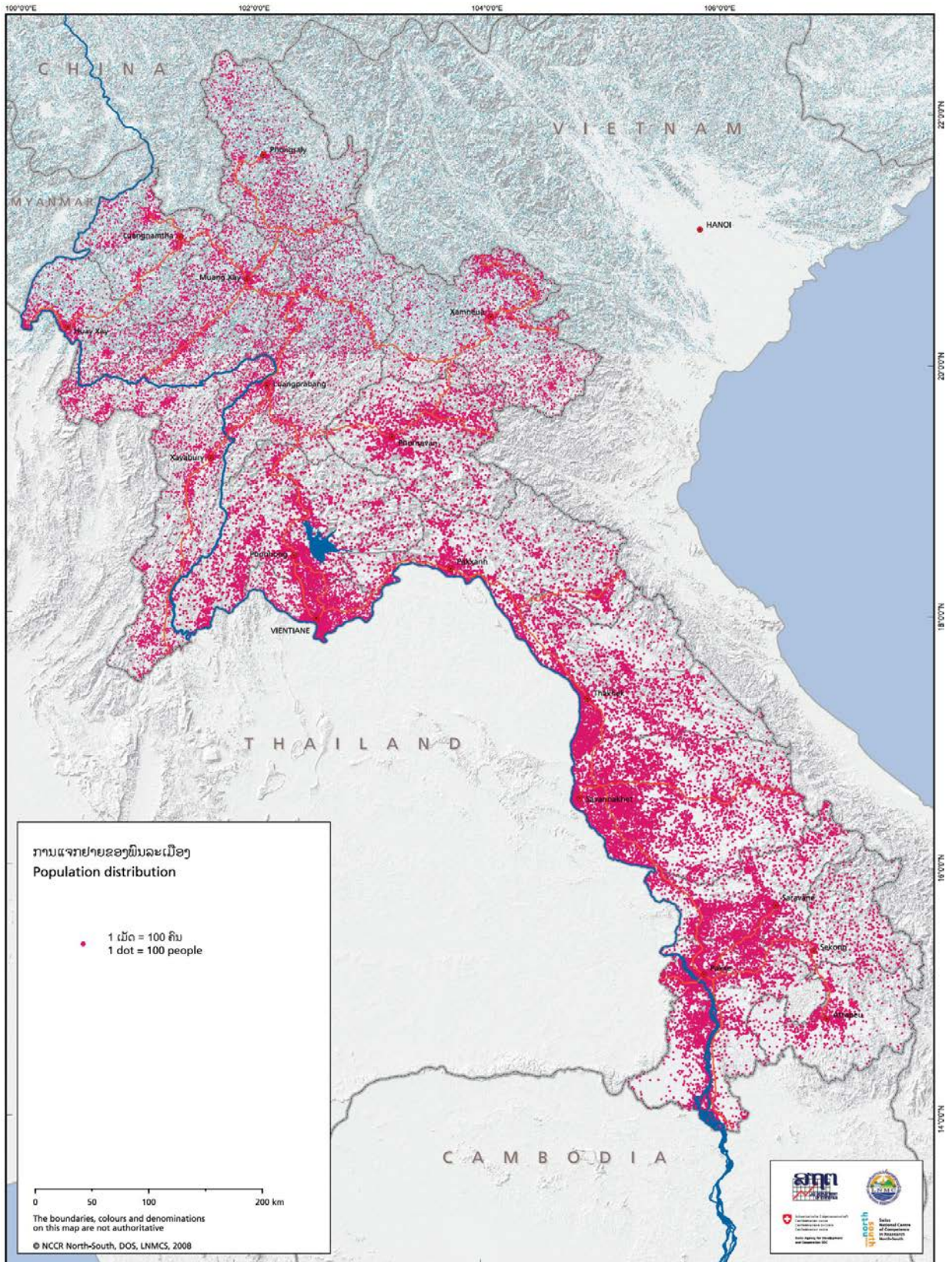


Figure 2.1. Map of population distribution in Laos (Messerli et al. 2008).

## 2.1. Gender

68% of the respondents were male and 32% female. In urban areas, the share of women responding to the survey was the highest at 43%, whereas this share was the lowest in non-electrified areas, approximately 20%. In Vientiane and rural electrified villages, around third of the respondents were female.

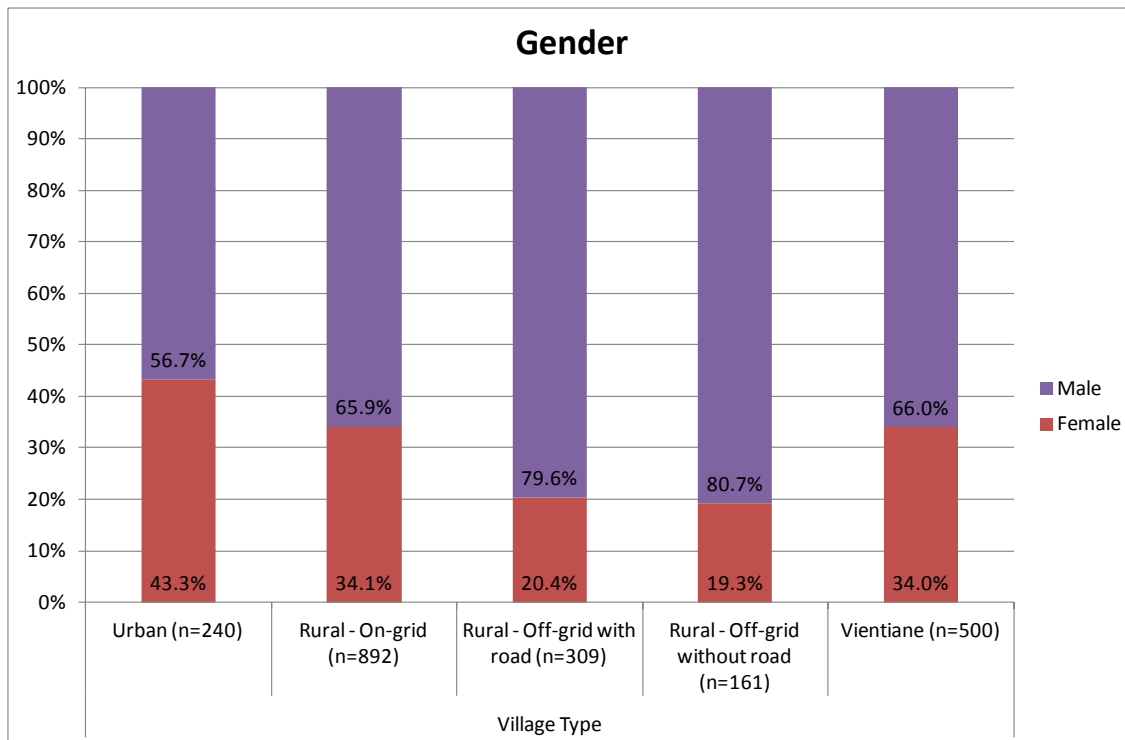


Figure 2.2. Respondent's gender by village type ( $\chi^2=48.0$ ,  $df=4$ ,  $p<0.001$ )

## 2.2. Marital status

As for marital status, vast majority (87%) of the respondents were married and had children. 7.1% were widowed, 2.6% married without children, 2.1% divorced and 1.6% consisted of respondents who were single.

The share of the single households was the highest in Vientiane, 3.6%, whereas in rural non-electrified villages only a few respondents lived alone. Similarly, being divorced was more common in the capital, 4.2%, compared to 1.2%–1.6% in the other areas. 10% of the urban respondents (8.8% in Vientiane) were widowed, and the share decreased as the village type became rural.

All in all, the more remote the village was, the less there was diversity in terms of marital status. In rural off-grid villages with no road access 93% of the respondents were married with children. The same share was 91% in off-grid villages with road access, 89% in electrified rural villages, 83% in urban areas and 79% in Vientiane.

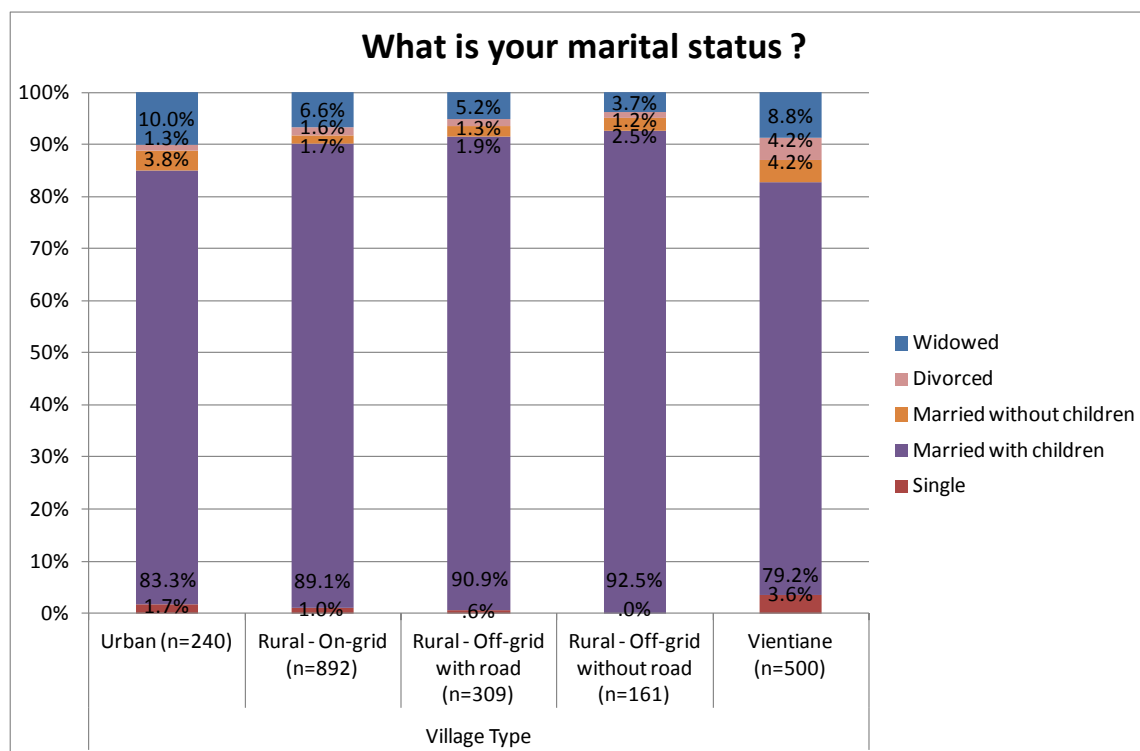


Figure 2.3. Respondent's marital status by village type ( $\chi^2=57.4$ ,  $df=16$ ,  $p<0.001$ ).

The households below the poverty line were slightly more often (89%) married and had children than those above the poverty line (85%). It was somewhat more common for the households above the poverty line to consist of single or divorced respondents, or of a married couple with no children. The differences are, however, fairly small, less than two percent units. Furthermore, some of the married couples without children can be expected to be newlyweds.

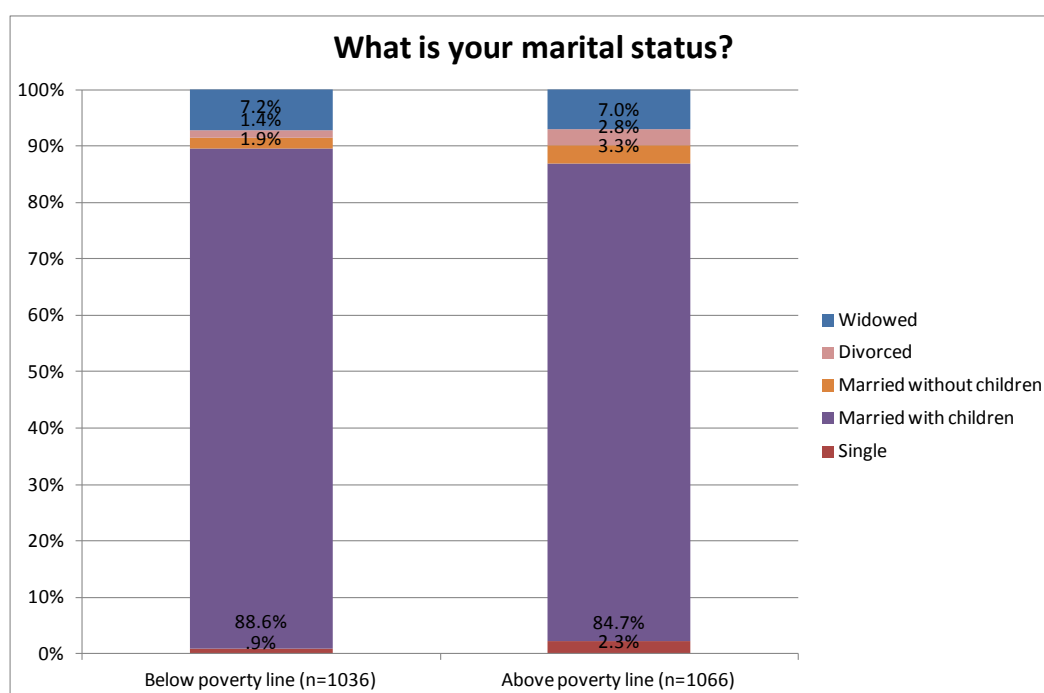


Figure 2.4. Respondent's marital status by the poverty line ( $\chi^2=16.5$ ,  $df=4$ ,  $p=0.002$ ).

## 2.3. Age

The ages of the respondents ranged from 20 to 79 years. On average, the respondents were 46 years old with a median value of 45 years. Half of the respondents were between 37 and 54 years old. It is worth remembering that the respondents were always household heads and as such this is not demographically representative of the whole of the population, but only of the respondents to this survey.

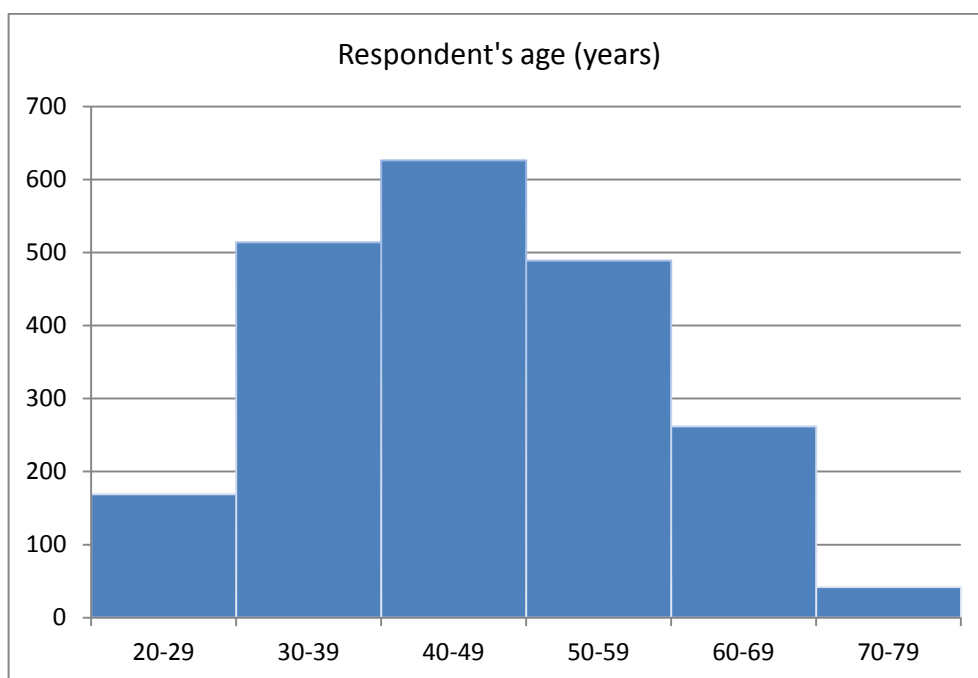


Figure 2.5. Respondents' age distribution (n=2102).

The respondents in the rural areas were, on average, slightly younger than those in the urban areas. The lowest average age, 43 years, was in the rural off-grid without road villages, while the respondents of Vientiane Capital had the highest average age, 48 years.

There was a weak positive relation between the age of the respondent and whether the household is below or above the poverty line. The households above the poverty line were on average two years older than the respondents of the households below the poverty line. This could, in some cases, indicate an accumulation of knowhow and expertise that results in the increase of material wealth.

Table 2.1. Distribution of the respondent's age by village type and the poverty line.

Respondent's age	All (n= 2102)	Urban (n=240)	Rural - On-grid (n=892)	Rural - Off-grid, with road access (n=309)	Rural - Off-grid, no road access (n=161)	Vientiane (n=500)	Below the poverty line (n=1036)	Above the poverty line (n=1066)
<b>Mean</b>	45.78	47.46	45.16	43.98	43.48	47.92	44.78	46.74
<b>Std. Deviation</b>	11.70	11.16	11.86	11.99	12.66	10.71	12.05	11.26
<b>Percentiles 25</b>	37.00	39.25	36.00	35.00	34.00	40.00	35.00	39.00
<b>50</b>	45.00	46.50	45.00	43.00	40.00	47.00	44.50	46.00
<b>75</b>	54.00	55.00	53.00	54.00	54.00	55.00	54.00	54.00

## 2.4. Ethnic group

On total, 69% of the respondents were Lao by their ethnicity. Lao people were by far the most common ethnic group in urban areas, 93%, while their share of the rural respondents was 56%. After Lao, the most common ethnic groups in this survey were Kim Mou (6.3%), Phou Thay (4.7%) and Leu (3.9%).

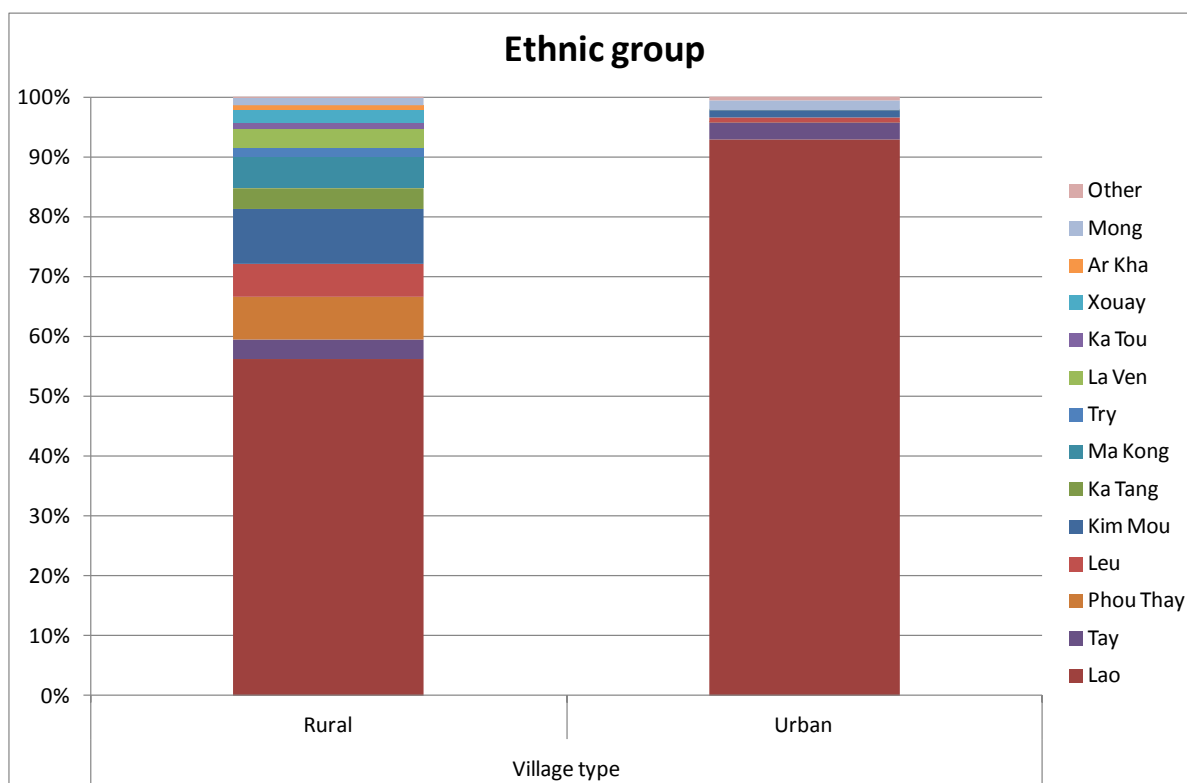


Figure 2.6. Respondent's ethnicity by village type ( $\chi^2=351.6$ ,  $df=13$ ,  $p<0.001$ ).

Table 2.2. The main ethnic groups in the survey ( $n=2102$ ).

		Rural	Urban	Total
<b>Ethnic group</b>	<b>Lao</b>	56.2%	92.8%	69.1%
	<b>Kim Mou</b>	9.0%	1.2%	6.3%
	<b>Phou Thay</b>	7.1%	.1%	4.7%
	<b>Leu</b>	5.7%	.7%	3.9%
	<b>Other</b>	22.0%	5.1%	16.0%
	<b>Total</b>	100.0%	100.0%	100.0%

## 2.5. Education of the household head

The education of the household head depended strongly on the village type. On total, 12% of the household heads had not attended any formal schooling. In Vientiane and other urban villages this share is less than 5%, whereas in rural off-grid villages with no road access, almost a quarter of the household heads never went to school. Of those who did, three quarters graduated from primary school, 15% from lower secondary and

6.5% from upper secondary. Only a few attended technical or vocational school, and none graduated from university. In other words, all university graduates live at least in a rural on-grid household and the majority of university graduates live in urban areas.

The level of education increases gradually as the village type changes from rural to urban and finally, Vientiane Capital. For example, the share of the household heads that have attended education after upper secondary school is 42% in Vientiane, 16% in other urban, 2.9% in electrified rural and even less in non-electrified rural villages.

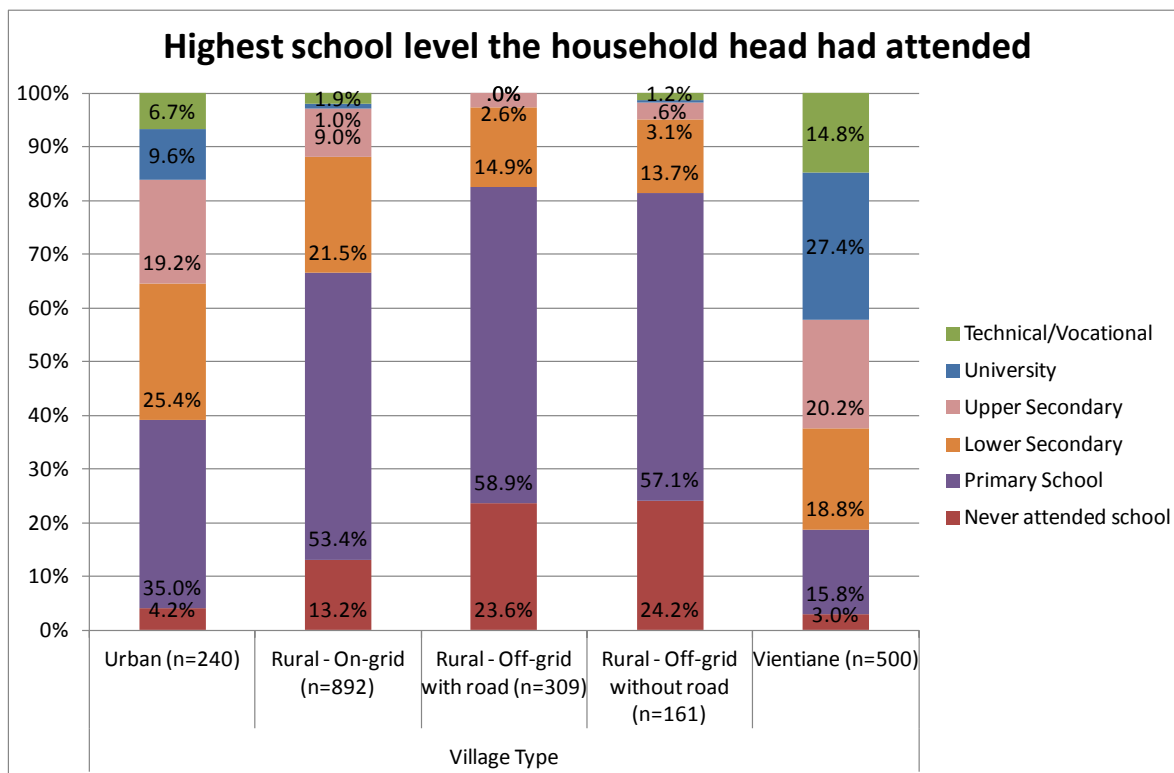


Figure 2.7. Highest school level the household head had attended by village type ( $\chi^2=783.2$ ,  $df=20$ ,  $p<0.001$ ).

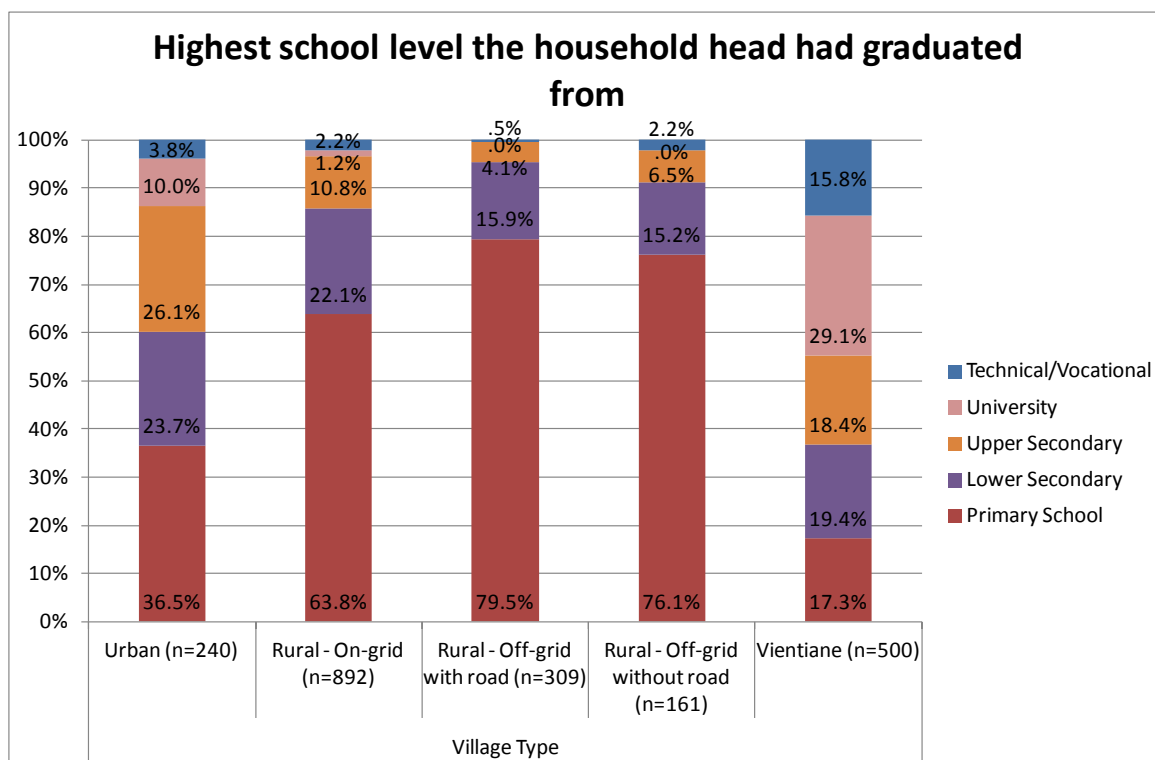


Figure 2.8. Highest school level the household head had graduated from by village type ( $\chi^2=592.5$ ,  $df=16$ ,  $p<0.001$ ).

Education of the household head and poverty are strongly related. Almost a fifth of the heads of households below the poverty line have not attended any formal schooling. This share is considerably lower, 4.7%, within the household above the poverty line.

71% of the household heads in the households below the poverty line that had had at least some education, had graduated from primary school, 18% from lower secondary and 7.5% from upper secondary school. Approximately two percent had graduated from both universities and vocational schools. Within the households that are classified above the poverty line, the level of education of the household head is considerably higher. 35% graduated from primary school, 22% from lower and 18% from higher secondary school, 16% from university and 9% from vocational or technical school.

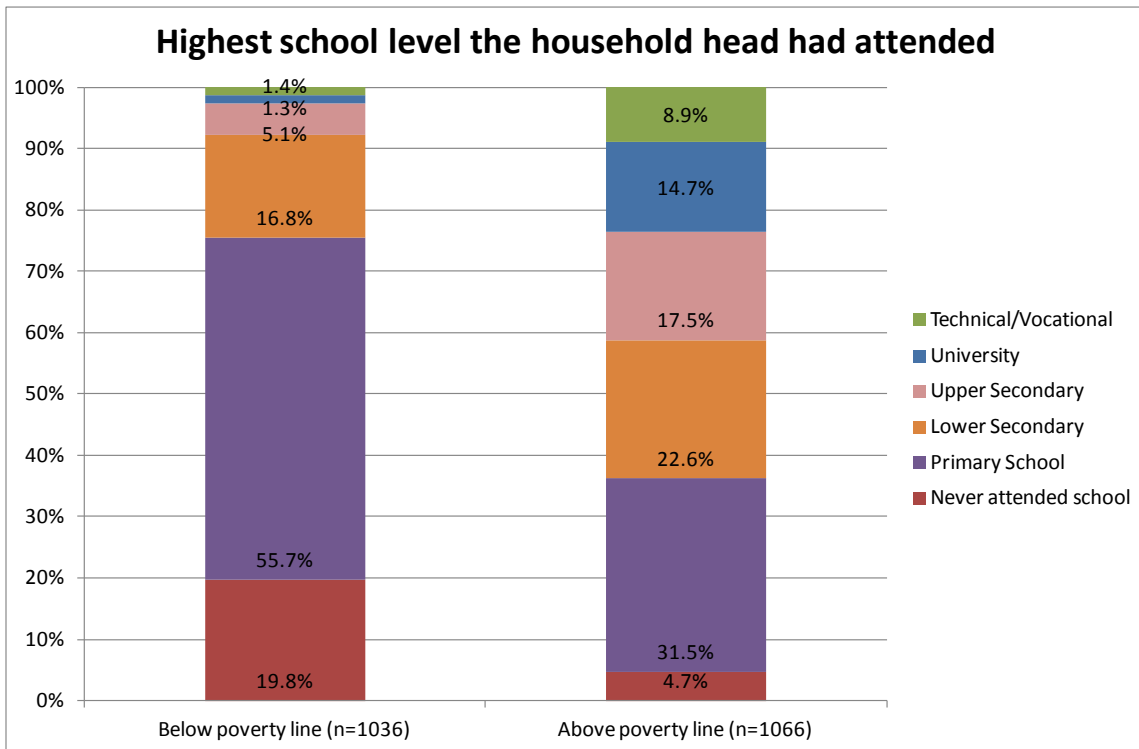


Figure 2.9. Highest school level the household head had attended by the poverty line ( $\chi^2=425.3$ ,  $df=5$ ,  $p<0.001$ ).

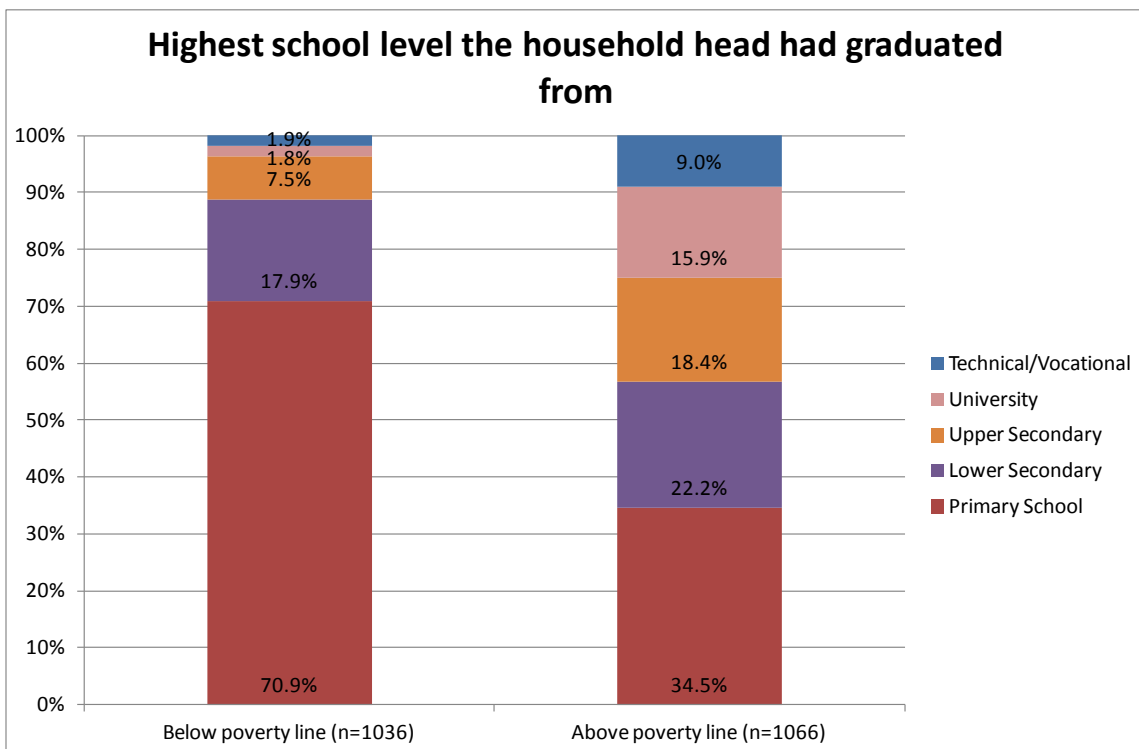


Figure 2.10. Highest school level the household head had graduated from by village type ( $\chi^2=256.6$ ,  $df=4$ ,  $p<0.001$ ).



## 2.6. Household members' ability to read and write

Most of the members in the interviewed households could read and write. Regardless, there were significant differences with the ability to read and write between the village types.

In Vientiane, 96% of the household heads, 95% of their spouses and 99.5% of other household members over 15 years of age can read and write. The respective figures in other urban villages are 96%, 91% and 93%; in rural electrified villages 87%, 72% and 87%; in rural off-grid villages with road access 76%, 54% and 76%; and finally, in rural off-grid villages without road access the shares are 75%, 43% and 74%.

In general, the shares of the household head and others more than 15 years old that can read and write are close to each other, and the shares decrease as the village type changes into more remote. The same trend is particularly strong related to the spouses' ability to read and write, as in the rural off-grid off-road villages less than half of the spouses can read and write. This would seem to indicate that the literacy rate in Laos is increasing.

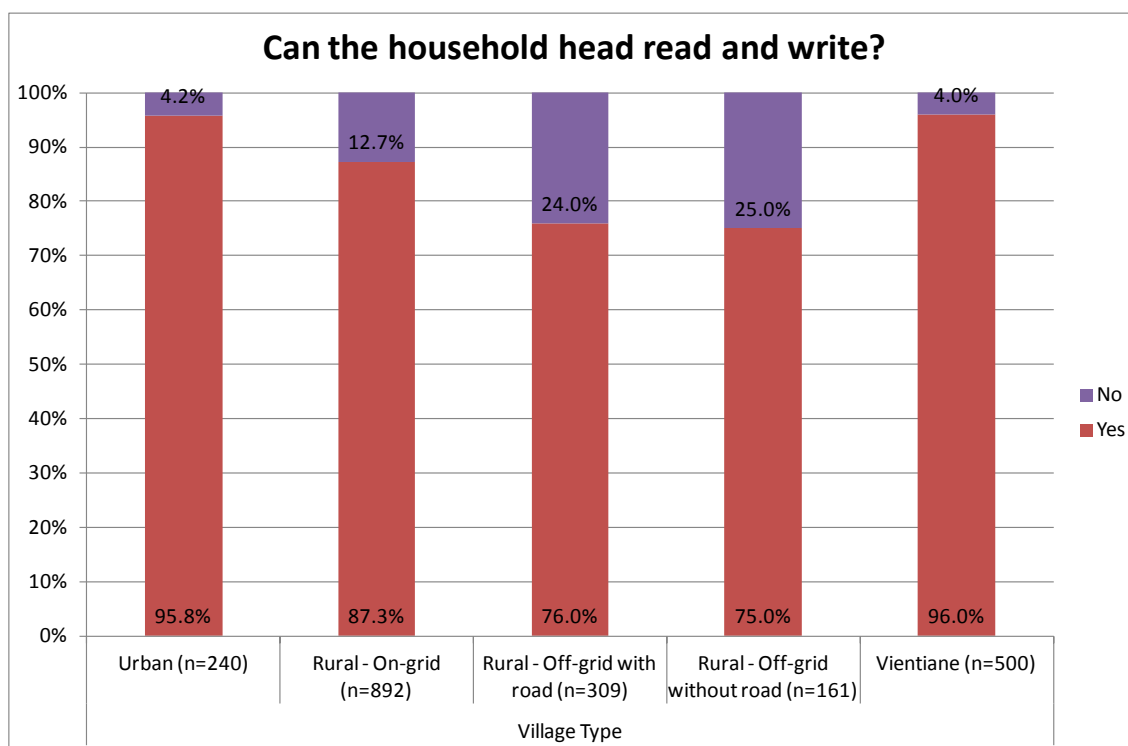


Figure 2.11. Household head's ability to read and write by village type ( $\chi^2=110.1$ ,  $df=4$ ,  $p<0.001$ ).

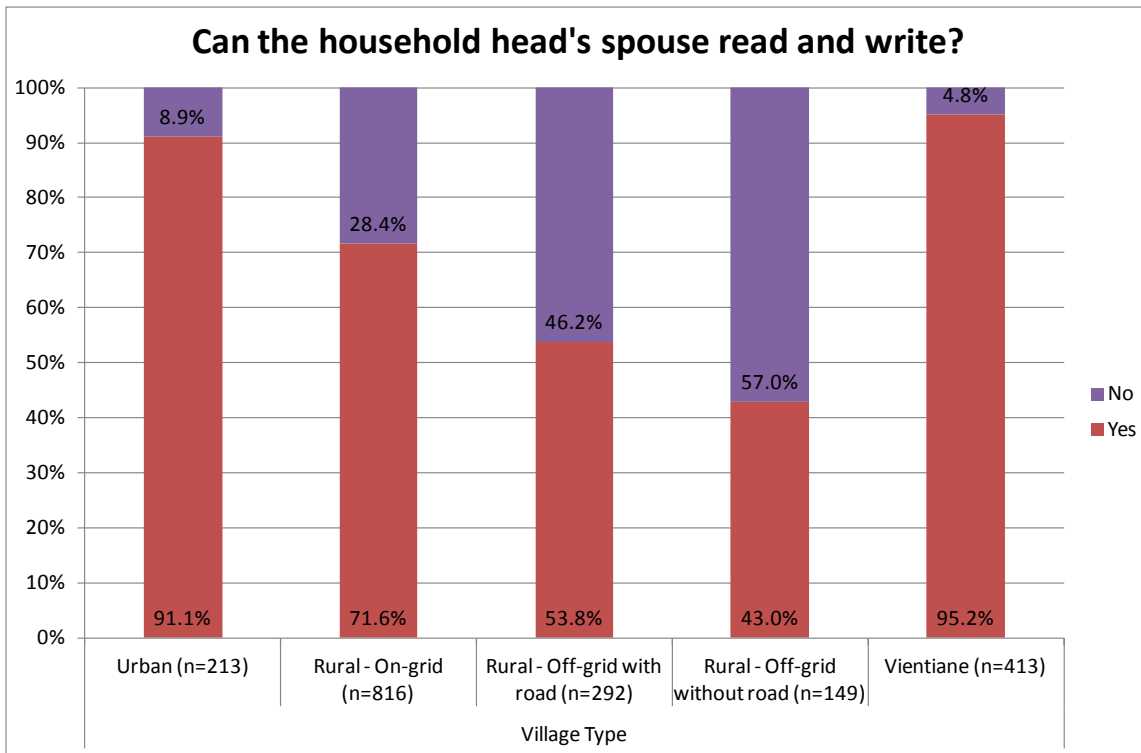


Figure 2.12. Household head's spouse's ability to read and write by village type ( $\chi^2=267.2$ ,  $df=4$ ,  $p<0.001$ ).

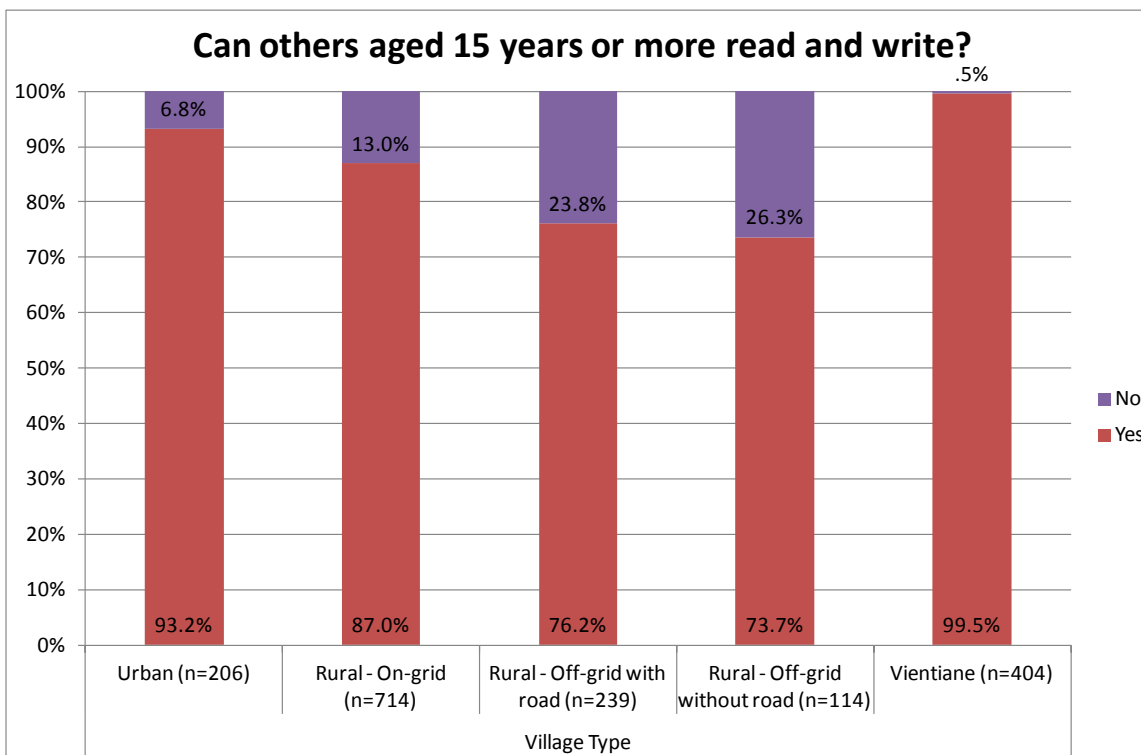


Figure 2.13. The ability of other's aged 15 or more to read and write by village type ( $\chi^2=112.9$ ,  $df=4$ ,  $p<0.001$ ).

As could be expected, household members in households above the poverty line were more often able to read and write than those below the poverty line. 95% of the household heads and others aged 15 or over, and 89% of the spouses of the household heads could read and write. Within the households below the pov-

erty line, the respective figures were consistently lower. Just 60% of spouses could read and write in households below the poverty line.

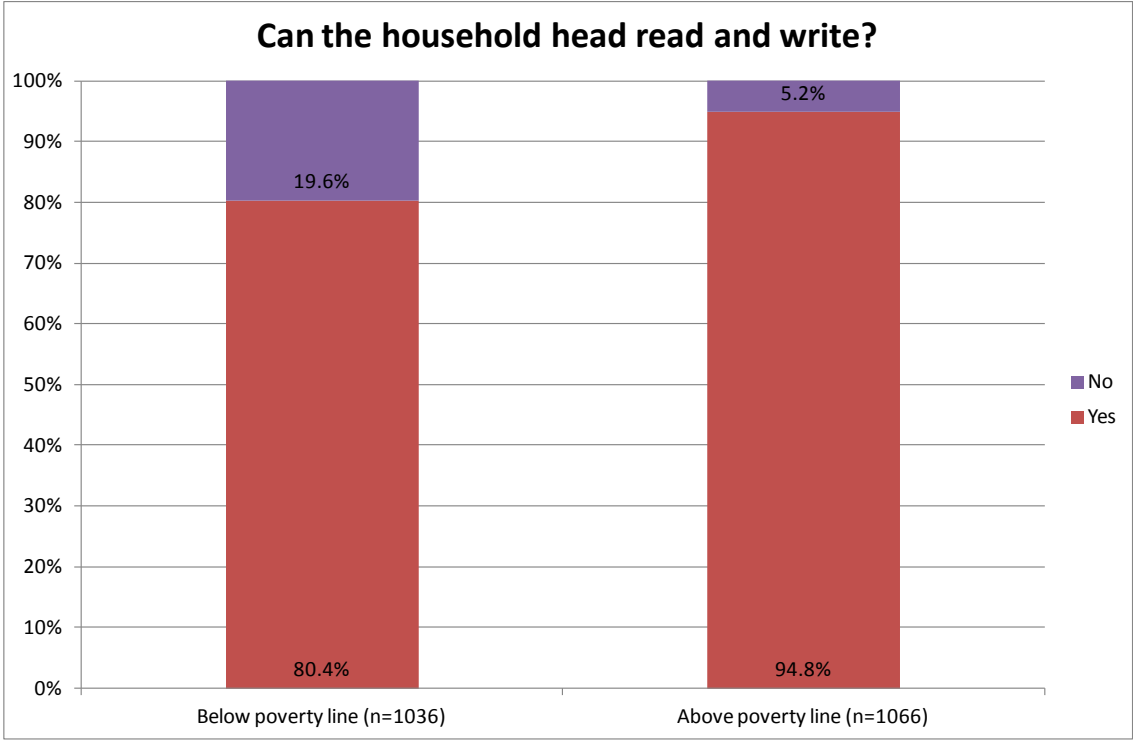


Figure 2.14. Household head's ability to read and write by the poverty line ( $\chi^2=102.1, df=1, p<0.001$ ).

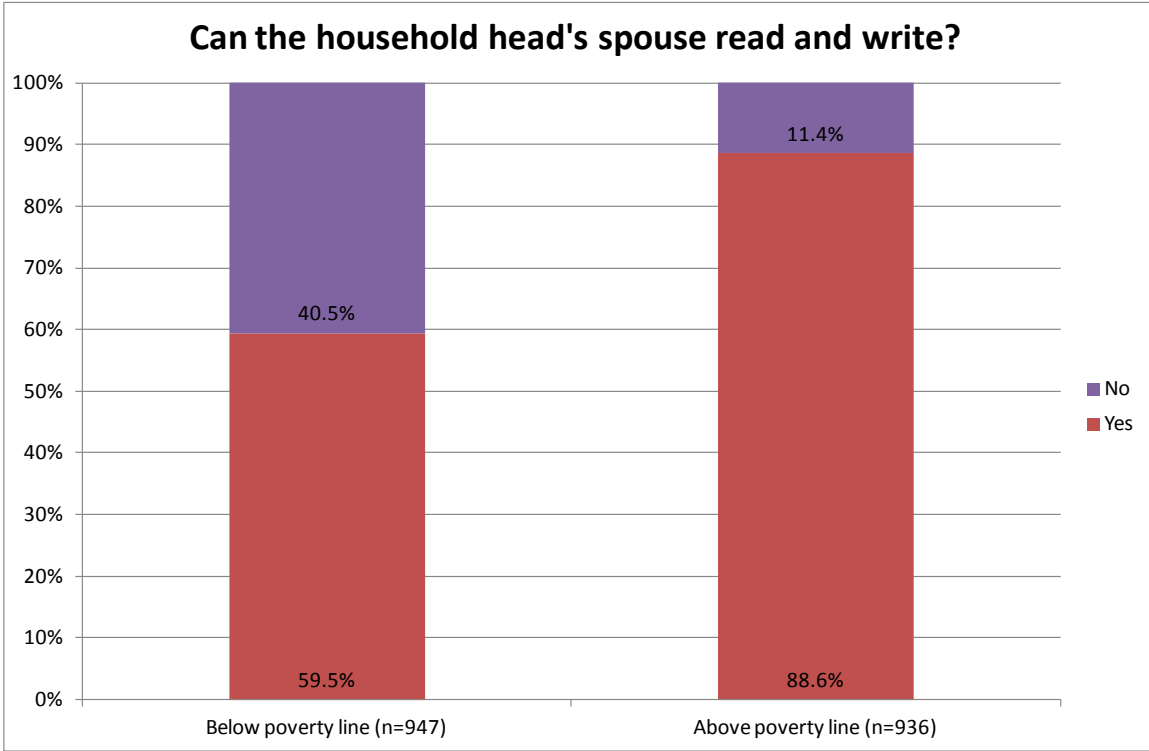


Figure 2.15. Household head's spouse's ability to read and write by the poverty line ( $\chi^2=207.0, df=1, p<0.001$ ).

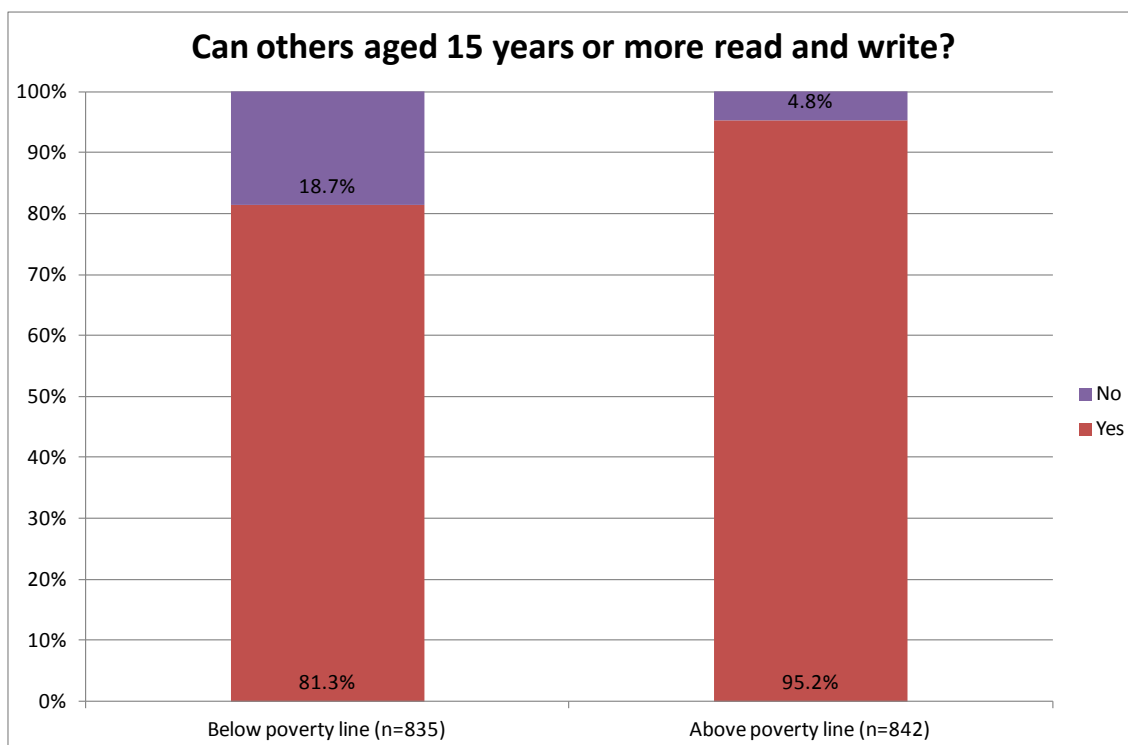


Figure 2.16. The ability of other's aged 15. or more to read and write by the poverty line ( $\chi^2=78.8$ ,  $df=1$ ,  $p<0.001$ ).

## 2.7. Household size

Households in rural villages had more household members compared with urban areas. Average household sizes in rural electrified and off-grid villages with and without road were 5.9, 6.2 and 6.3 people respectively, while in Vientiane and other urban areas the average household sizes were 5.4 and 5.6 people. Median household size in rural villages was 6. In urban villages and Vientiane the median was 5. In urban villages and Vientiane, there were, on average, slightly more women (2.8) than men (2.6) in the households. In other parts of the country, the proportions of female and male members were very similar.

Households below the poverty line were considerably larger than those above the line, 6.4 compared to 5.2 members. The respective medians were 6 and 5. Proportions of men and women were close to each other, regardless of whether the household was above or below the poverty line.

Table 2.3. Household size by village type.

How many people live in your house?	Urban- (n= 240)	Rural On-Grid (n=892)	Rural Off-Grid with Road Access (n=309)	Rural Off-Grid without Road Access (n=161)	Vientiane (n= 500)	Below the poverty line (n=1036)	Above the poverty line (n=1066)
<b>Mean</b>	5,60	5,87	6,15	6,28	5,37	6,41	5,20
<b>Std. Deviation</b>	2,13	2,38	2,57	2,31	2,28	2,44	2,14
<b>Percentiles</b>							
<b>25</b>	4,00	4,00	4,00	5,00	5,00	4,00	4,00
<b>50</b>	5,00	6,00	6,00	6,00	6,00	5,00	5,00
<b>75</b>	7,00	7,00	8,00	8,00	8,00	6,00	7,00
<b>Male average</b>	2,79	2,99	3,07	3,21	2,58	3,23	2,57
<b>Female average</b>	2,85	2,93	3,10	3,15	2,79	3,21	2,65

### 3. ASSETS, LIVELIHOOD ACTIVITIES, INCOME AND LIABILITIES

In this chapter we report key results of the survey that concerned assets, livelihood activities, income and liabilities. As we know, ownership of assets is a key issue for rural and urban development. The structures of land use are connected human development as well as to ecosystem services. In Laos land questions have been culturally sensitive because of war memoirs and drug policy changes after opium era (see.e.g. Baird & Le Billon 2012, Cohen 2009).

In addition to the land use questions presented in this chapter, we asked whether the households used land that the state had acquired for foreign land concession or compulsory acquisition for national development project. Using this type of land was marginal, practiced by only 14 households. As background information average expenditure levels in the Lao PDR are visualized in Fig. 3.1.

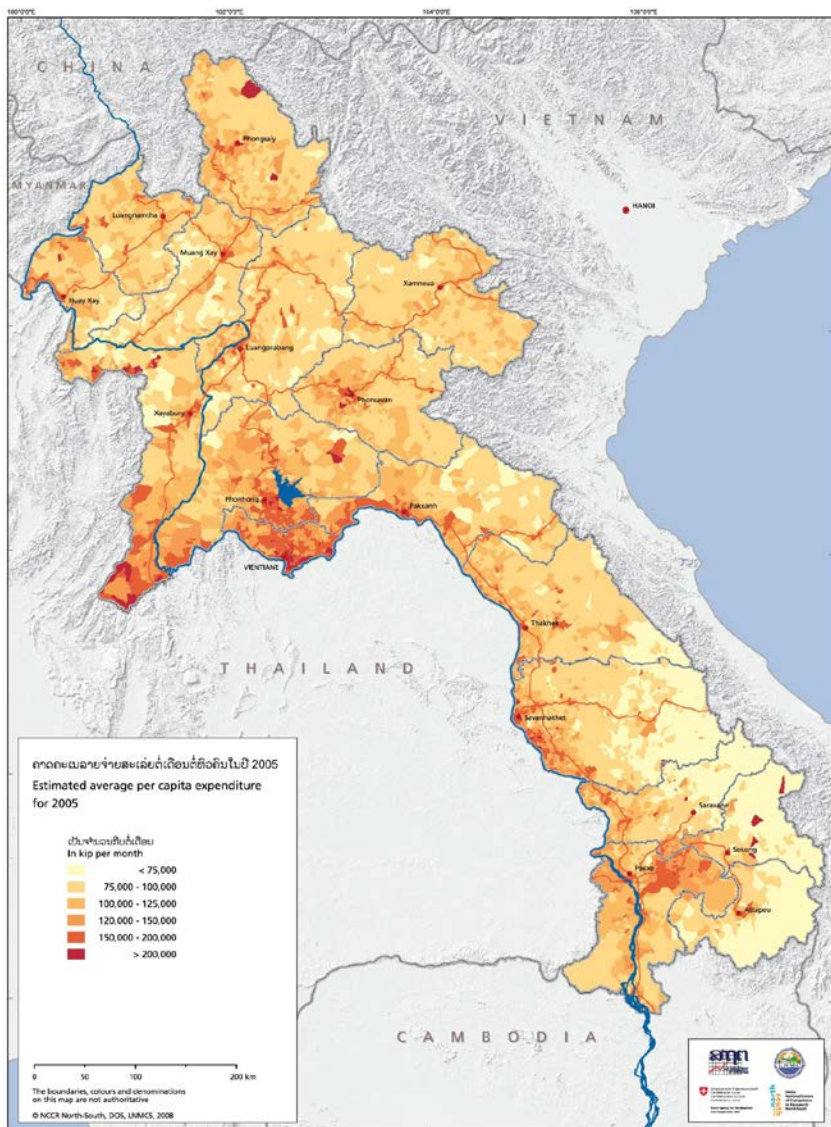


Figure 3.1. The map of average expenditure per capita in Laos (Messerli et al. 2008)

### 3.1. Land ownership

Most households owned their own house plot, although the rural off-grid households without road access owned the plot less often than the others with an ownership rate of 82% compared with rates of 95%-97% in other households. Besides house plot, rural off-grid households with road connection possessed the largest variety of land plots: 77% owned rice fields, 36% garden fields, 17% land for swidden, 8.4% plantation land, and 9.1% empty land. The respective figures for rural on-grid households were 72%, 33%, 14%, 7.8%, and 8.7%. It was slightly more common for rural off-grid households without road connection to own garden fields (36%) and land for swidden (17%) than for others, and less common to own rice fields (56%), compared with the other rural households. Urban households possessed plantation land more often than households in rural villages (11%) but notably less rice fields (36%), garden fields (23%) and swidden land (3.8%).

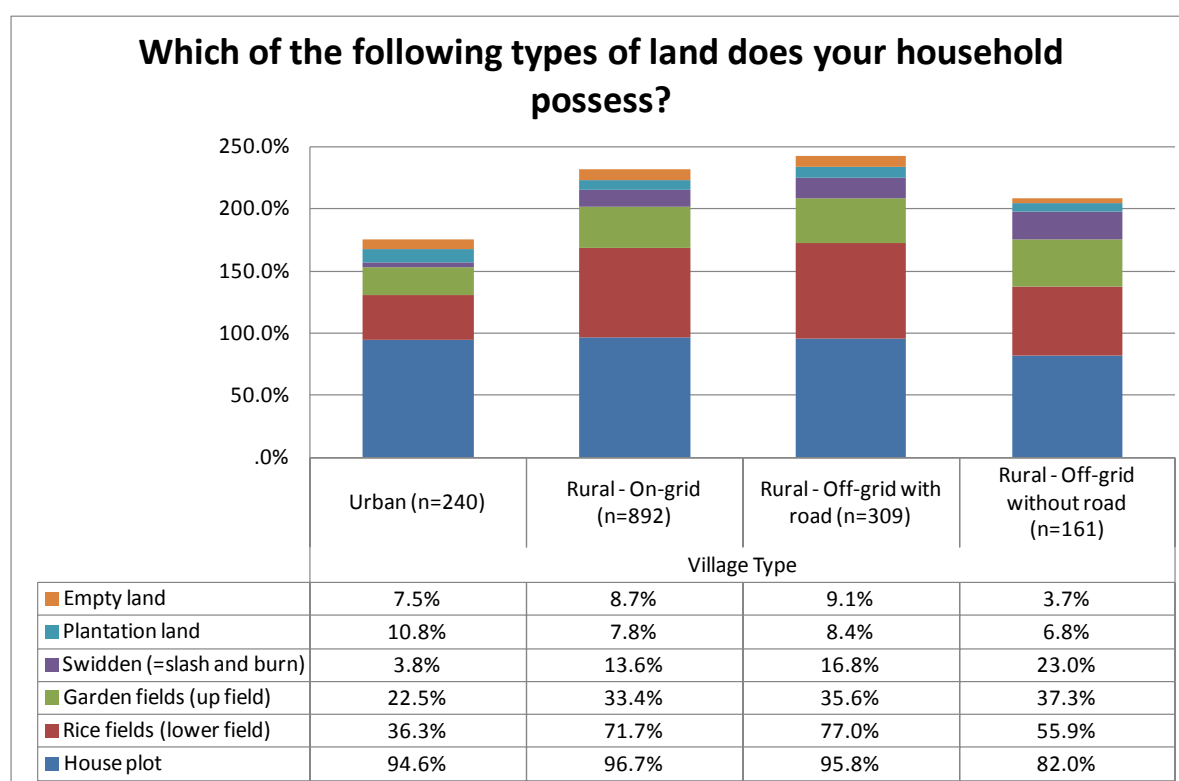


Figure 3.2. Ownership of different types of land by village type.

There were no dramatic differences in land ownership based on the poverty line division. Households above the poverty line possessed most examined land types more commonly than the households below the poverty line. A house plot was owned by 94% of the households below the poverty line and 97% of the households above the poverty line. The respective figures for rice fields were 70% and 59%, for garden fields 31% and 35%, for swidden land 13% and 15%, for plantation land 7.6% and 9.5%, and for empty land 7.6% and 9%. These results indicate that land ownership is hardly related to monetary wealth.

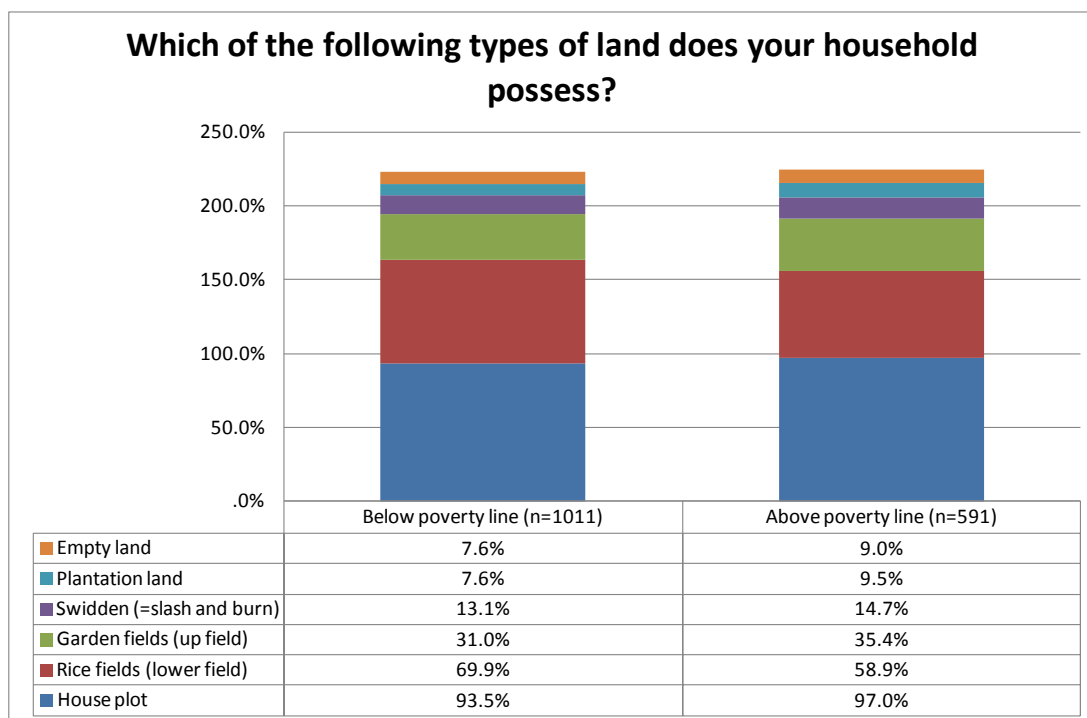


Figure 3.3. Ownership of different types of land by the poverty line (not asked in the Vientiane survey).

### 3.2. Rental land

Renting land is not common in the Lao PDR. In urban areas, the most common type of rental land is house plots with 2.1% renting. In rural on-grid villages, 4.9% rented in rice fields, and 3.3% land for swidden. Renting in swidden land was also the most common option in the rural off-grid areas with 5.2%-5.6% utilizing rental land.

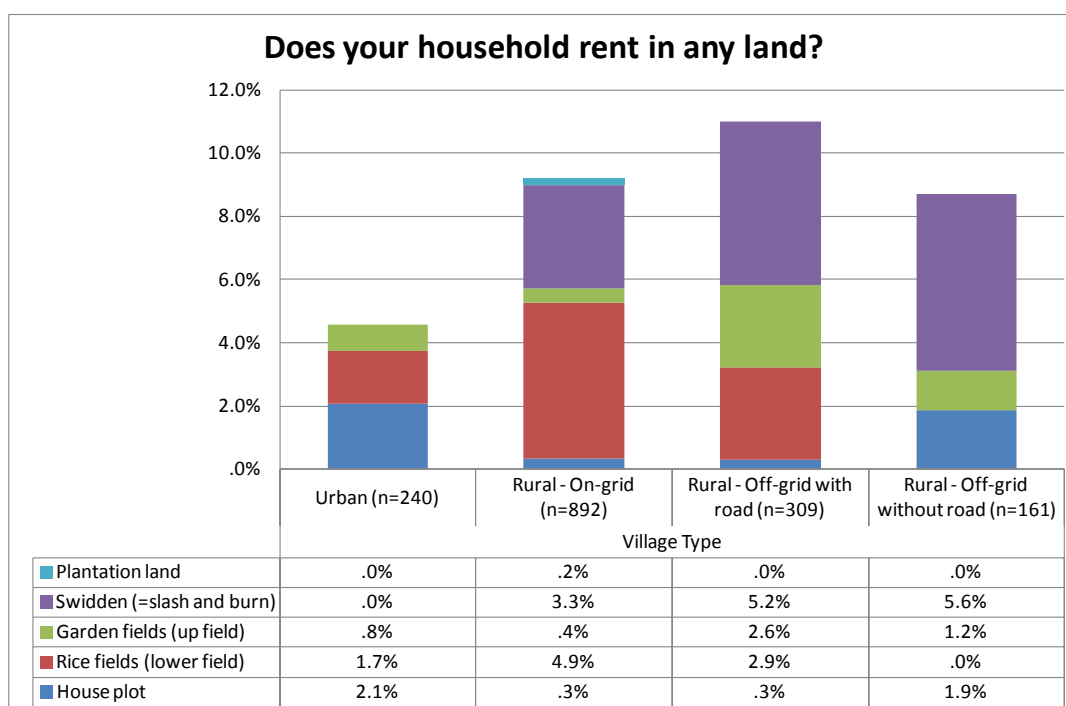


Figure 3.4. Renting in different types of land by village type.

Households below the poverty line rented land more than households above the poverty line. For the former, it was the most common to rent swidden land (4.9%), rice fields (2.8%), and garden fields (1.4%), whereas the latter rented solely rice fields (4.9%). Other types of land were rarely rented by Laotian households.

Only a few households rented out land. The rental activities were concentrated within urban households where 3.3% rented out rice fields and 1.7% house plots. Within rural on-grid households, 2.2% rented out rice fields. All other land types were rented out by less than 1% of the households within each village type. A similar result was found when comparing households below and above the poverty line. Rice fields were rented out by 1.3% of the households below the poverty line and by 2.9% above the poverty line. Other land types were rented out by less than one percent.

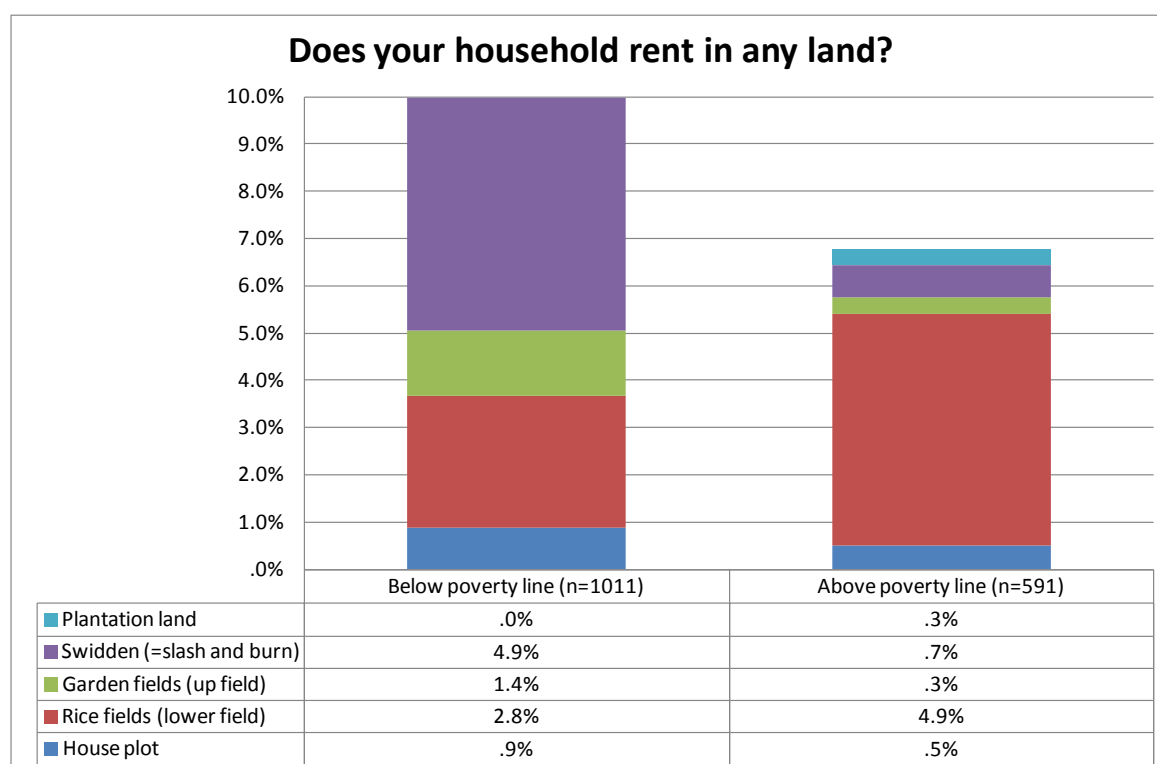


Figure 3.5. Renting in different types of land by the poverty line (not asked in the Vientiane survey).

Fig. 3.5 reveals that poverty is one key reason for “slash and burn use” of land in Laos. In the households above poverty line “slash and burn use” of land is considerably smaller than in the households below poverty line.

### 3.3. Usage of land owned by the village

In urban areas, using land that belongs to the village was less common than in the rural areas. The most common activity practiced on the village land was collecting firewood. Nearly a quarter (23%) of urban households, three quarters (76%) of rural on-grid households, 78% rural off-grid households with road access, and 89% of rural off-grid households without road access collected firewood on village land. In rural villages, grazing was another widely practiced activity. Rural households with no road connection in their village utilized village land the most.



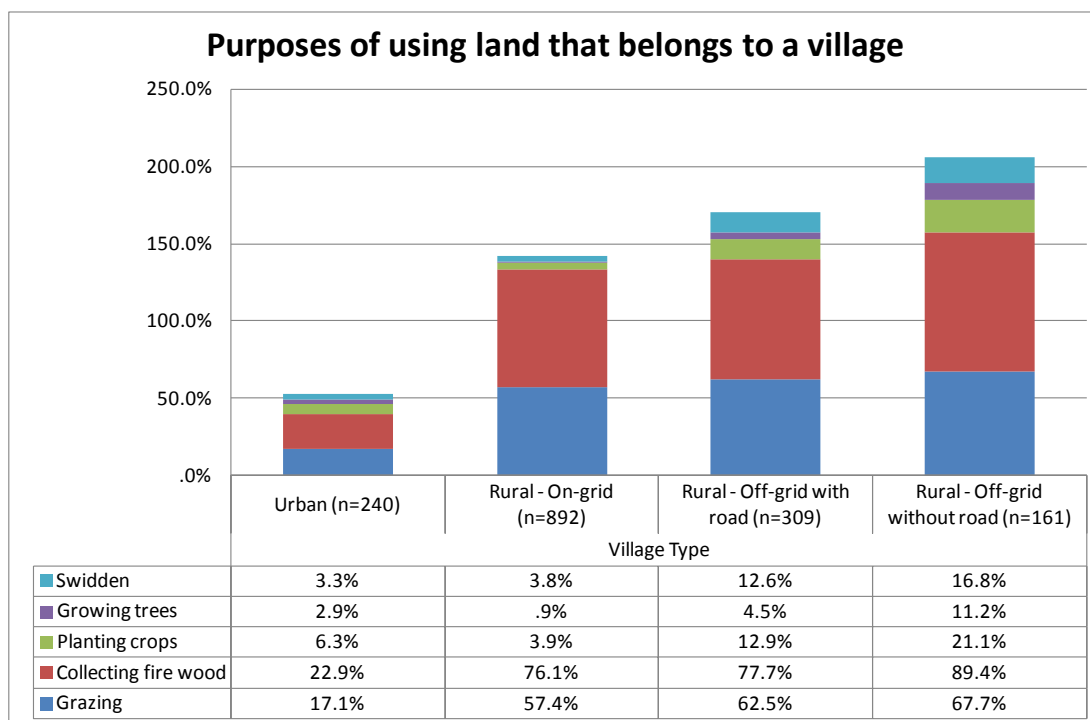


Figure 3.6. Usage of land that belongs to the village by village type.

The households below the poverty line used village land for more activities than the households above the poverty line. Almost three quarters (73%) of the households below the poverty line collected firewood on village land, 62% used the land for grazing, 11% for planting crops, 9.4% for swidden (slash and burn), and 3.6% for growing trees. The respective figures within the households above the poverty line were 65%, 39%, 2.0%, 2.2%, and 1.9%.

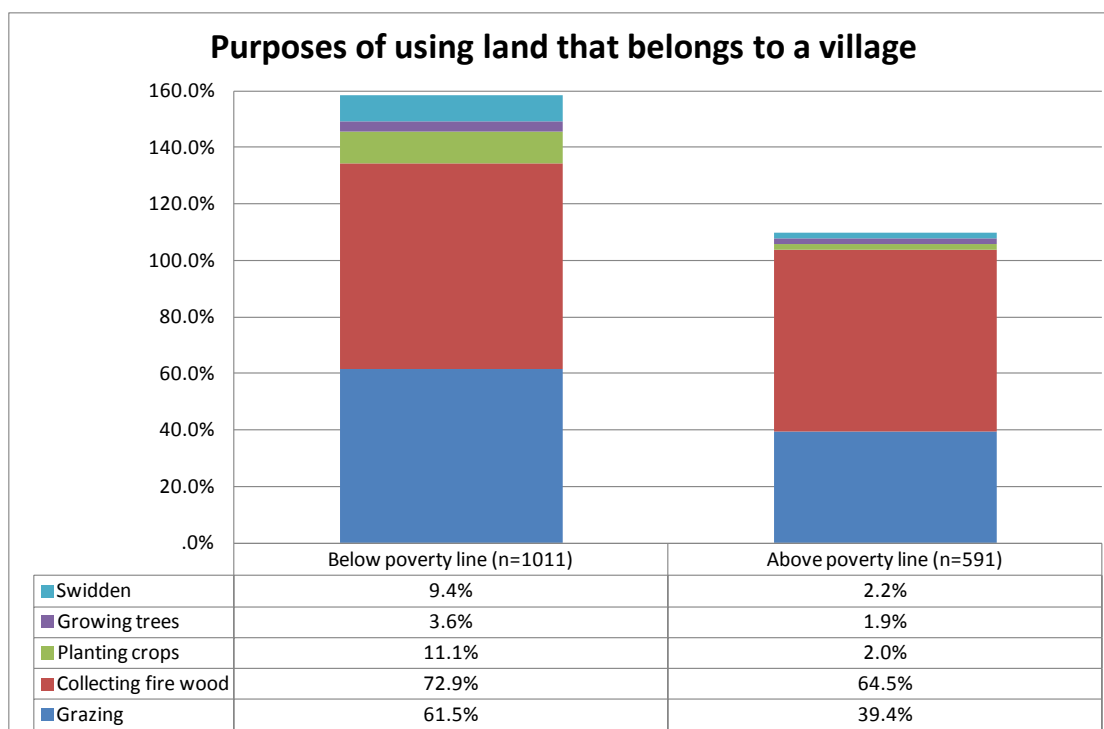


Figure 3.7. Usage of land that belongs to the village by the poverty line (not asked in the Vientiane survey).

### 3.4. Raising livestock or fish

The frequency of raising livestock or fish varied between the different village types. Approximately 90% (89–95%) of households in rural areas raised livestock or fish, while in Vientiane and other urban areas the respective figures were 22% and 60%. This result was in line with our prior expectations.

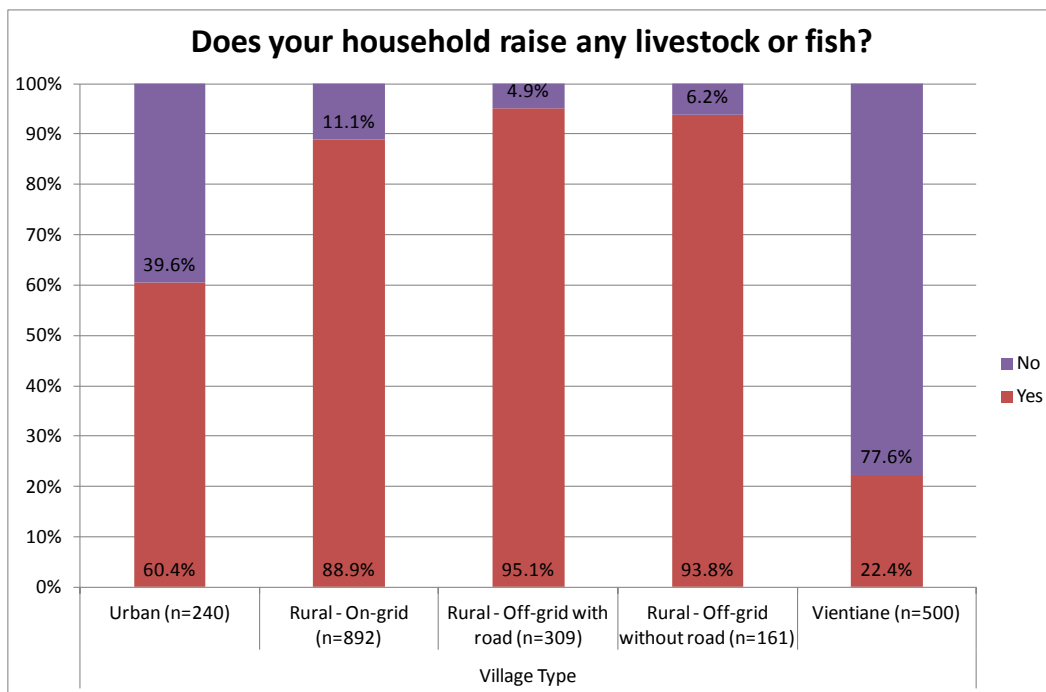


Figure 3.8. Raising livestock or fish by village type ( $\chi^2=855.7$ ,  $df=4$ ,  $p<0.001$ ).

Households below the poverty line raised livestock or fish more often (88%) than households above the poverty line (54%). The difference between these two groups is statistically significant.

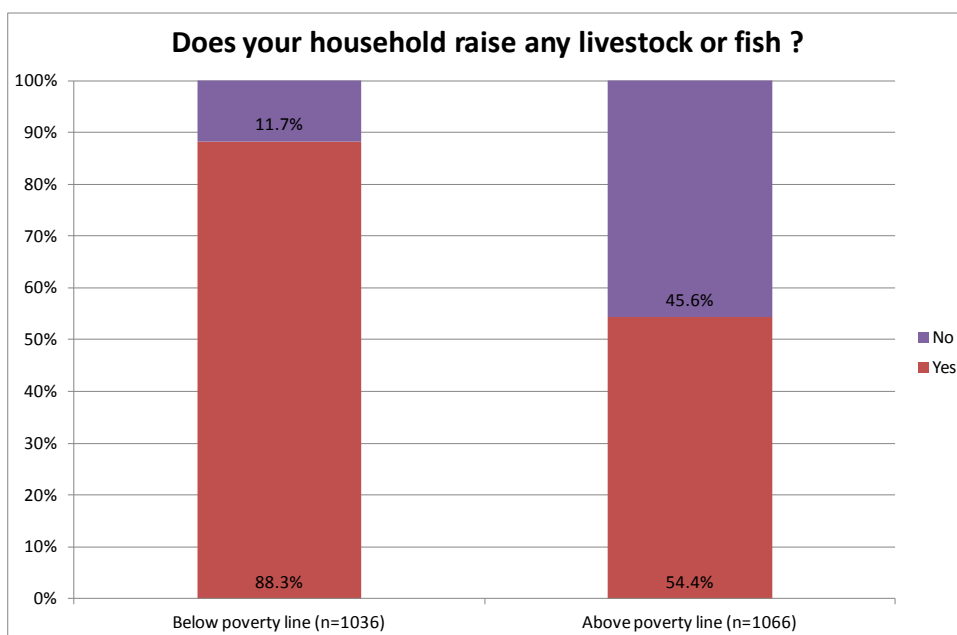


Figure 3.9. Raising livestock or fish by the poverty line ( $\chi^2=294.2$ ,  $df=1$ ,  $p<0.001$ ).

### 3.5. Livestock ownership

Rural households had a larger variety of livestock that they raised compared to urban households. In the Vientiane capital region, fifth of the households raised poultry, whereas other types of livestock were rare. Poultry was also the most common type of livestock in the other types of villages. Just over half of urban and three quarters of rural households raised poultry. The share of households raising pigs and cattle increased as the village type became more remote. The majority of rural off-grid households without road access owned cattle (72%) and pigs (71%).

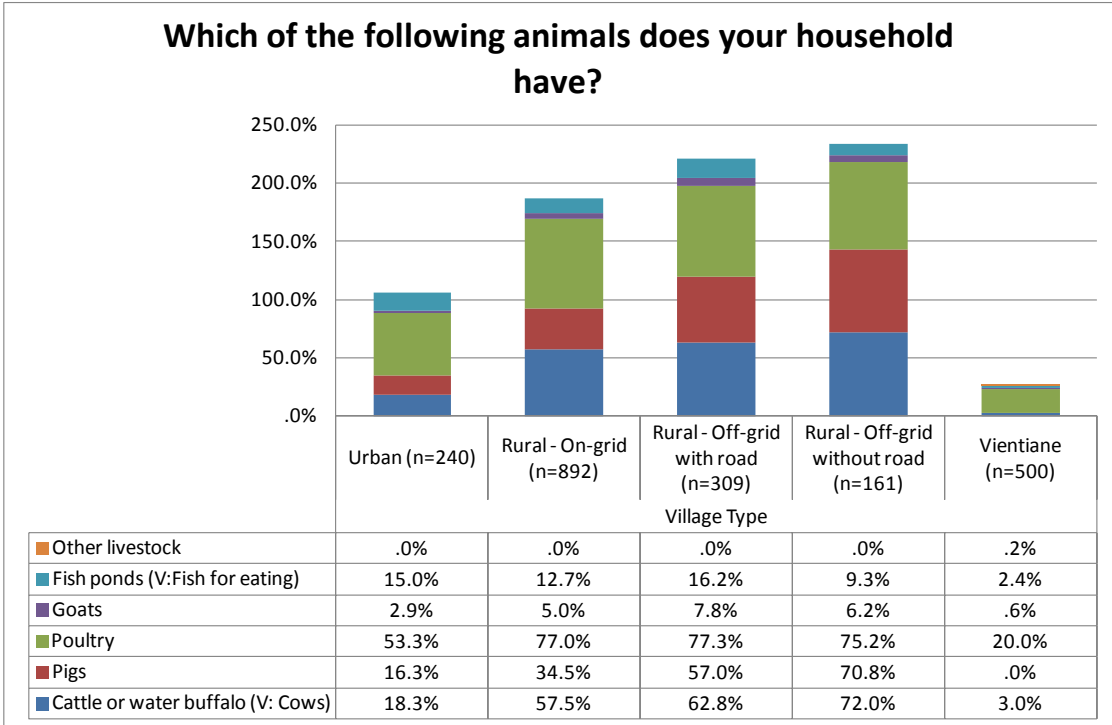


Figure 3.10. Livestock ownership by village type (V refers to the Vientiane survey).

Households below the poverty line had more variety in their livestock than households above the poverty line. The former owned mainly poultry (73%), cattle and water buffalos (61%), pigs (45%), and fish ponds (12%). The respective shares for the latter were 48%, 23%, 16%, and 9.7%. Goats were the least common type of livestock owned by 6.6% within the households below the poverty line and 2.0% within the households above the line.

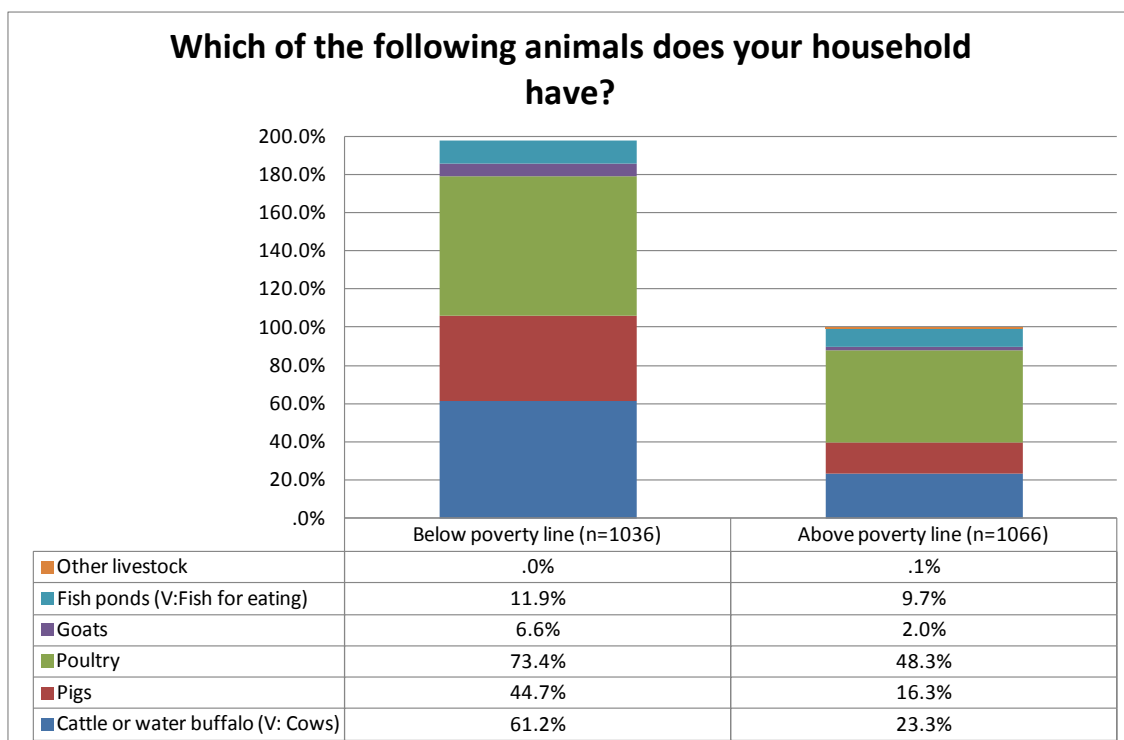


Figure 3.11. Livestock ownership by the poverty line (V refers to the Vientiane survey).

### 3.6. Vehicle ownership

Motorcycles were the most common vehicle owned in nearly all village types, possessed by 95% of the households in Vientiane and other urban areas, 75% in rural on-grid, 62% in rural off-grid with road access, and 27% in rural off-grid without road access. Two-wheel tractors, hand tractors or tok-toks were the second most common vehicle in the rural areas: 44% in on-grid areas, 55% in off-grid areas with road access, and 28% in off-grid areas without road access had at least one. Bicycles were also quite common, owned by 9.9%-40%, depending on the village type. Households in non-electrified rural villages owned bicycles less often than others. Cars and pick-ups (or, four-wheel drives) were the most common in Vientiane (17% and 33%, respectively) and other urban villages (6.3% and 12%). Less than 5% owned a car or a pick-up in rural areas. Tuk-tuks were owned by just a few percent of households in urban areas (3.8%) and Vientiane (2.2%), and only by few in rural villages. Outside Vientiane, 1%-5% of the households owned a boat, with or without motor, with the exception of rural off-grid households without road access, where 11% possessed at least one boat with motor. In Vientiane, none of the surveyed households owned a boat. Hardly any households in the Lao PDR owned a truck, a four-wheel tractor or an oxcart.

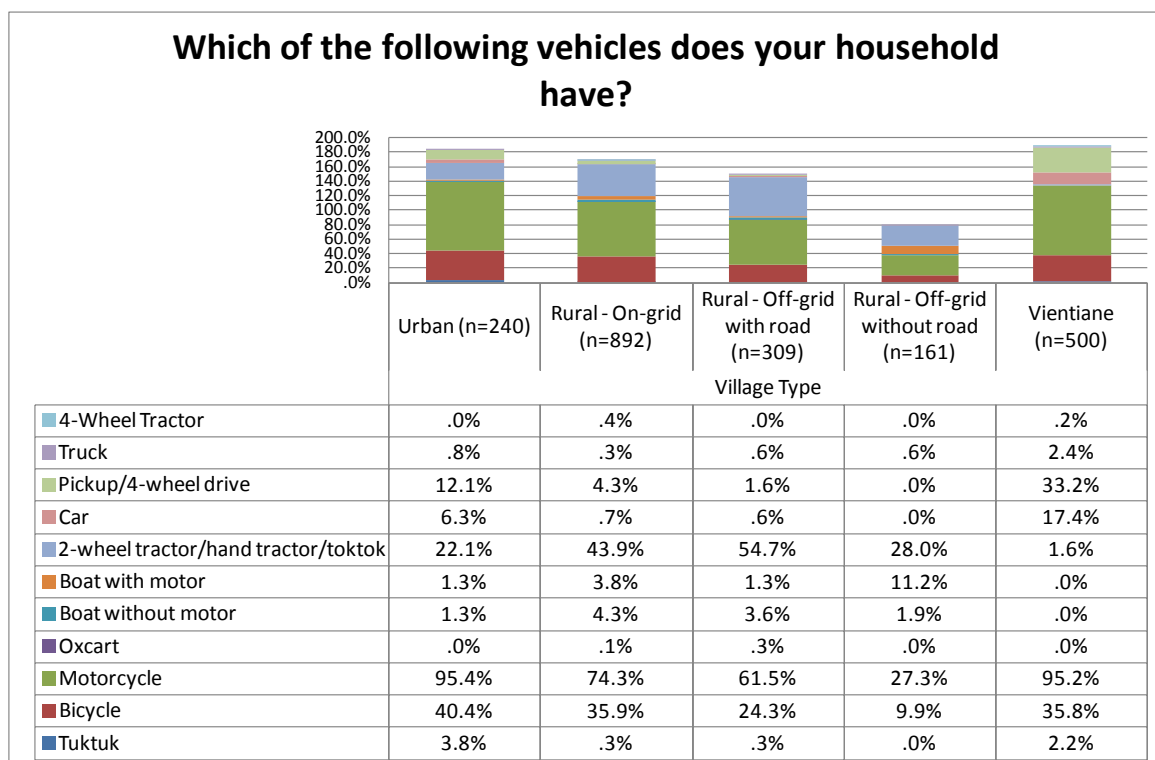


Figure 3.12. Vehicle ownership by village type.

It was more common for the households above the poverty line to own a motorcycle (87%), bicycle (37%), pick-up or four-wheel drive (21%), and car (9.4%), compared to households below the poverty line (65%, 28%, 1.8%, and 1.0%, respectively). The households earning less, on the other hand, possessed more two-wheel tractors, hand tractors, or tok-toks (46%) compared to the ones earning more (18%).

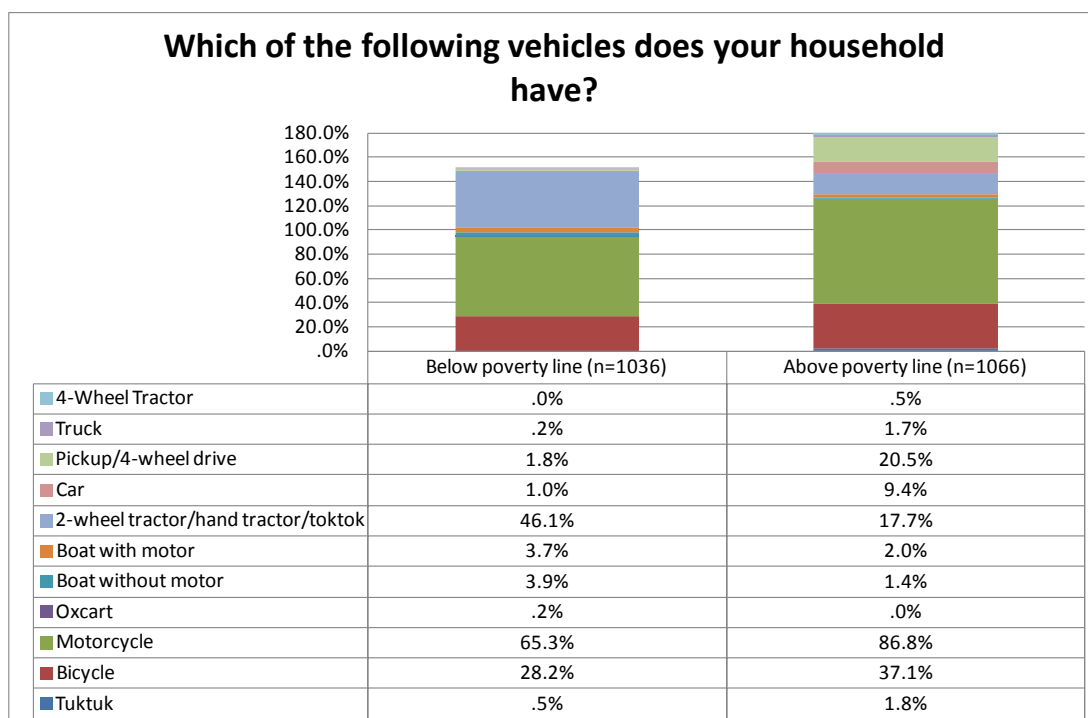


Figure 3.13. Vehicle ownership by the poverty line.

Results in Fig. 3.13 indicate that people below the poverty line have much less vehicles than people above the poverty line. Thus, the mobility of people appears to depend on the poverty level of people in the Lao PDR. However, households below the poverty line had more two-wheel tractors.

### 3.7. Sources of drinking water

The source of drinking water in dry season varied depending on which village type the respondents lived in. In urban areas, drinking water came mainly from bottles (71%) and tap water (24%). In rural on-grid villages there was more variety on the sources of drinking water. The most common sources were bottled pure drinking water (29%), gravity flow systems (18%), private well in house yard (16%), shared or public well without pump (15%), groundwater (14%), and a public dam, pond, lake or river (12%). As for the households in rural off-grid villages with road the most common drinking water sources were gravity flow system (39%), shared or public well without pump (27%), groundwater (16%), and public dam, pond, lake or river (14%). In rural off-grid villages without road there was less variety. The three most common drinking water sources were gravity flow systems (50%), a public dam, pond, lake or river (37%), and shared or public well without pump (11%). Hardly anyone collected rainwater at their house for drinking water. A few households in rural villages received their water directly from a natural spring (num aok bor). This option was not in the original survey but specified by a few in the ‘other’ option which allowed respondents to specify their answer.

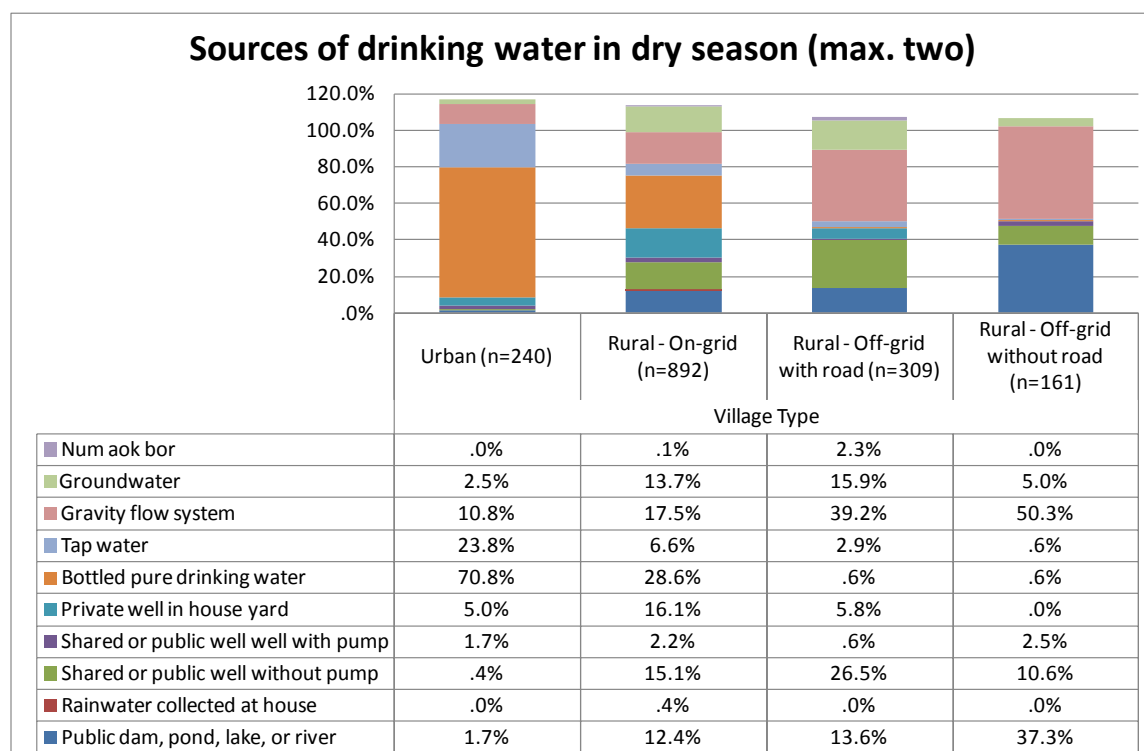


Figure 3.14. Main sources of drinking water (maximum two replies) in dry season by village type.

Households below the poverty line received their drinking water in the dry seasons mainly from gravity flow systems (27%), a public dam, pond, lake or river (19%), shared or public well without pump (17%), groundwater (15%), bottled water (14%), private well (8.8%), and tap (6.4%). Within the households above the

poverty line there was less variety in the water sources with bottled water being by far the most common (48%), followed by gravity flow systems (18%), private wells (14%), shared wells with a pump (11%), and tap water (10%). Groundwater and a public dam (or pond, or river) were main water sources for approximately 5%.

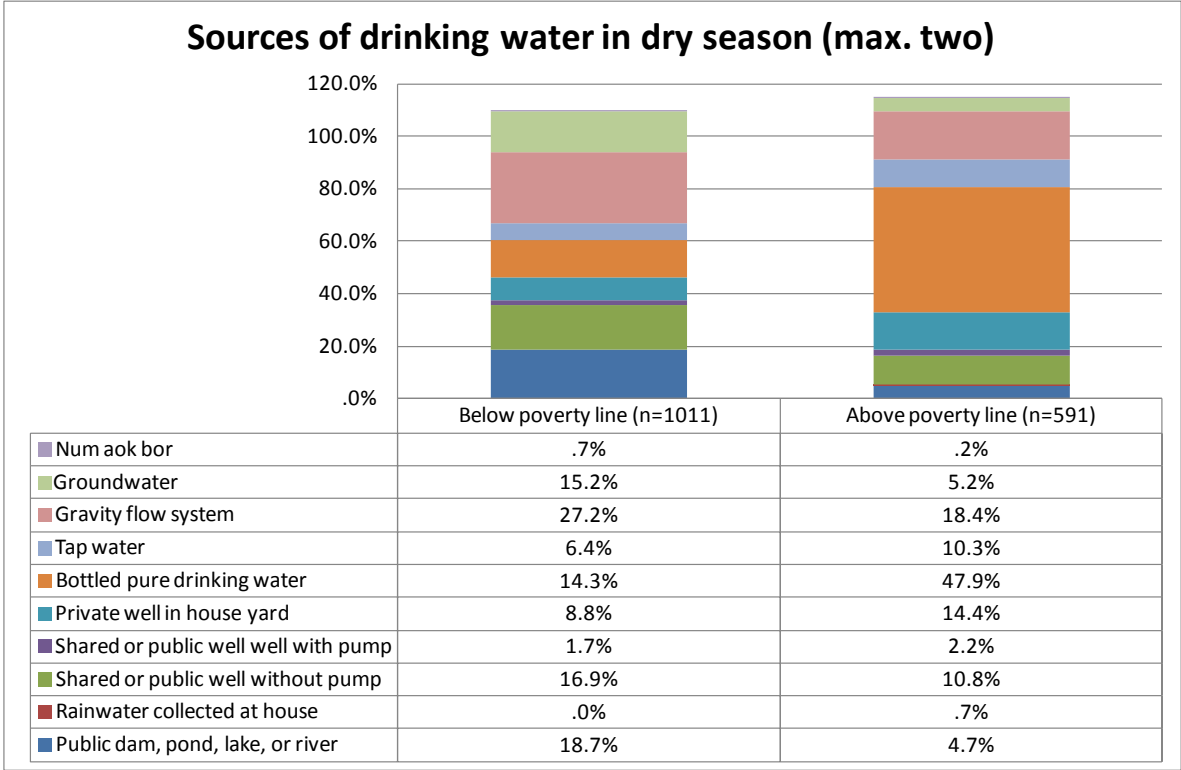


Figure 3.15. Main sources of drinking water (maximum two replies) in dry season by the poverty line (not asked in the Vientiane survey).

Sources of drinking water in the wet season were very similar to the sources in the dry season. The most substantial difference was related to rainwater collection, which was practiced by 4.6% of urban, 17% of rural on-grid, 11% of rural off-grid with road access, and 21% by rural off-grid without road access households. Also, the rural households without road access received less water from public natural water sources in the wet season (27%) compared to the dry season (37%).

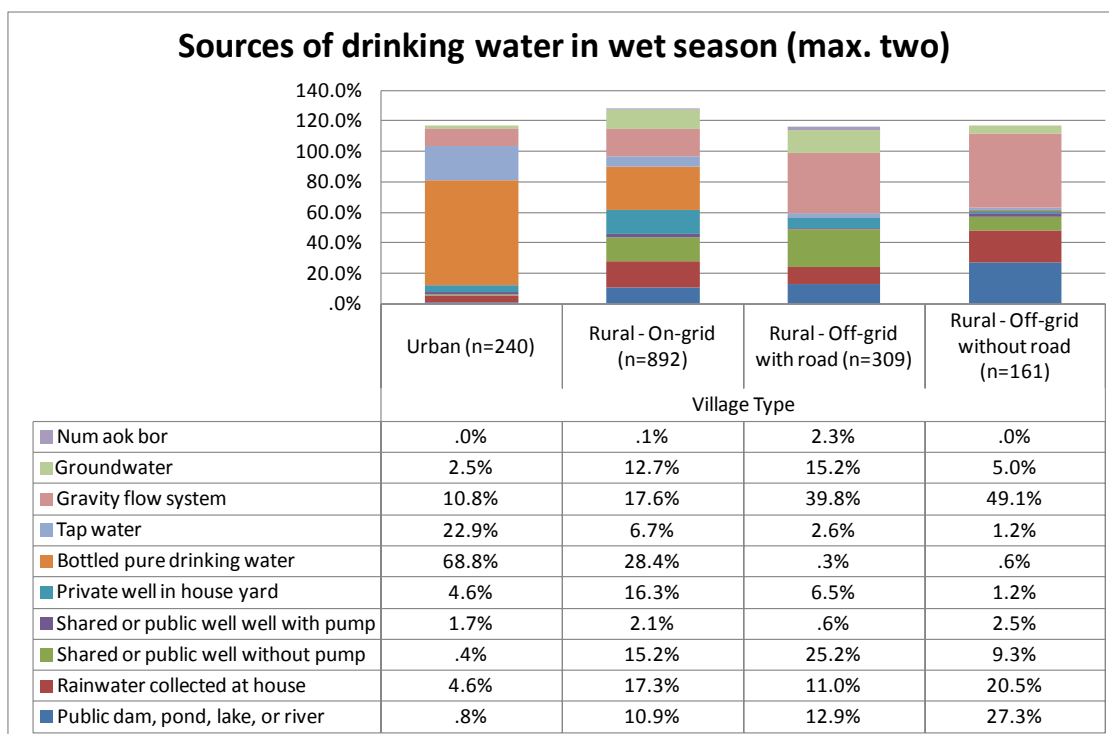


Figure 3.16. Main sources of drinking water (maximum two replies) in wet season by village type (not asked in the Vientiane survey).

Regarding households below and above the poverty line the only difference in the drinking water sources of the wet and the dry seasons were also related to rainwater collection. Nearly of fifth (18%) of the households below the poverty line collected rainwater for drinking while the respective figure was 9.0% within the households above the poverty line.

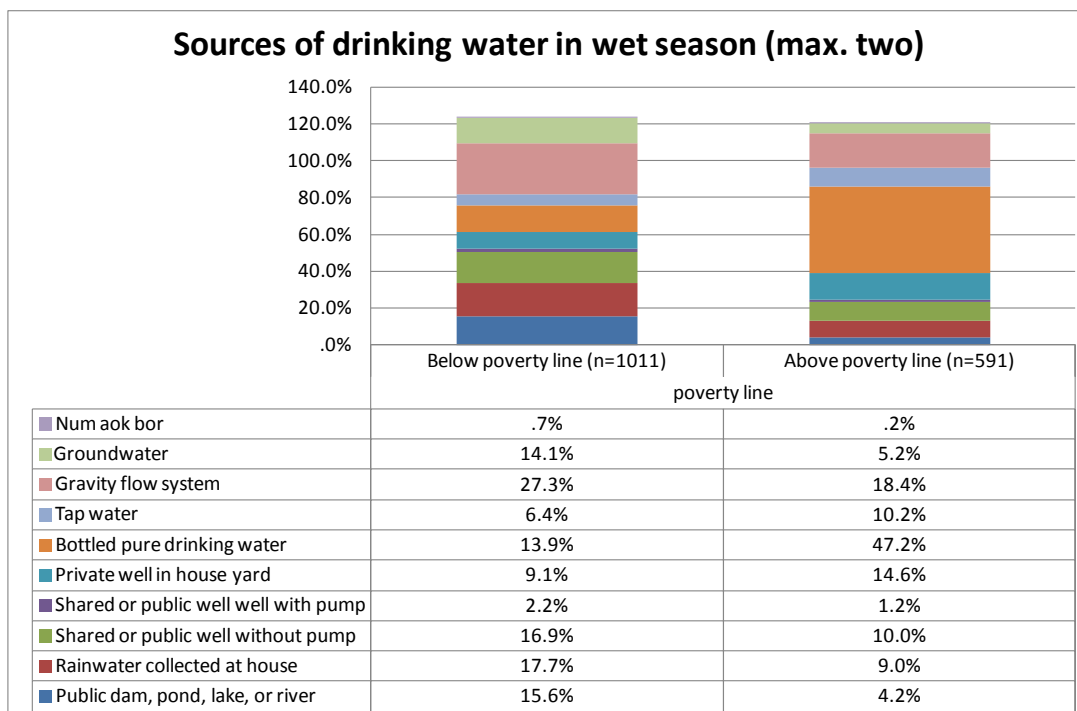


Figure 3.17. Main sources of drinking water (maximum two replies) in wet season by the poverty line (not asked in the Vientiane survey).



### 3.8. Working in agriculture, fishery or forestry

In rural areas, almost every household (99–100%) had a member working – at least part time – in agriculture, fishery or forestry. Considerably fewer (69%) households in urban villages had someone working in in these fields.

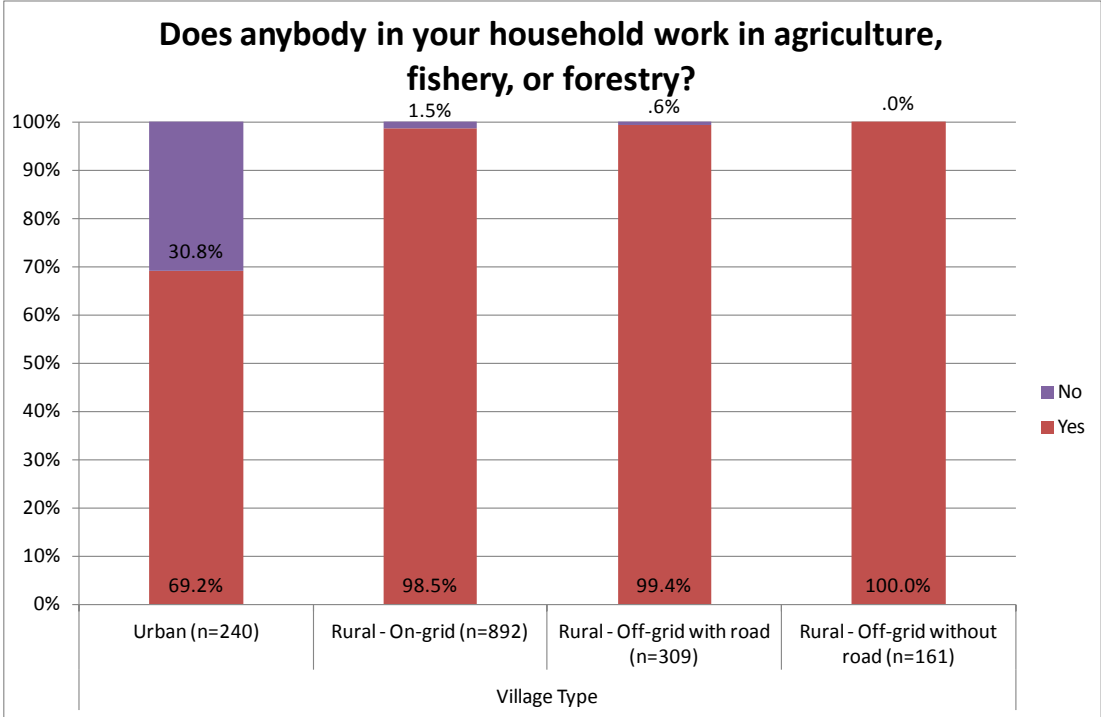


Figure 3.18. Working in agriculture, fishery or forestry by village type ( $\chi^2=344.5$ ,  $df=3$ ,  $p<0.001$ , not asked in the Vientiane survey).

Nearly all (98%) households below the poverty line had someone working in agriculture, fishery or forestry. As for households above the poverty line, 89% had someone working in at least one of these fields. The difference between these two groups is statistically significant. In urban areas, 30.8% of household had people working in agriculture, fishery or forestry.

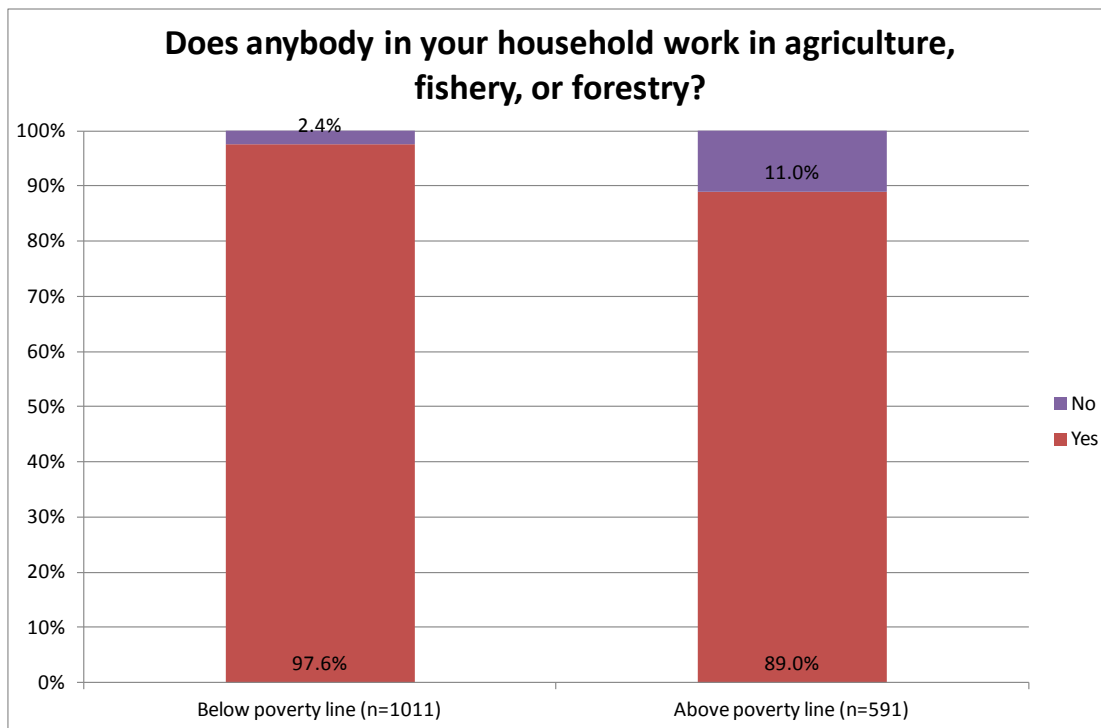


Figure 3.19. Working in agriculture, fishery or forestry by the poverty line ( $\chi^2=52.9$ ,  $df=1$ ,  $p<0.001$ , not asked in the Vientiane survey).

### 3.8.1. Working in agriculture

The following graphs describe the different types of activities that household members were involved in the wet season 2010 and dry season 2009/2010. The differences between the wet and the dry season are not very big when it comes to animal stock, be it poultry, cattle or pigs. However, the most significant change is in rice production. 90% of household below the poverty line, and 72% of households above the poverty line, were engaged in rice production during the wet season. It is worth noting that work related to rice production does not seem to be replaced by other agricultural work during the dry season. In the dry season around 10% of all households worked with rice production.

Poultry is the most common livestock in all households. Around 75% of all rural households had livelihood activities relating to poultry, while the figure stands at around 50% for urban households. Pigs and cattle seem to be more common the further the households are from the urban areas (in terms of access to electricity and roads). Furthermore, households below the poverty line are more often involved in livestock activities regarding any kind of livestock, compared with households above the poverty line.

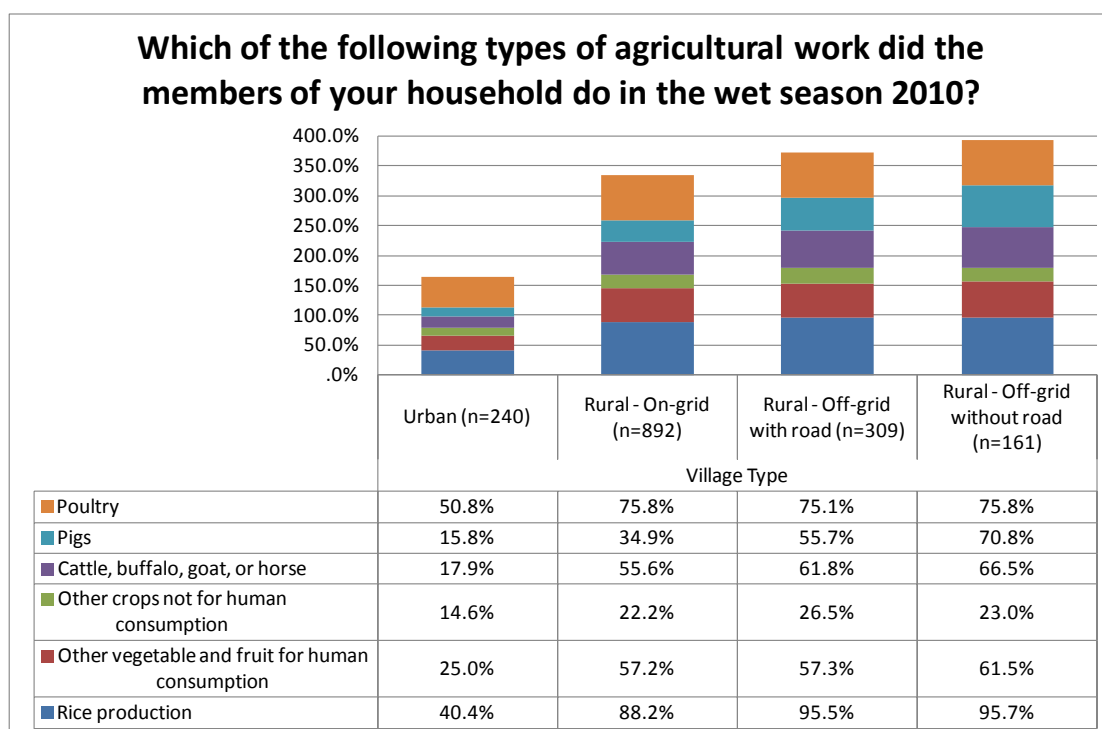


Figure 3.20. Agricultural activities practiced in the wet season 2010 by village type (not asked in the Vientiane survey).

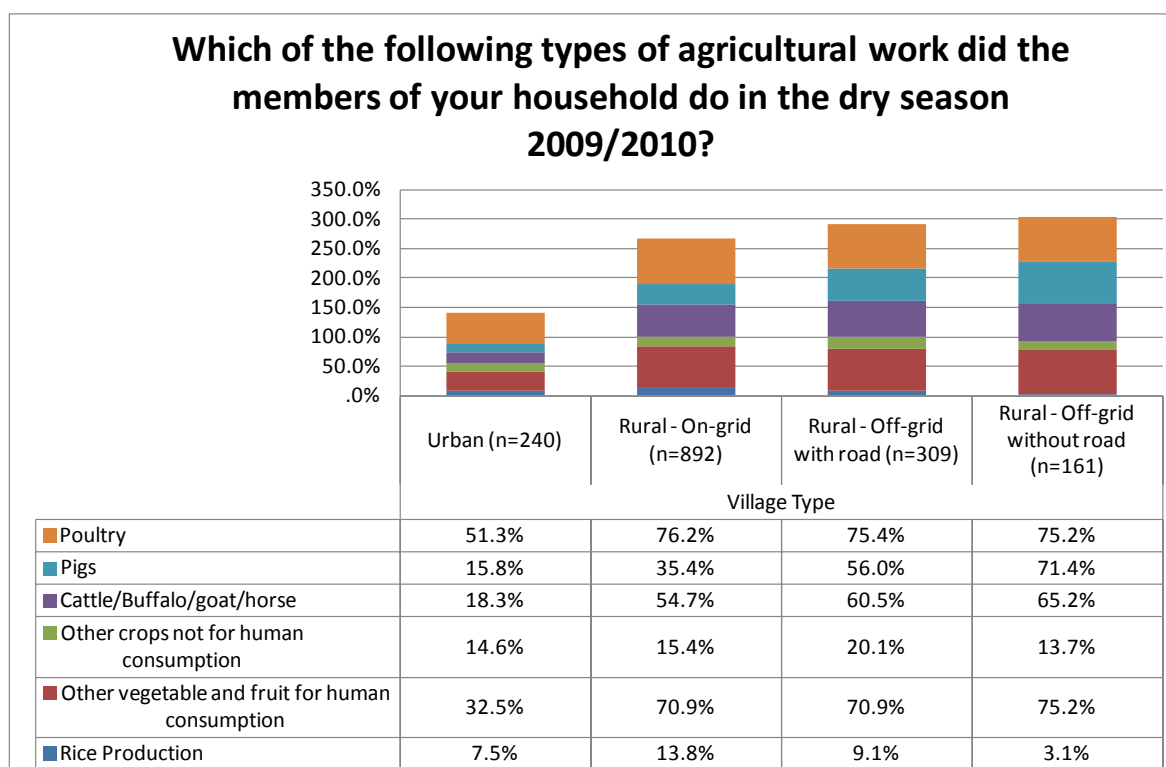


Figure 3.21. Agricultural activities practiced in the dry season 2009/2010 by village type (not asked in the Vientiane survey).

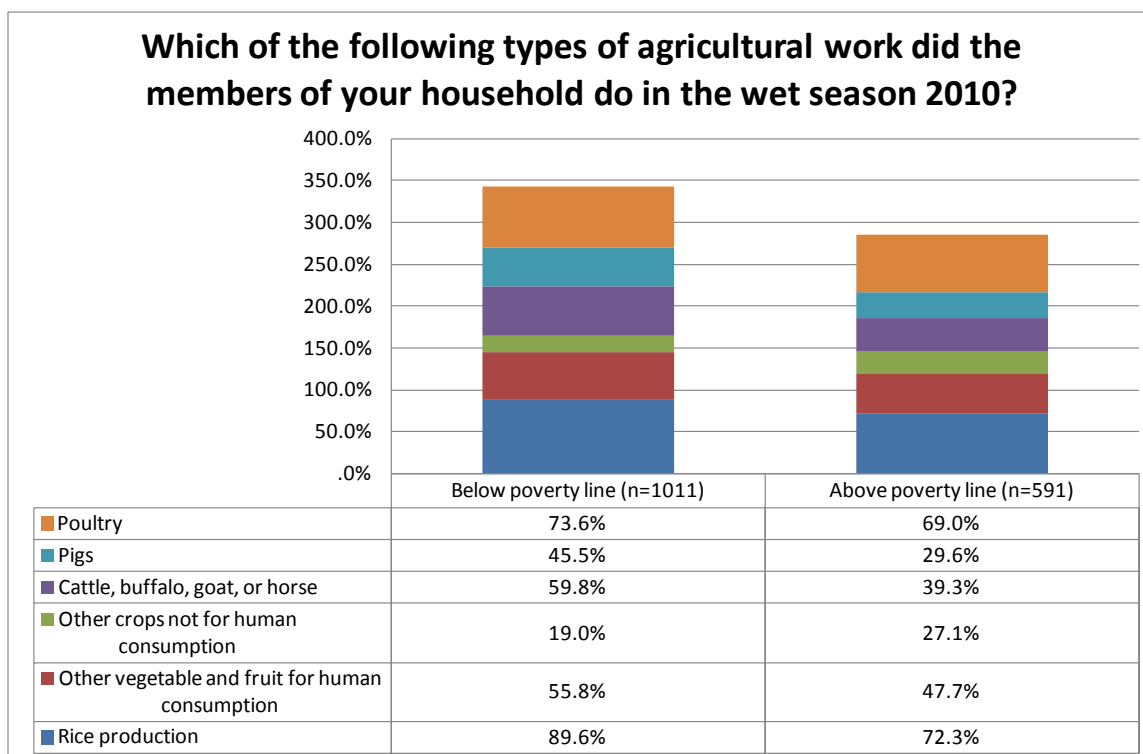


Figure 3.22. Agricultural activities practiced in the wet season 2010 by the poverty line (not asked in the Vientiane survey).

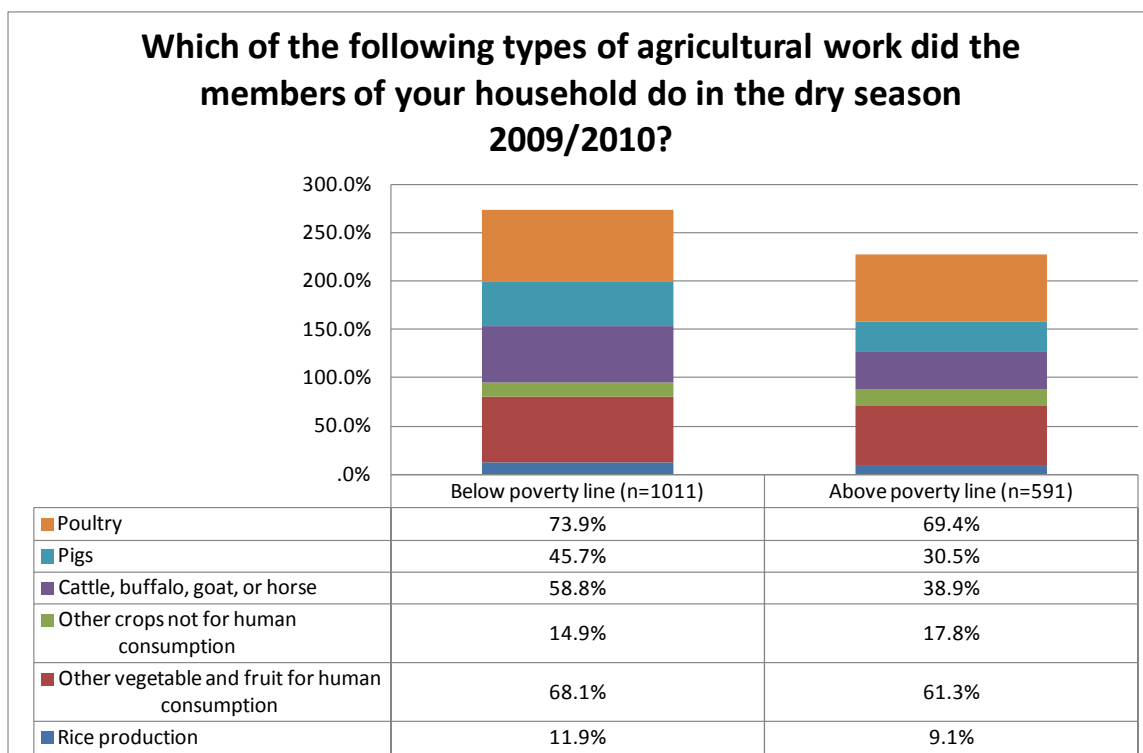


Figure 3.23. Agricultural activities practiced in the dry season 2009/2010 by the poverty line (not asked in the Vientiane survey)

### 3.8.2. Working in fishery

River fishing was the most common fishery-related work activity in Laos, practiced by 20–25% of urban households, 51–56% of rural on-grid households, 58–69% of rural off-grid households with road, and 74%–76% of rural off-grid households without road access, depending on the season. In the wet season, river fishing was more common. Also paddy field fishing was almost as common as river fishing in the wet season. There was less variation in fish, frog or eel farming, which was practiced by 9–19% of all households in both seasons.

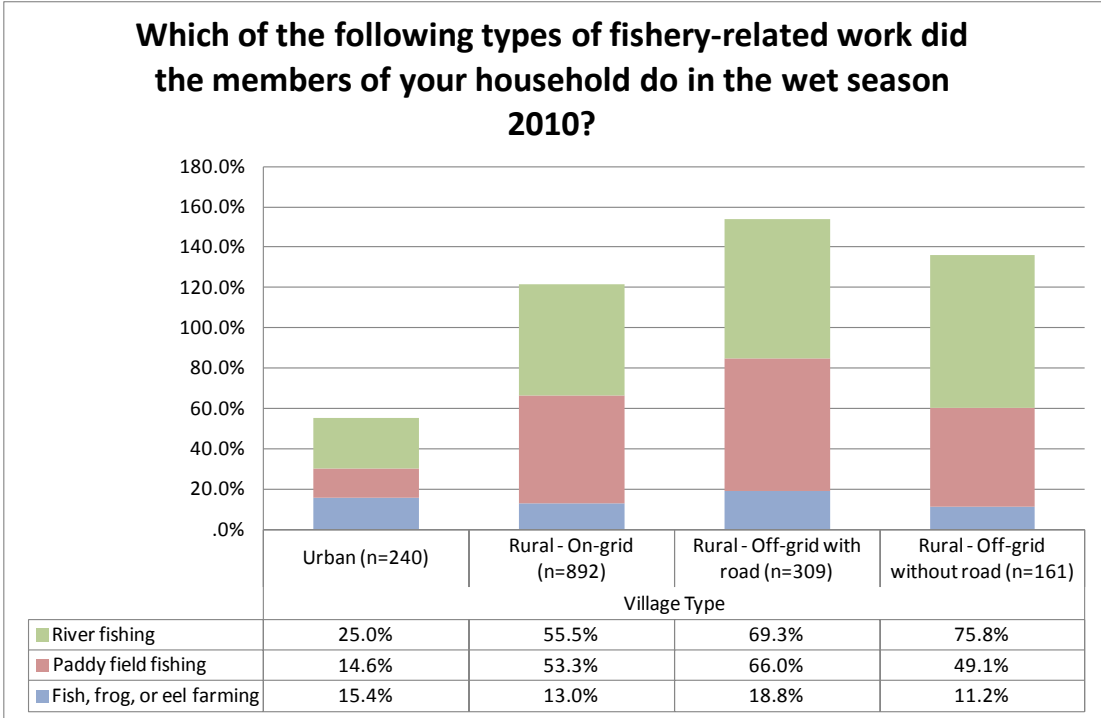


Figure 3.24. Fishery-related activities practiced in the wet season 2010 by village type (not asked in the Vientiane survey)

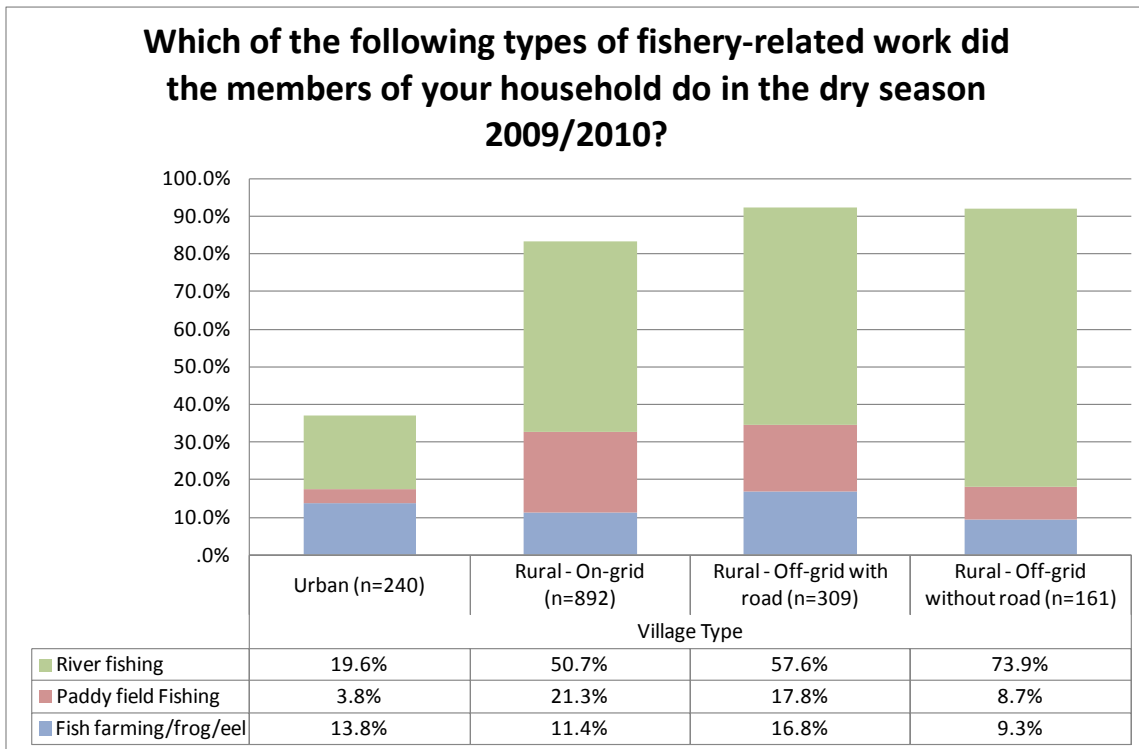


Figure 3.25. Fishery-related activities practiced in the dry season 2009/2010 by village type (not asked in the Vientiane survey)

Households below the poverty line practiced more fishery-related livelihood activities than the wealthier households. Otherwise, the comparison between the dry and wet seasons is similar to abovementioned: fishing was more common in the wet season.

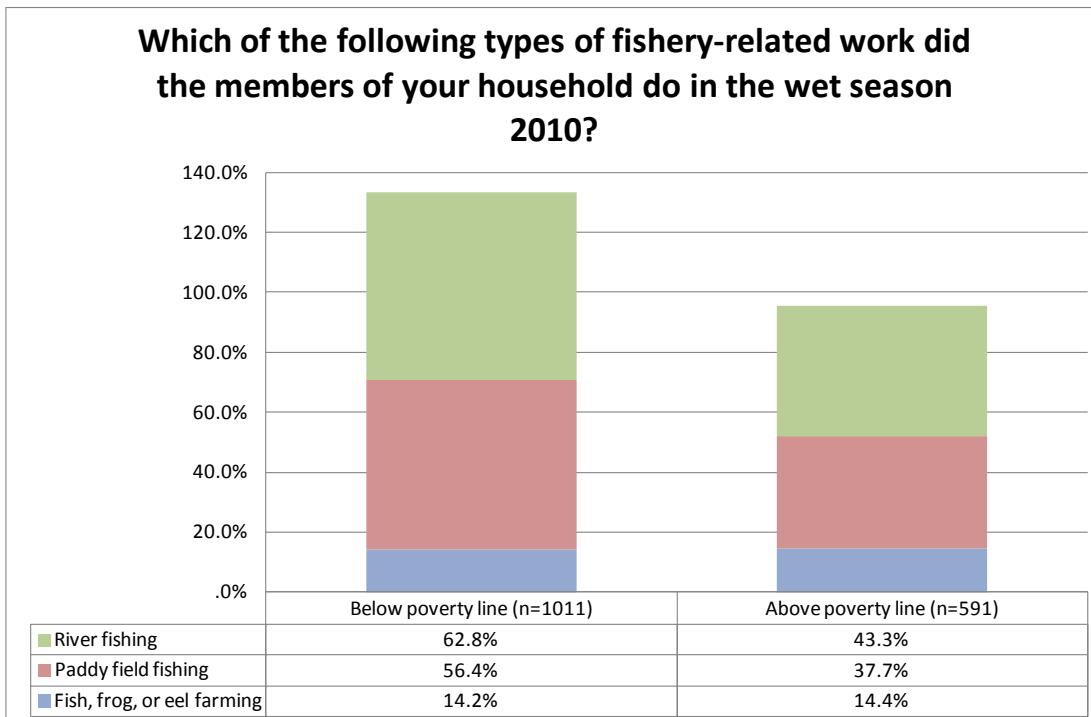


Figure 3.26. Fishery-related activities practiced in the wet season 2010 by the poverty line (not asked in the Vientiane survey).

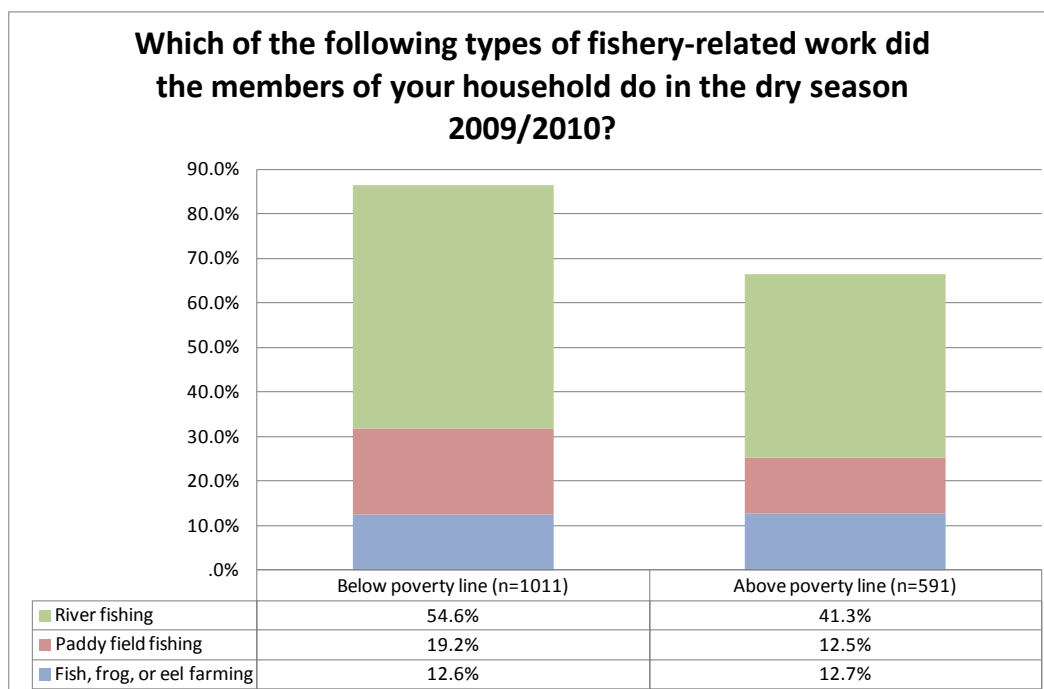


Figure 3.27. Fishery-related activities practiced in the dry season 2009/2010 by the poverty line (not asked in the Vientiane survey).

### 3.8.3. Working in forestry

Activities related to common land non-timber forest products (NTFPs) from trees, such as fibre or bark, did not depend on the season. Timber and firewood collection were the most common activities in the dry season, practiced by approximately 90% of rural households (33% of urban). Collection of common land food NTFPs were the most common activities in wet season, with 71–89% of rural households (23% of urban) practicing them.

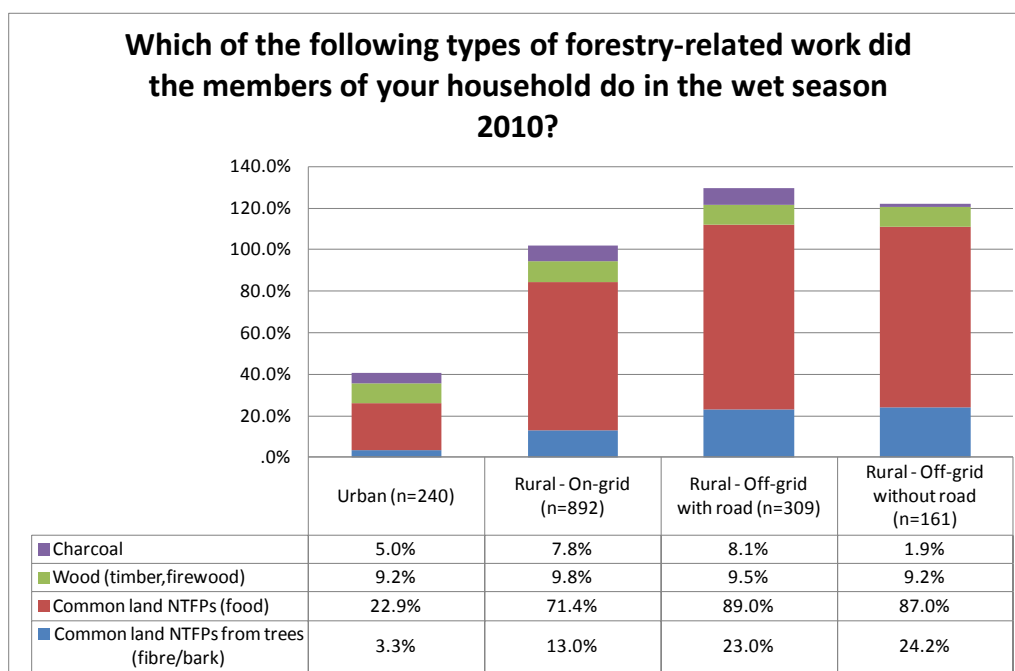


Figure 3.28. Forestry-related activities practiced in the wet season 2010 by village type (not asked in the Vientiane survey).

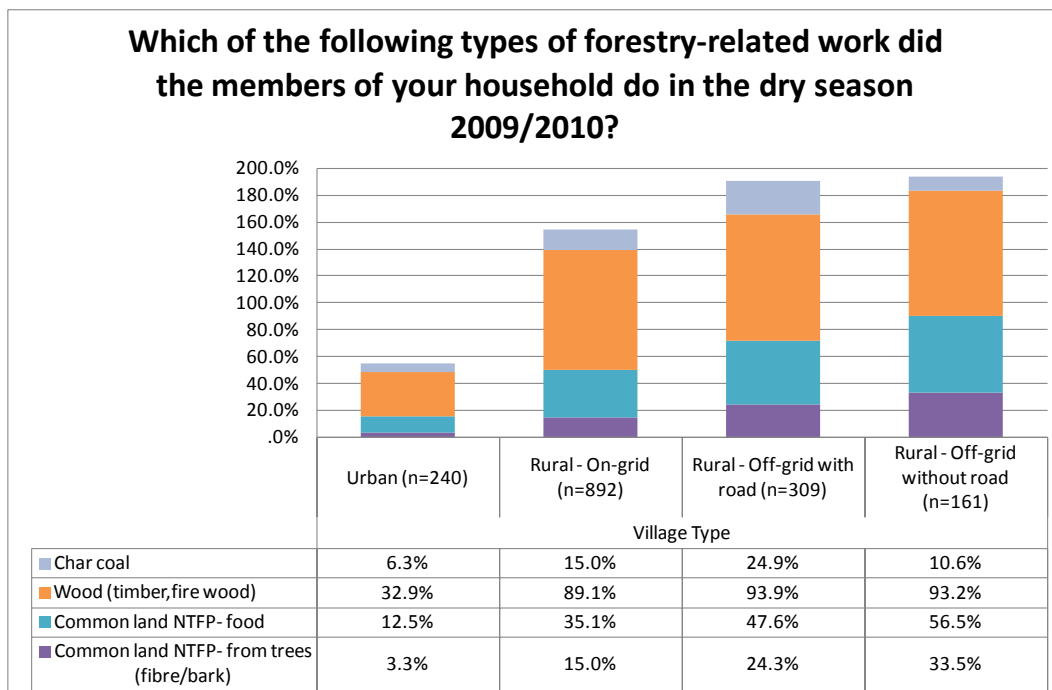


Figure 3.29. Forestry-related activities practiced in the dry season 2009/2010 by village type (not asked in the Vientiane survey).

Overall, households above the poverty line were less involved in livelihood activities related to forestry than households below the poverty line. The same difference holds true in the comparison between urban and rural households.

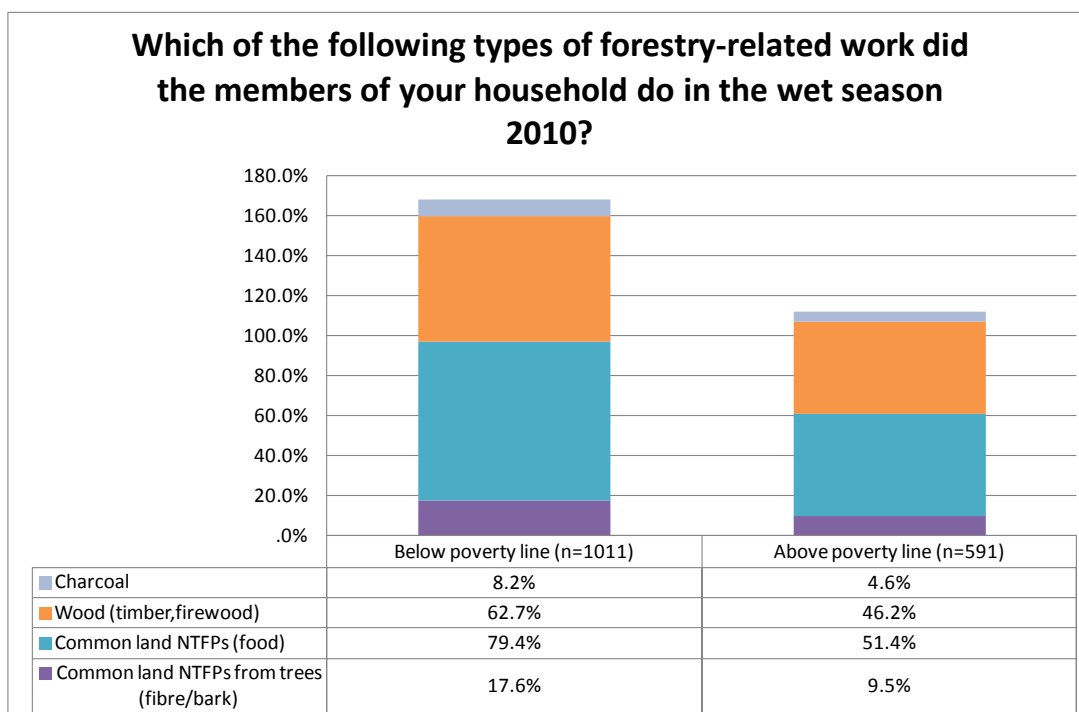


Figure 3.30. Forestry-related activities practiced in the wet season 2010 by the poverty line (not asked in the Vientiane survey).



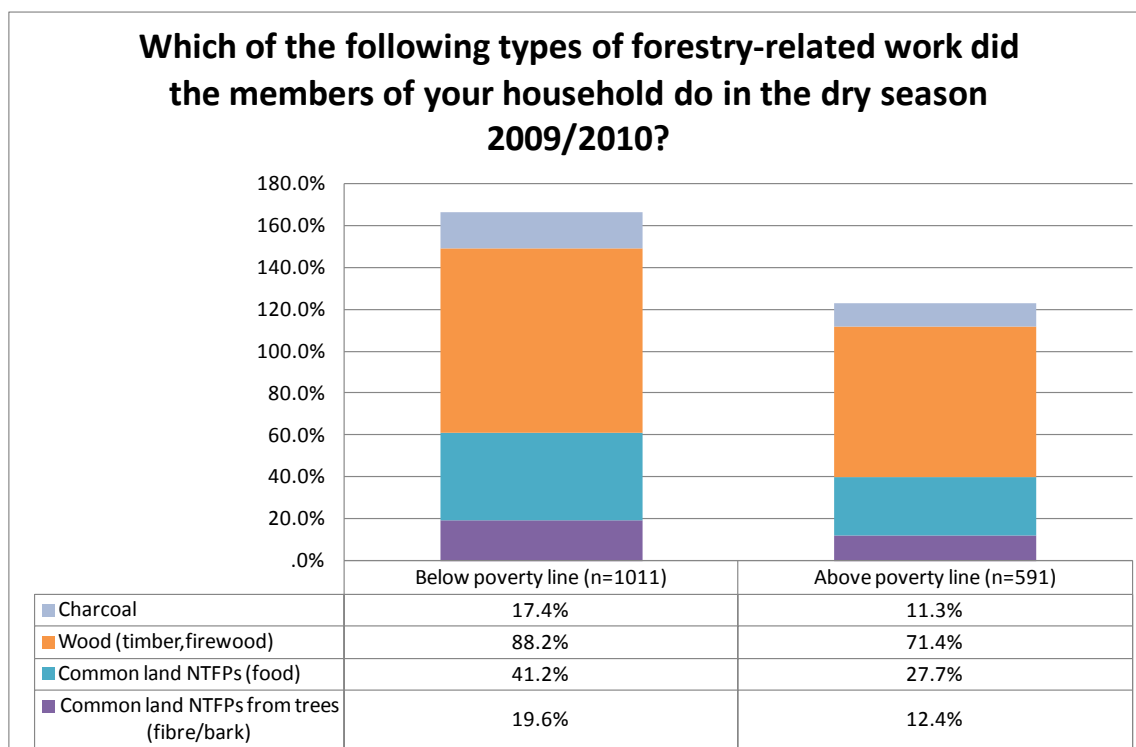


Figure 3.31. Forestry-related activities practiced in the dry season 2009/2010 by the poverty line (not asked in the Vientiane survey).

### 3.9. Livelihood activities affected by natural or man-made events

#### 3.9.1. Fertilizers or pesticides

Looking at agricultural livelihood activities, rural off-grid households without a road have benefitted the least from the use of pesticides or fertilizers. This could be explained by their restricted access to these substances. While excess use of pesticides or fertilizers was seen as a problem by a few households in village types, they were generally perceived to be beneficial. Over 40% of all rural households have experienced a pest strike or a crop disease over the past four seasons.

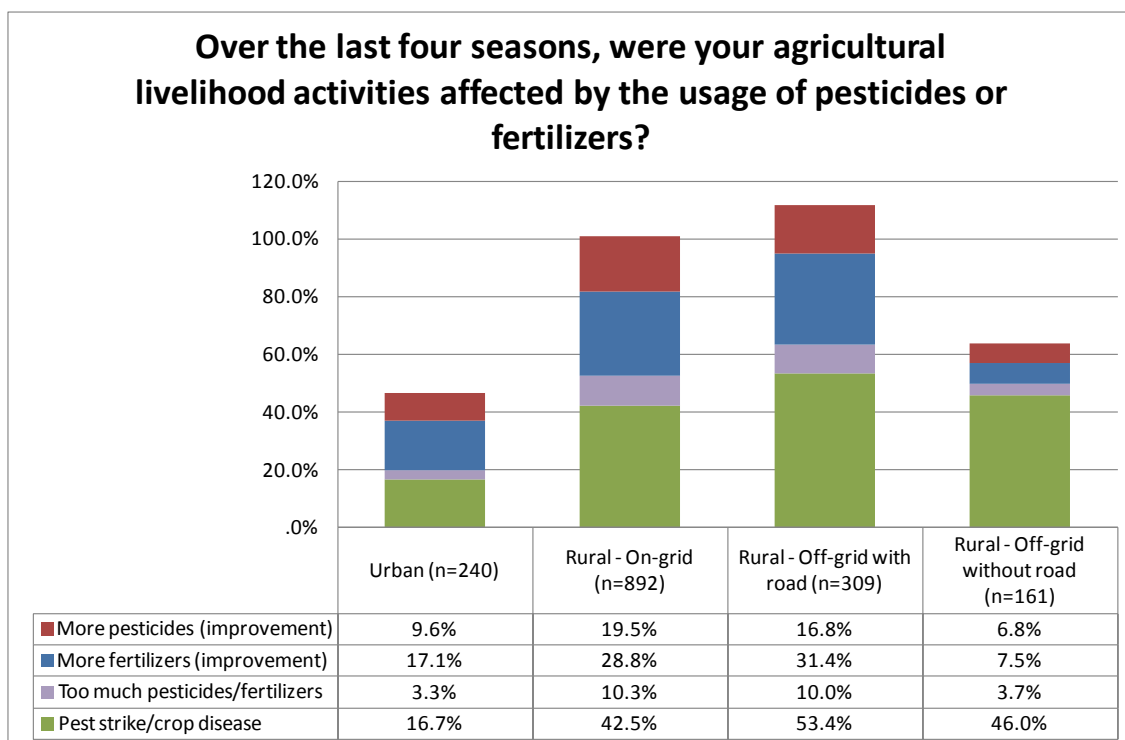


Figure 3.32. Positive or negative changes in livelihood activities caused by the fertilizers or pesticides by village type (not asked in the Vientiane survey).

Looking at the impacts of pesticides/fertilizer use against household income level the households above the poverty line seem to be less affected by crop disease, pest strikes or the use of pesticides/fertilizers.

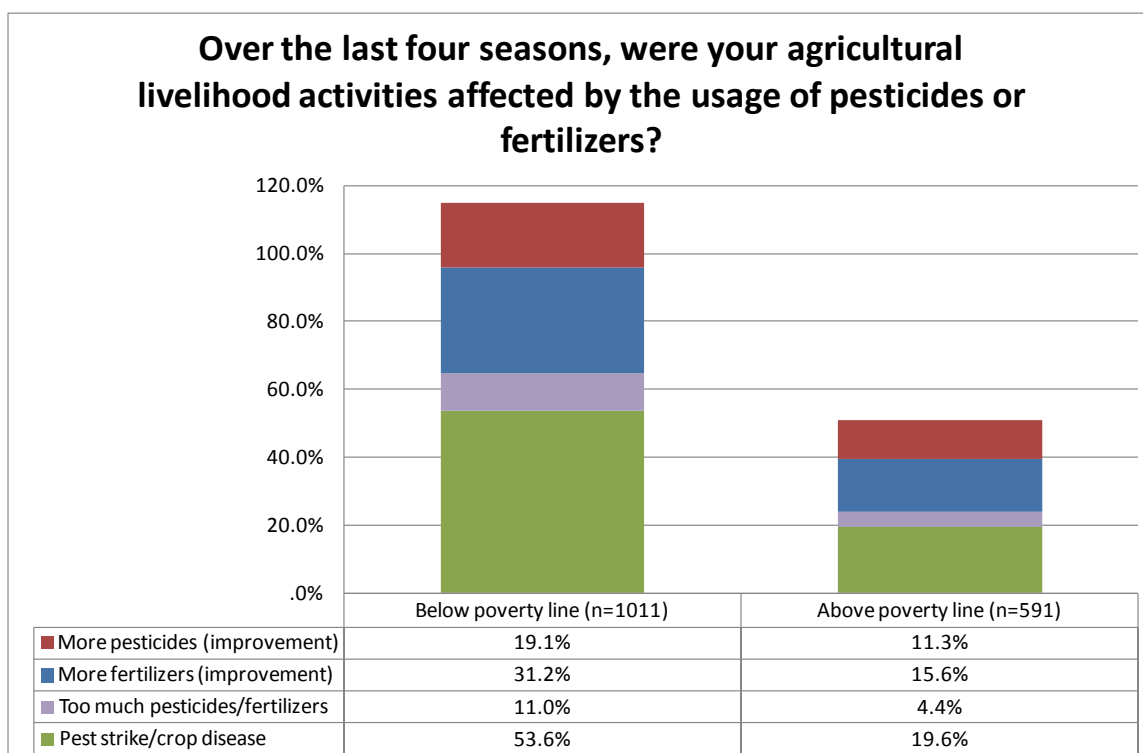


Figure 3.33. Positive or negative changes in livelihood activities caused by the fertilizers or pesticides by the poverty line (not asked in the Vientiane survey)

### 3.9.2. Work force

Better availability of workforce had benefitted roughly the same proportion of urban households (9.6%) that had suffered from the lack of available work force (7.5%). The same held true for households in all village types. There was little overall variation between village types regarding livelihood effects related to work force availability.

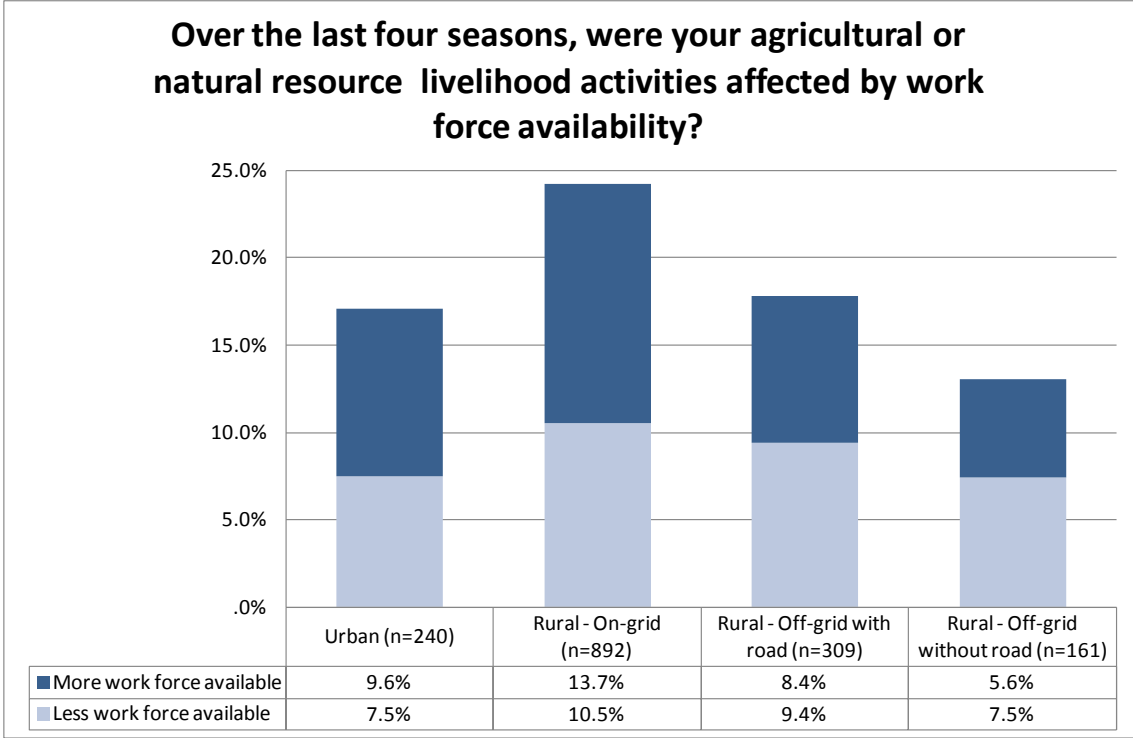


Figure 3.34. Positive or negative changes in livelihood activities caused by work force availability by village type (not asked in the Vientiane survey).

The livelihoods of the households below the poverty line had been slightly more affected by work force availability, with 13% stating there had been more and 11% stating less available work force. The respective figures for the households above the poverty line were 8.5% and 7.8%. All in all, the differences were small.

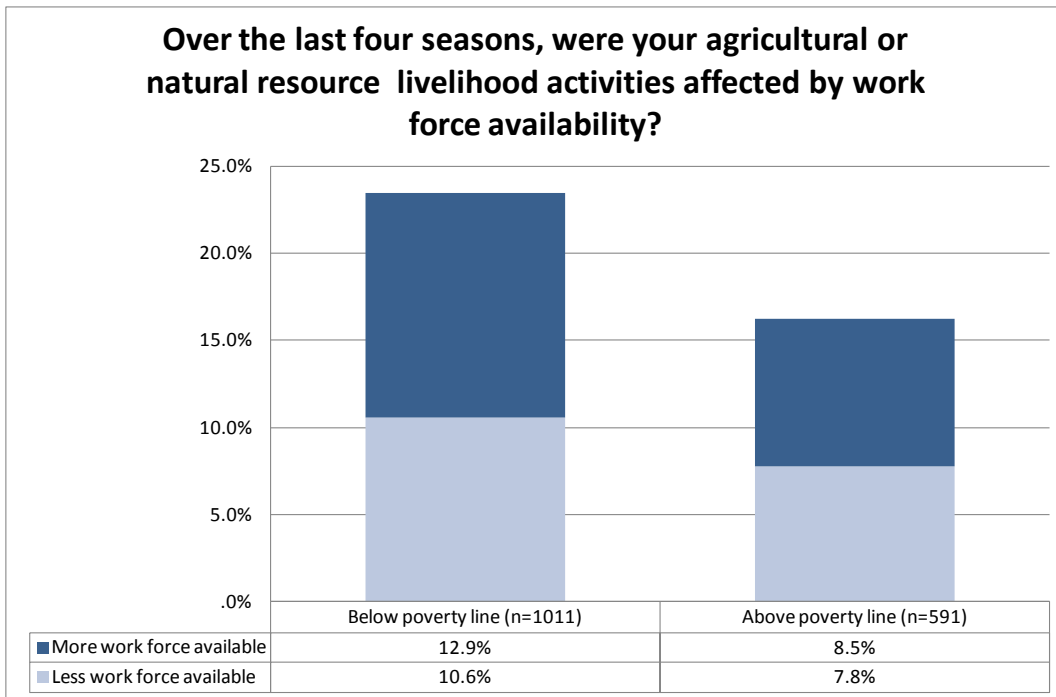


Figure 3.35. Positive or negative changes in livelihood activities caused by work force availability by the poverty line (not asked in the Vientiane survey).

### 3.9.3. Market demand

Rural on-grid and off-grid households with road access had been most affected by changes in market demand, with the majority of the changes being positive (16–20%, compared to 6.8–9.9% stating less market demand). Overall, there had been more positive than negative changes in livelihoods due to increased market demand.

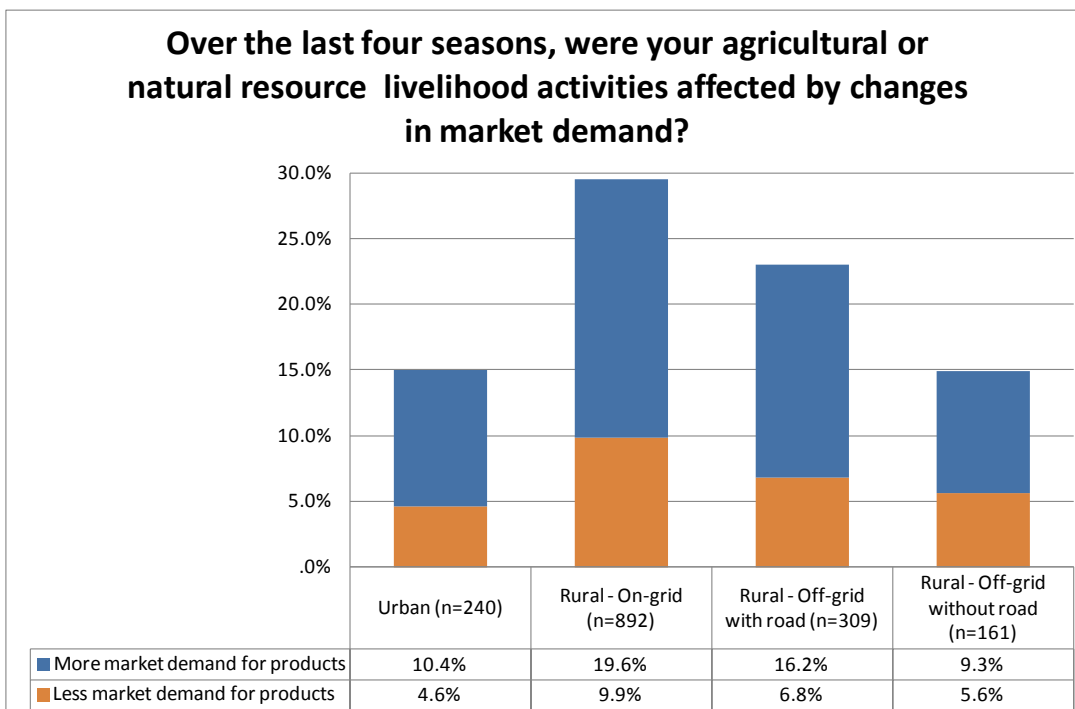


Figure 3.36. Positive or negative changes in livelihood activities caused by changes in market demand by village type (not asked in the Vientiane survey).

The change in market demand had affected 30% of households below the poverty line, with over 20% experiencing an increased demand. For households above the poverty line, 10% had felt a positive impact on their livelihoods due to increased market demand.

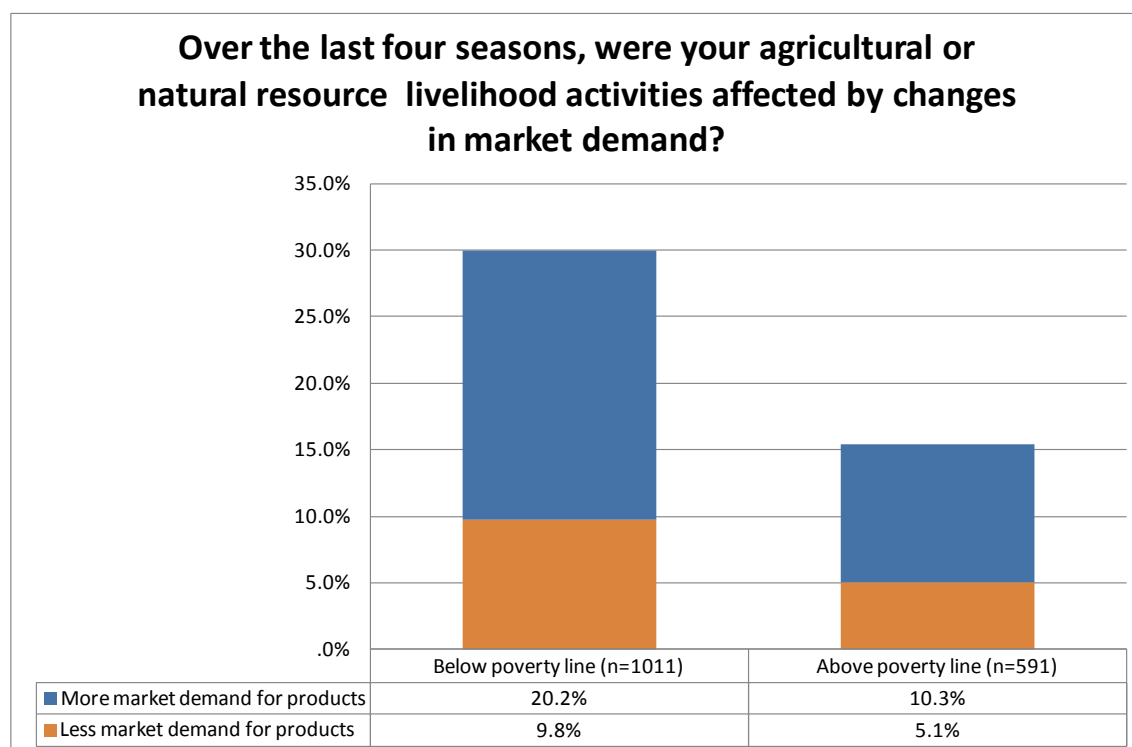


Figure 3.37. Positive or negative changes in livelihood activities caused by changes in market demand by the poverty line (not asked in the Vientiane survey).

### 3.9.4. Forest resources

Changes in the availability of forest resources had had significant impacts on livelihoods. The changes had been more often for the worse in all household types, as well as for all income levels. 15% of urban households said that their livelihood activities had been negatively affected by the decrease in the availability of forest resources while the decreased availability had had a negative effect for nearly a third of all rural households.

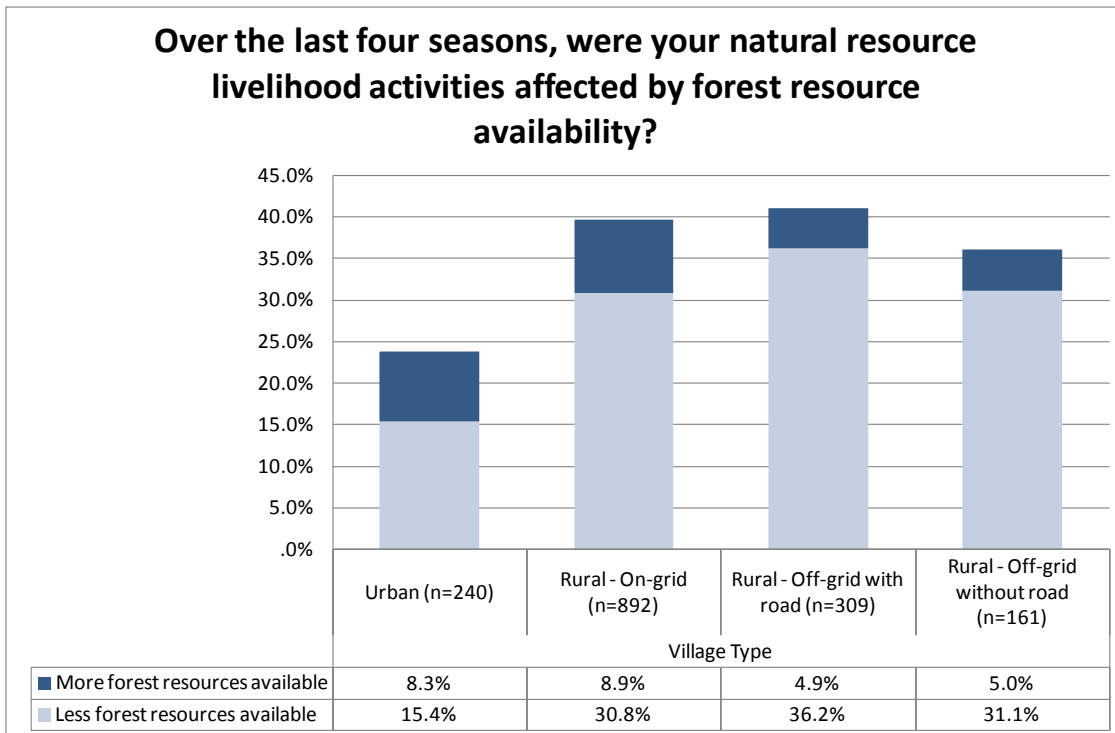


Figure 3.38. Positive or negative changes in livelihood activities caused by changes in forest resource availability by village type (not asked in the Vientiane survey).

Negative change in forest resource availability had affected households below the poverty line more (32%) than those above the poverty line (25%).

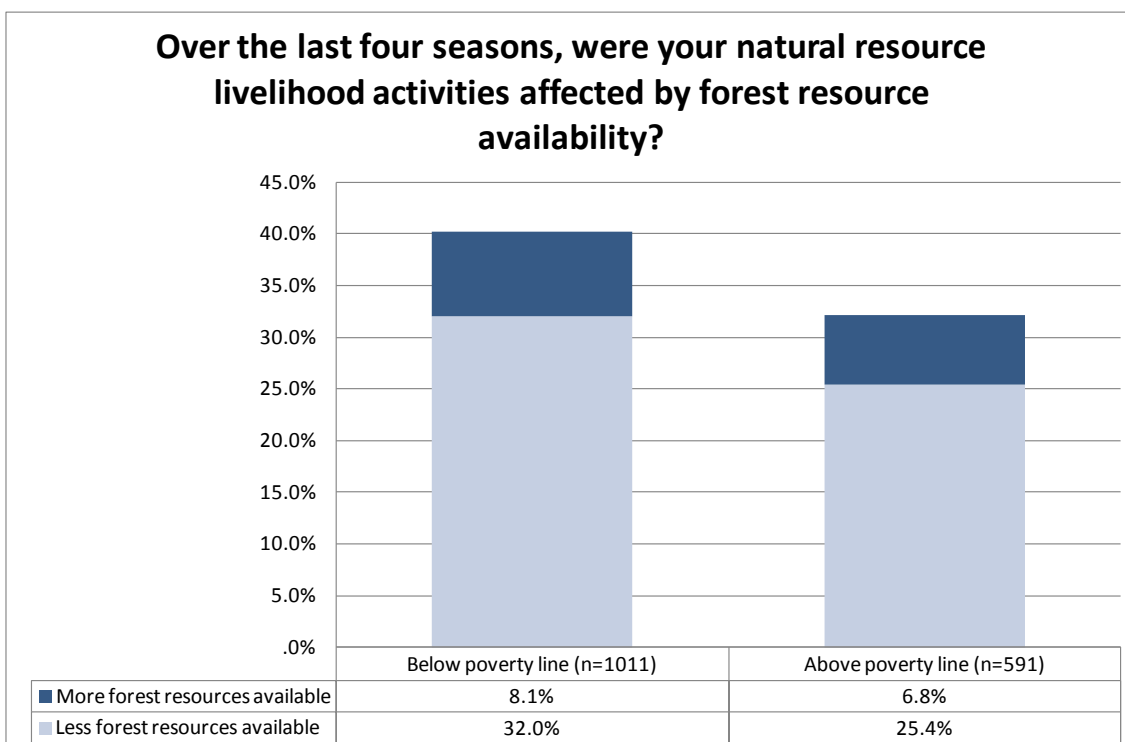


Figure 3.39. Positive or negative changes in livelihood activities caused by changes in forest resource availability by the poverty line (not asked in the Vientiane survey).

### 3.9.5. Fishery resources

The decrease in the availability of fishery resources had affected the livelihoods of Laotian households negatively – between 29% and 35% of rural households informed of negative impacts from fishery resources availability.

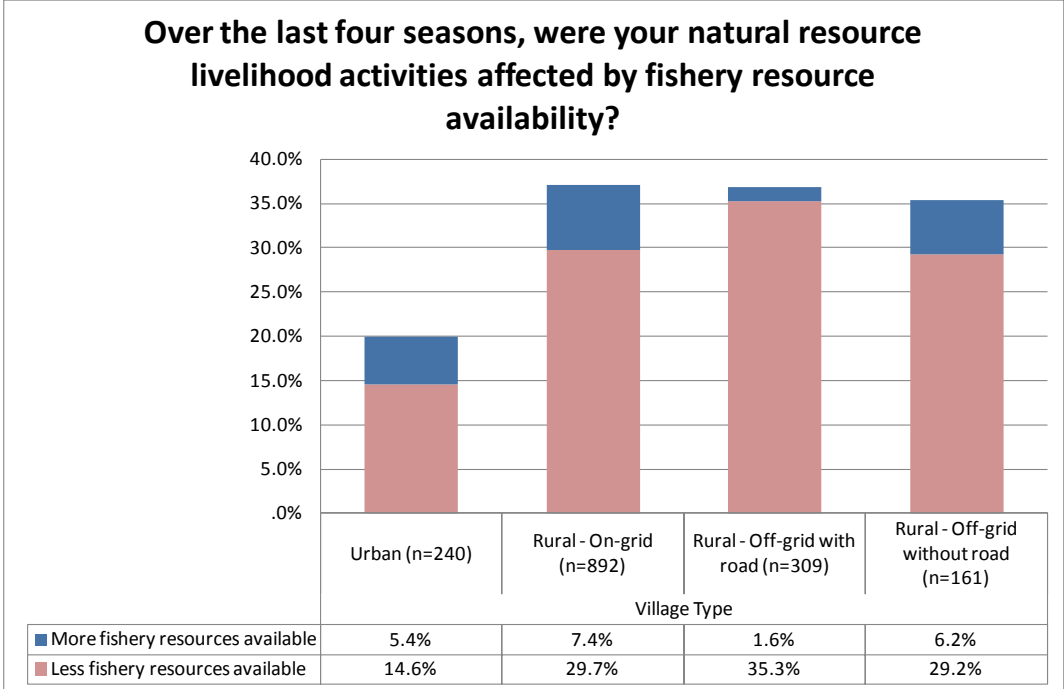


Figure 3.40. Positive or negative changes in livelihood activities caused by changes in fishery resource availability by village type (not asked in the Vientiane survey).

Over a third of households below the poverty line had experienced negative impacts on their livelihoods due to decrease in available fishery resources. The depletion of fishery resources had also had a negative effect for 18% of households above the poverty line. Considerably less (5.6–6.0%) had experienced a positive impact on their livelihoods due to more fisheries being available.

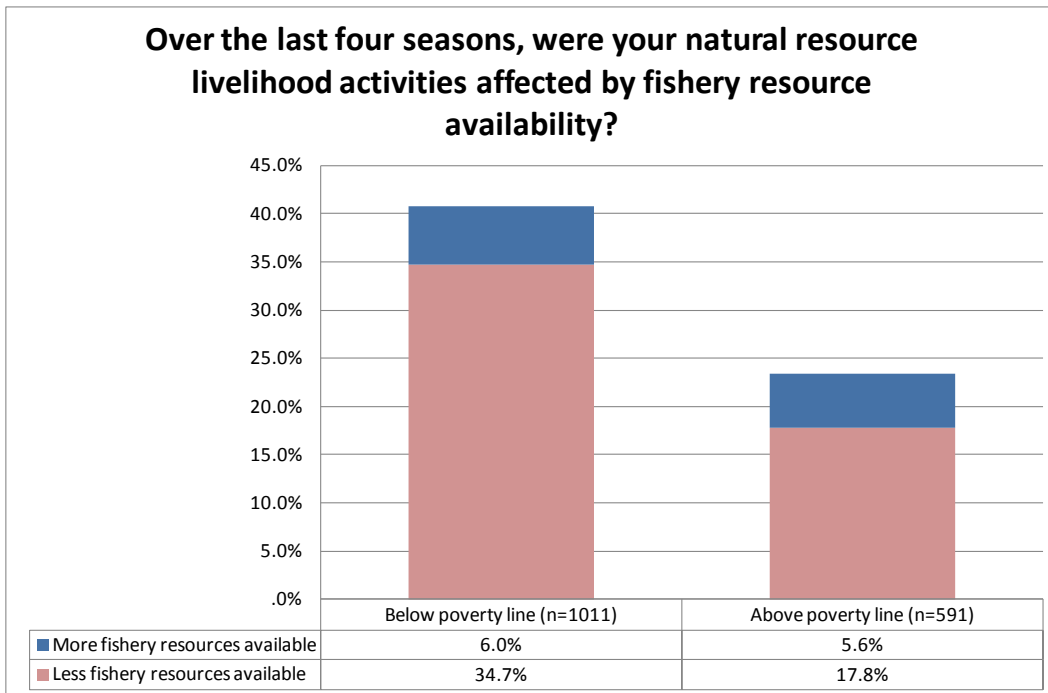


Figure 3.41. Positive or negative changes in livelihood activities caused by changes in fishery resource availability by the poverty line (not asked in the Vientiane survey).

### 3.9.6. Irrigation, drought or floods

Looking at the past two years, most rural households had suffered from a drought. The most negatively affected had been rural off-grid households with road, of whom 70% reported negative impacts on their livelihoods. Urban households were significantly less affected by drought with only 21% reporting the incidence. At the same time, around 30% of rural households with road access reported having benefitted from better irrigation. Floods had affected the livelihoods of 10–24%, depending on the village type.



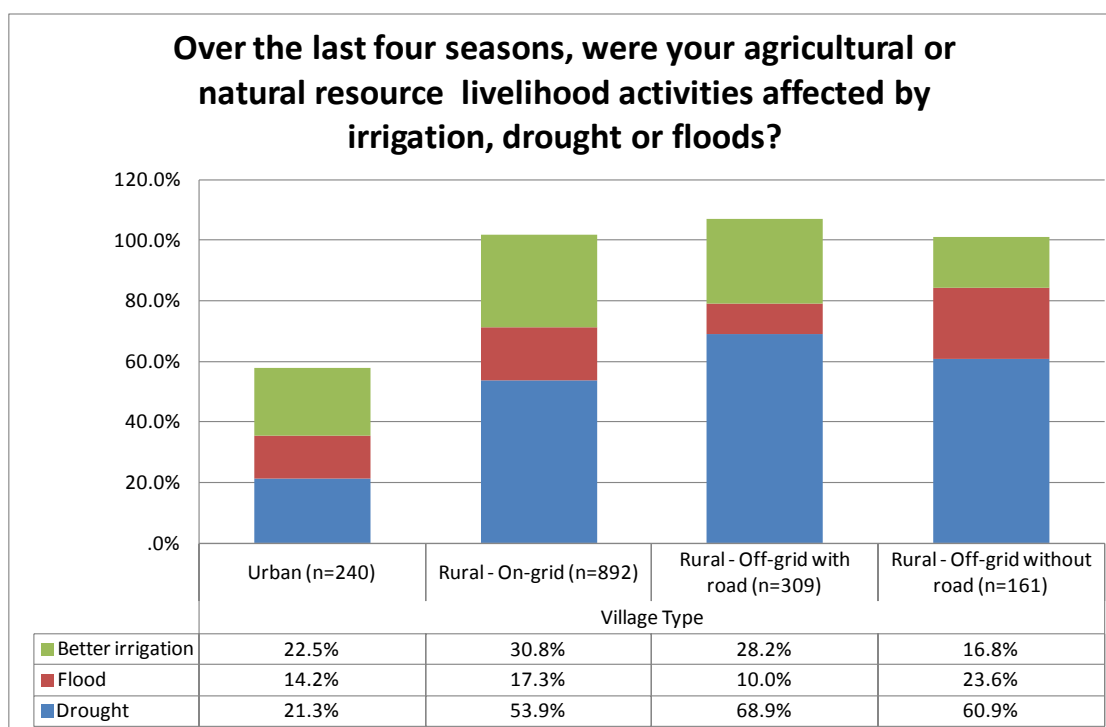


Figure 3.42. Positive or negative changes in livelihood activities caused by irrigation, drought or floods by village type (not asked in the Vientiane survey).

Examining the occurrence of floods and droughts, it seems to hold true that poor households had been more vulnerable. 67% of households below the poverty line had suffered from drought in the past two years, while fewer than 30% of households above the poverty line have had negative impacts on their livelihoods due to drought. Furthermore, floods seem to be twice more likely to affect households below the poverty line than households above the poverty line. Better irrigation had, however, also affected the poorer households more often (32%) than the wealthier ones (20%).

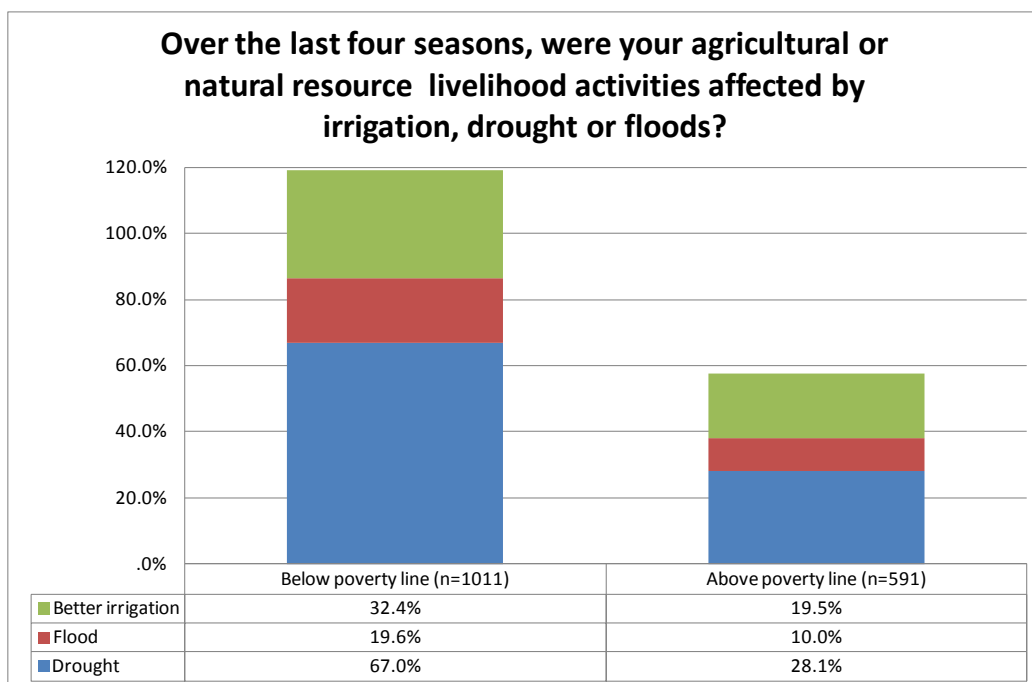


Figure 3.43. Positive or negative changes in livelihood activities caused by irrigation, drought or floods by the poverty line (not asked in the Vientiane survey).

### 3.9.7. Animal welfare

Animal diseases were reported as negatively affecting household livelihoods by just under half of all rural households. At the same time, better animal care or medicines were seen as improving livelihoods by at least 25% in all household categories, with most improvement (47%) reported by rural off-grid households with road access.

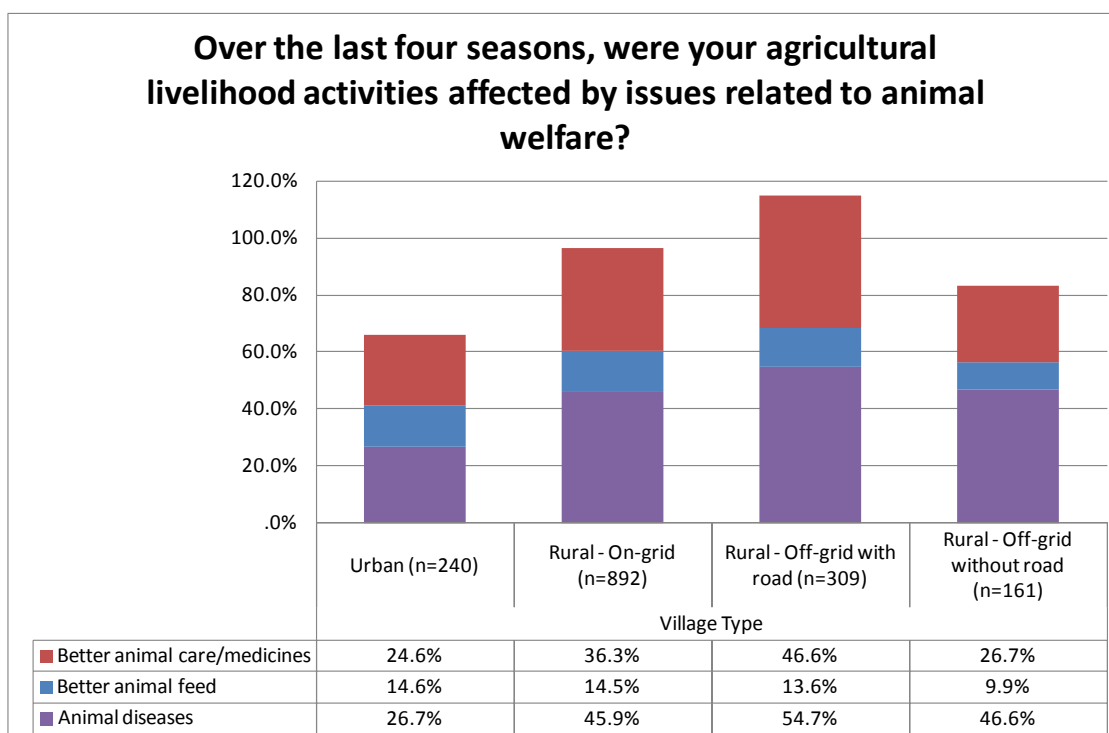


Figure 3.44. Positive or negative changes in livelihood activities caused by changes in animal welfare by village type (not asked in the Vientiane survey).

Changes in livelihoods from issues related to animal welfare, for better or worse, were much more common for households below the poverty line than those above the line. This could be due to the fact that richer urban households were the most likely not to have animals for livelihood activities. More than half (56%) of households below the poverty line had had to deal with animal diseases, while the same figure for households above the poverty line was 25%. On total, there had been slightly more positive changes in animal care.

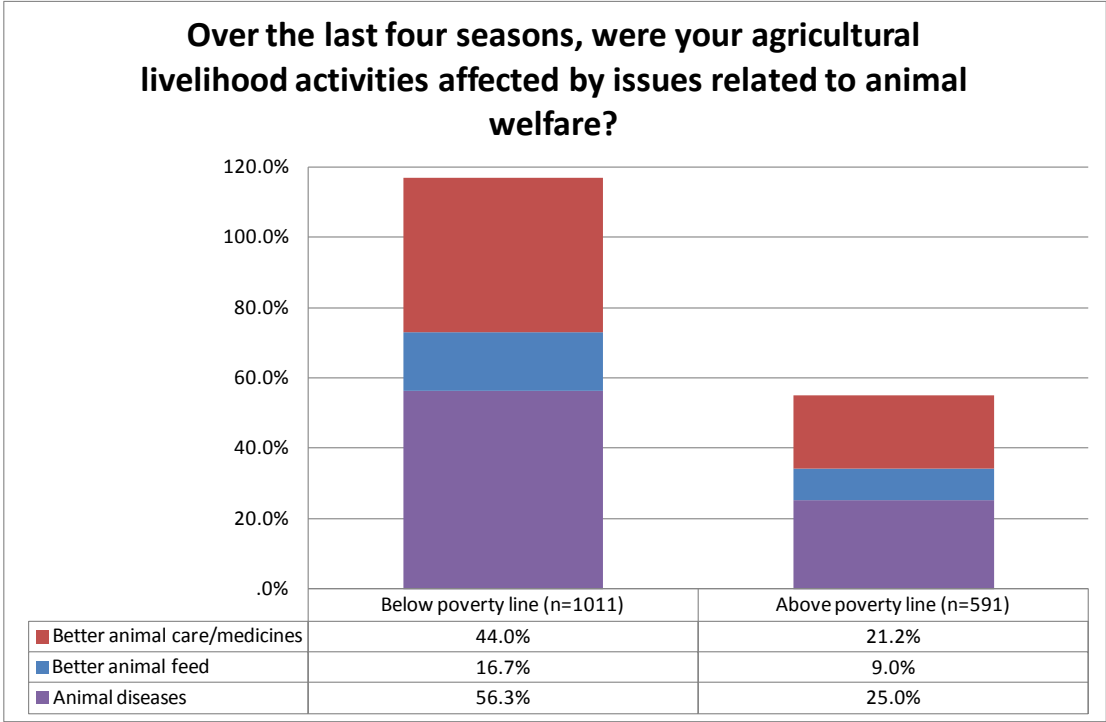


Figure 3.45. Positive or negative changes in livelihood activities caused by changes in animal welfare by poverty (not asked in the Vientiane survey).

### 3.10. Business and wage labour activities

Practically all urban households had someone in their household that earned cash from either business activities or from wage labour. However, when one considers that there is no subsistence farming in Vientiane and there is no universal social welfare in Laos, it is easier to understand that someone from each household is occasionally involved in some sort of business activities. Even in rural households, the percentage of households where no-one is involved in any business activities is very small, with only 12% of rural households without road access reporting this to be the case. We can note that Laos has some kind of hybrid economy where elements of public state economy, market economy and customary sharing economy are mixed (see e.g. Shan 1992).

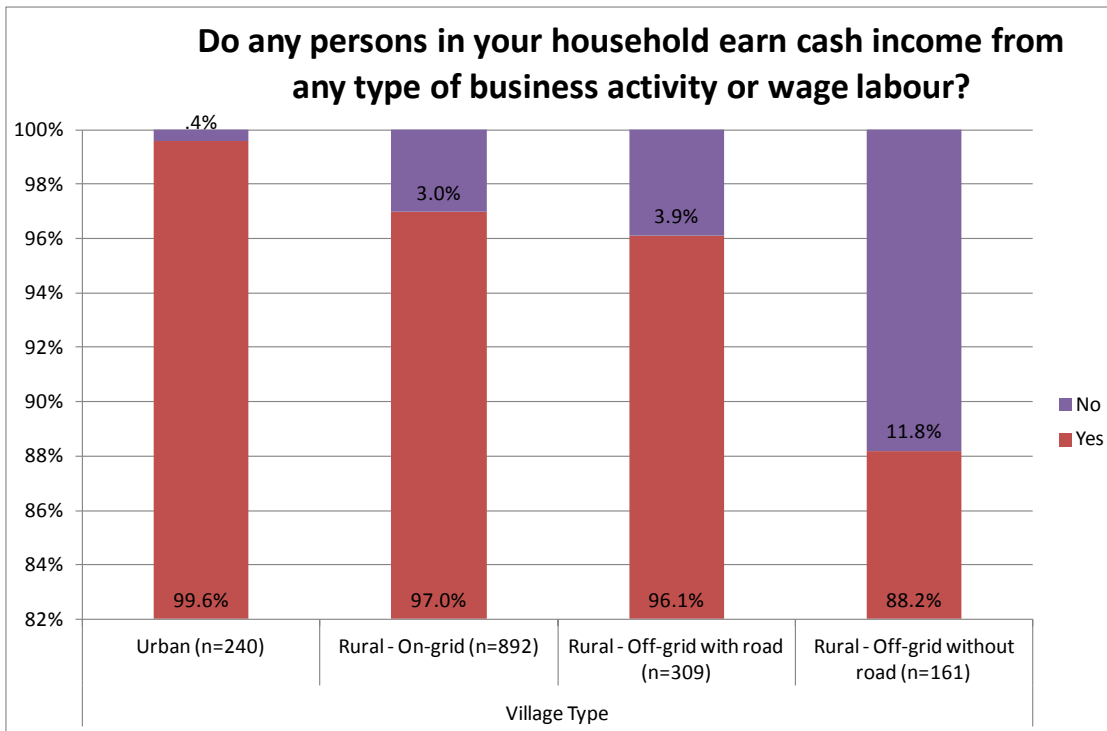


Figure 3.46. Business or wage labour activities by village type ( $\chi^2=38.25$ ,  $df=3$ ,  $p<0.001$ , not asked in the Vientiane survey). Note that the scale is from 82% to 100%.

There was only a small difference between the households above and below the poverty line regarding business or wage labour activities. As for households below the poverty line, 95% had at least one member doing these activities, and the respective figure within the households above the poverty line was 98%.

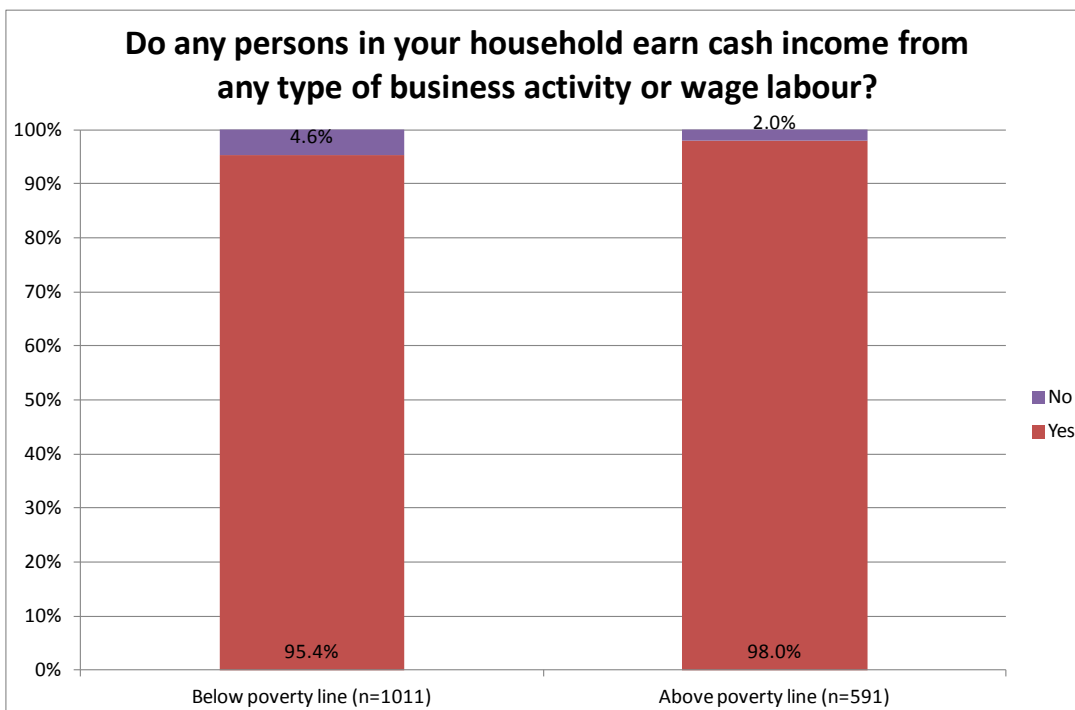


Figure 3.47. Business or wage labour activities by the poverty line ( $\chi^2=7.21$ ,  $df=1$ ,  $p=0.007$ , not asked in the Vientiane survey).

The differences for sources of cash income varied only a little between wet and dry seasons in 2010. Wage labour seemed to be slightly more common in the dry season than in the wet season.

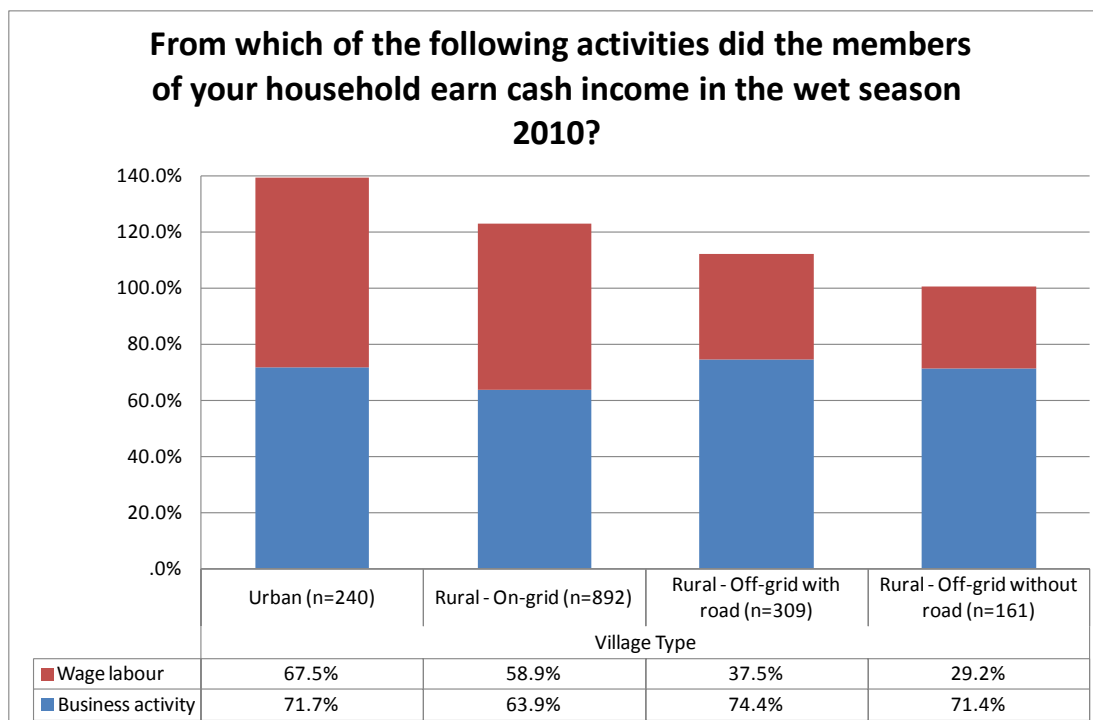


Figure 3.48. Business and wage labour activities by village type (not asked in the Vientiane survey).

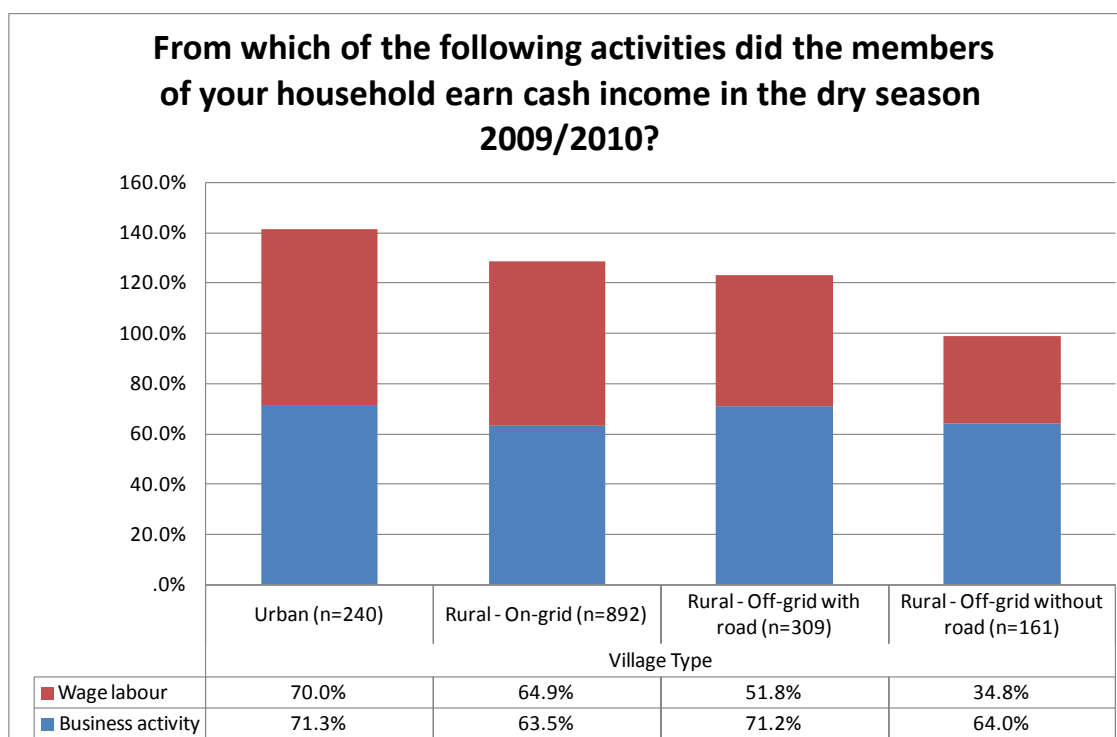


Figure 3.49. Business and wage labour activities by village type (not asked in the Vientiane survey).

For households below the poverty line, wage labour was less common than for households above the poverty line. Respectively, households below the poverty line were more likely to be involved in business activities than households above the poverty line. It is important to notice that in all households across village types (with the exception of rural households without a road in the dry season) and income levels, households' involvement in cash earning activities exceeded 100%. Thus, it is very common that members from a single household are to some extent involved in both wage labour and business activities.

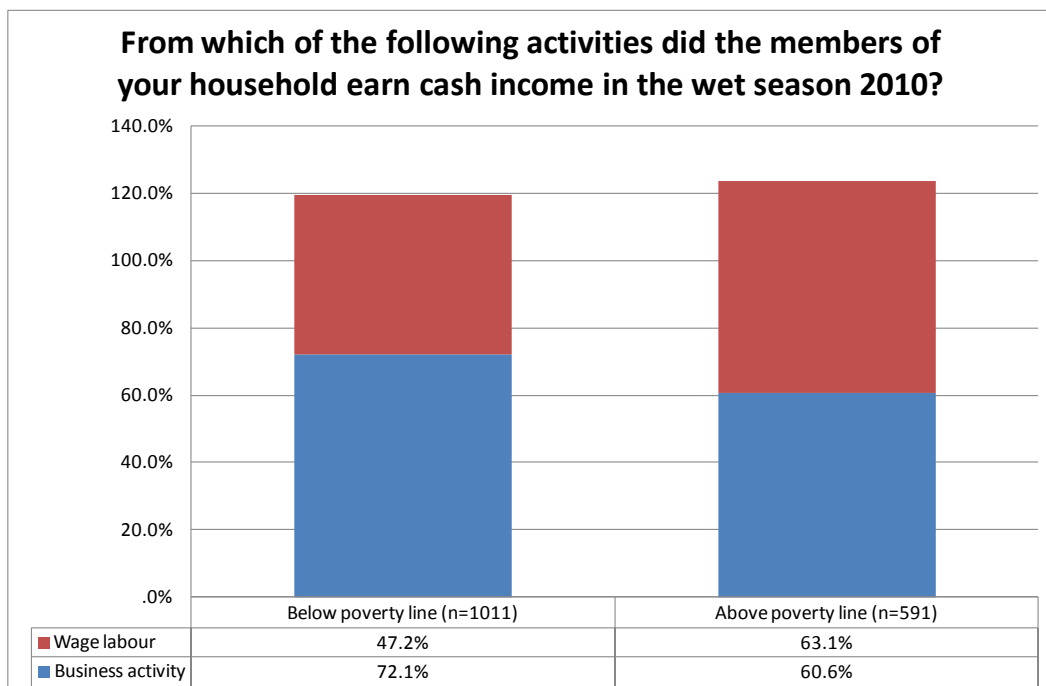


Figure 3.50. Business and wage labour activities by village type (not asked in the Vientiane survey).

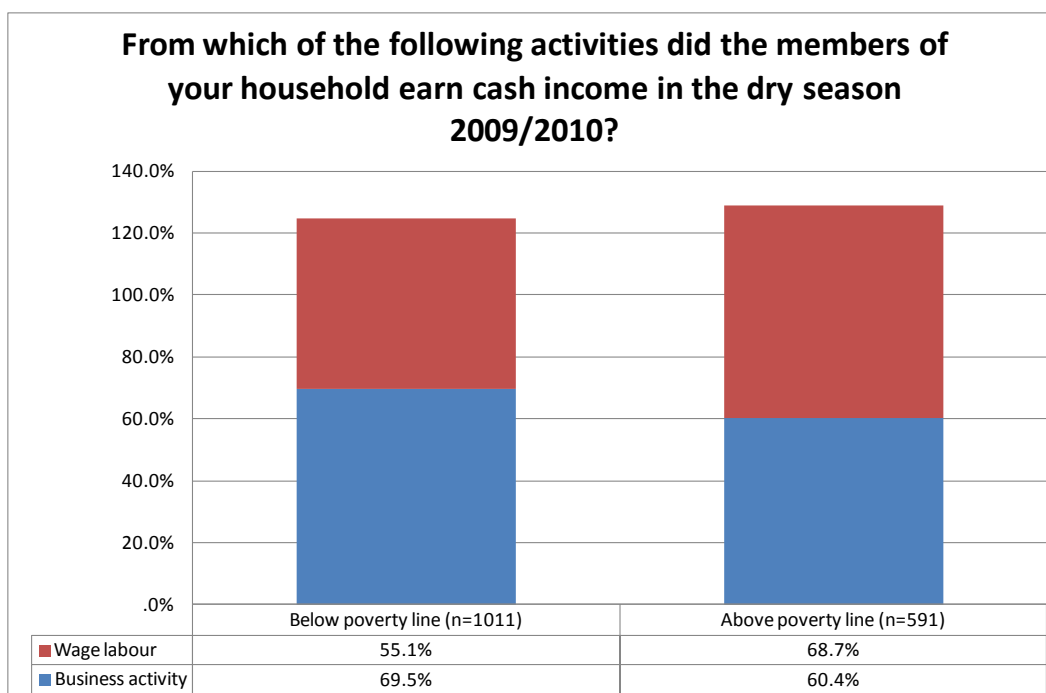


Figure 3.51. Business and wage labour activities by village type (not asked in the Vientiane survey).

### 3.11. Business or wage labour activities undertaken due to migration

In around 20% of all households a member had migrated for wage labour or business activities. Moving to another country for work was rare for the members of urban households (0.8%). It had taken place at 4.3% of rural off-grid households without road. Nevertheless, a household member moving abroad was most common for rural on-grid households (13%), and second most common for rural off-grid households with road (10%). For rural households with a road moving abroad is nearly twice as common as moving to Vientiane (5.5–5.8%).

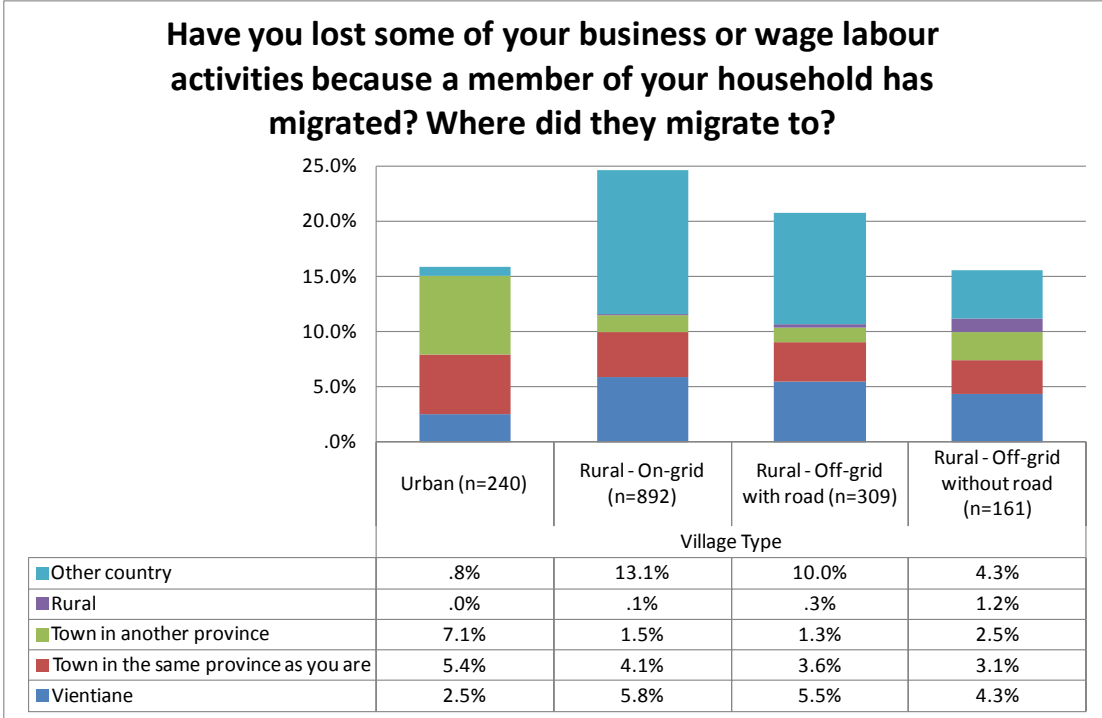


Figure 3.52. Business or wage labour activities being undertaken due to migration by village type (not asked in the Vientiane survey).

Migration was more common for households below the poverty line than for household above the poverty line. Regardless of household income level around 5% of migrants had moved to Vientiane. A household member moving abroad for wage labour or business activities had occurred for 12% of household below the poverty line, and for 6.6% of households above the poverty line.

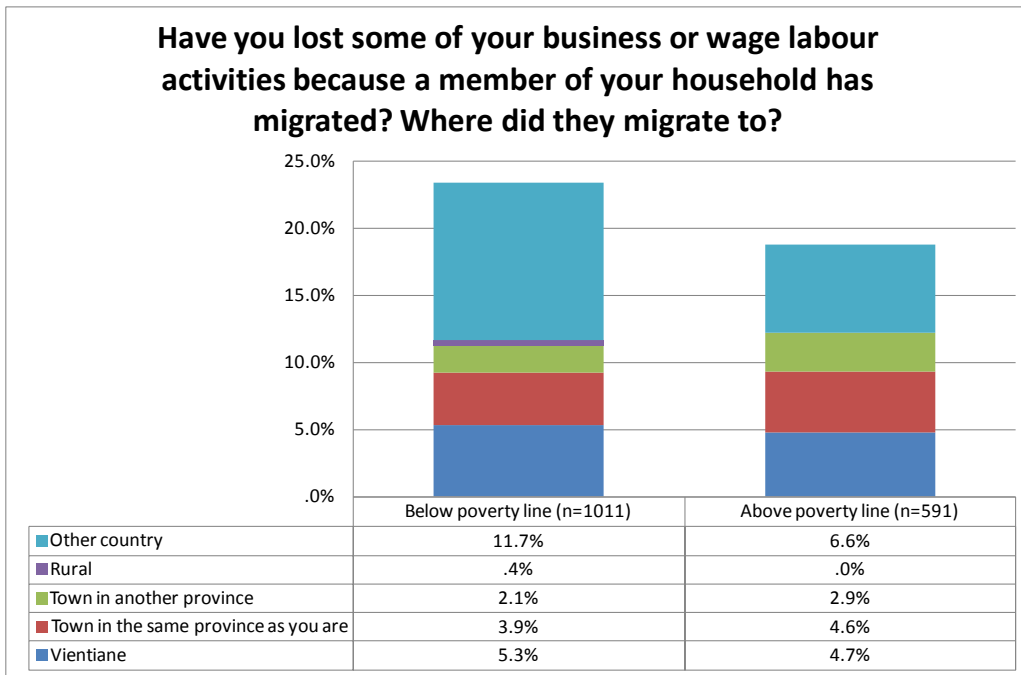


Figure 3.53. Business or wage labour activities being undertaken due to migration by the poverty line (not asked in the Vientiane survey)

### 3.12. Monthly income

Monthly household income levels depended significantly on the household type. Households' income in Vientiane was generally higher than in other urban areas or rural areas. Also, urban households' income was greater than that of rural households. A little surprisingly, the percentage of households earning over 1 million LAK is greater in rural off-grid households without road (22%) than in rural off-grid households with road (18%).

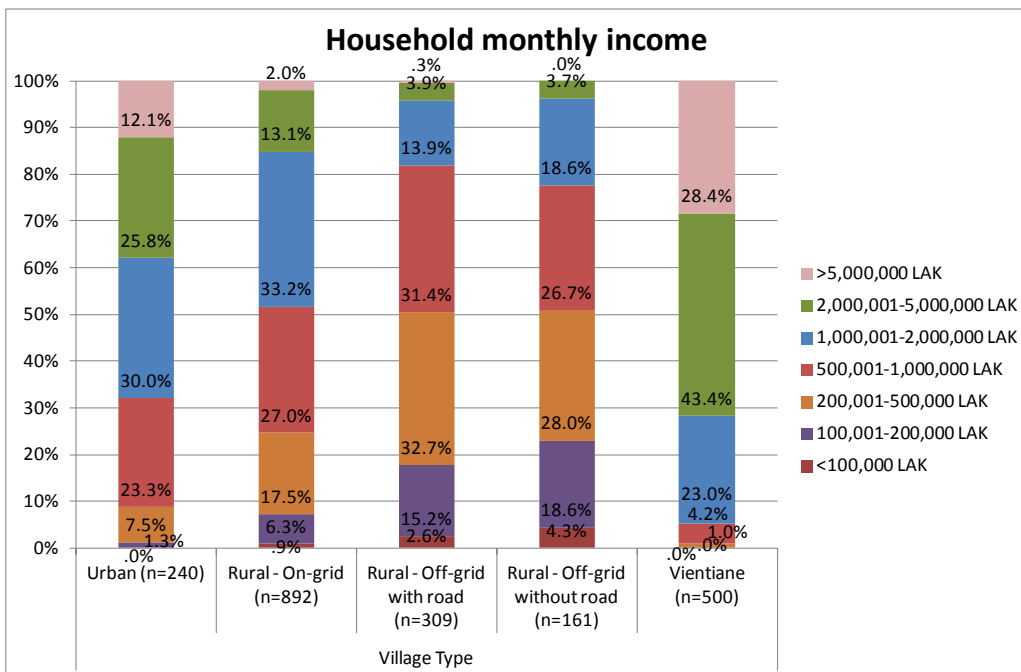


Figure 3.54. Total monthly income by village type ( $\chi^2=965.44$ ,  $df=24$ ,  $p<0.001$ ).



### 3.13. Monthly expenditure and savings

Household expenditures reflected quite closely the income levels of different households, and many also managed to save some of their income. As could be expected, savings were significantly higher in Vientiane than in other households – and the smallest in rural off-grid households without road.

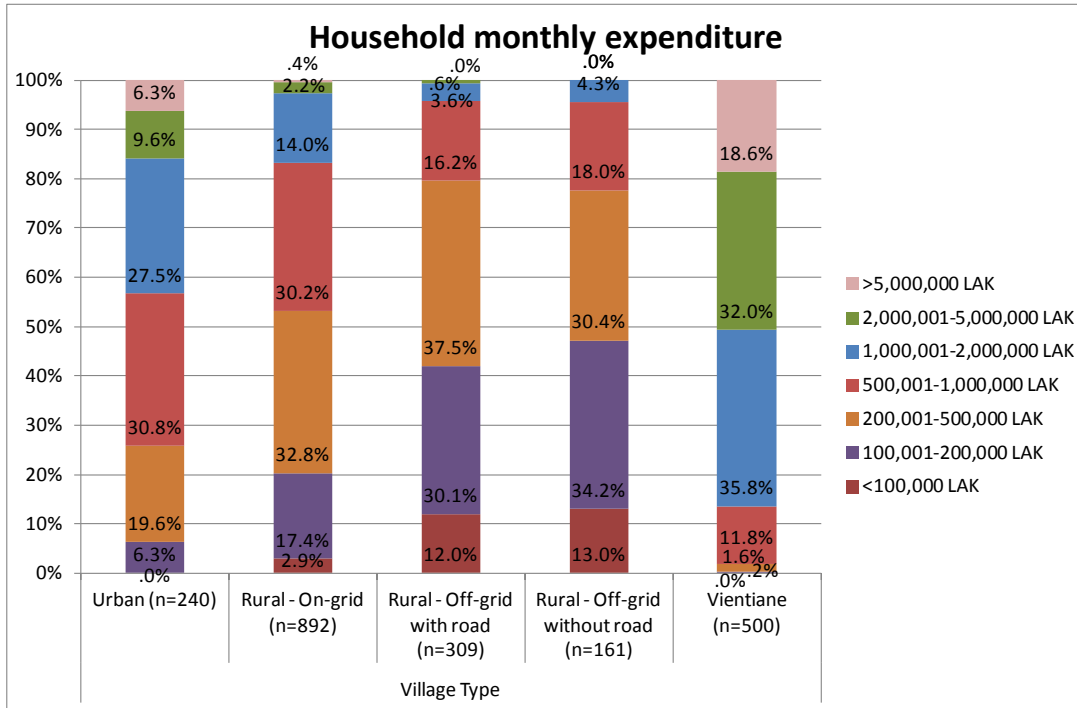


Figure 3.55. Total monthly expenditure by village type ( $\chi^2=1242.3$ ,  $df=24$ ,  $p<0.001$ ).

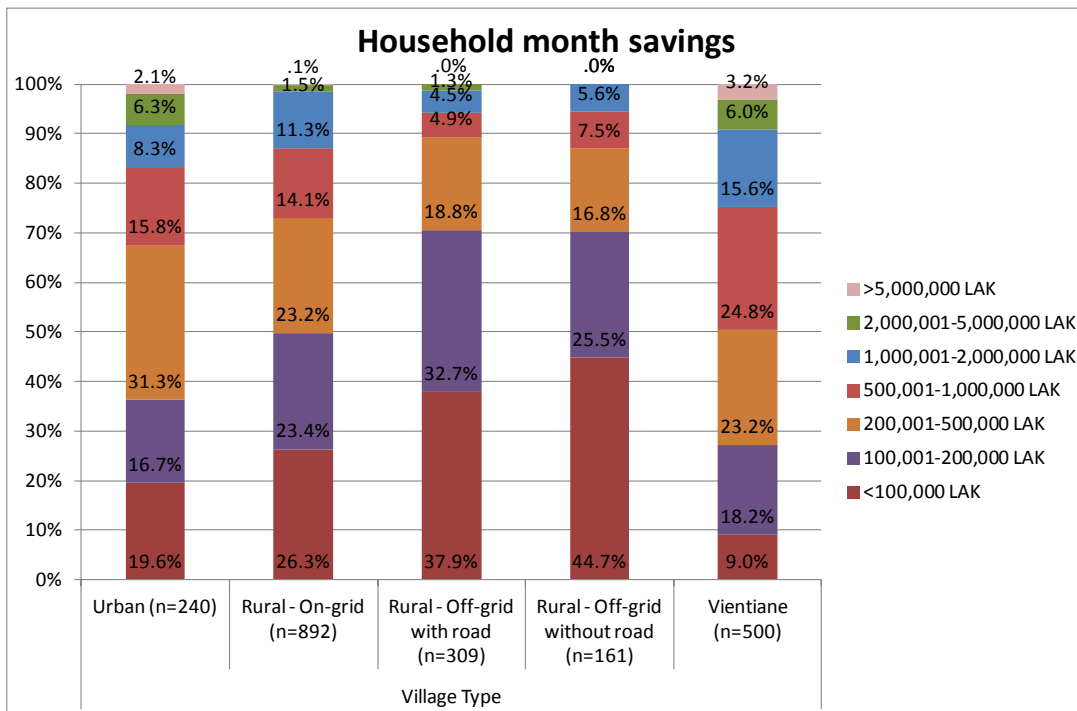


Figure 3.56. Total monthly savings by village type ( $\chi^2=300.42$ ,  $df=24$ ,  $p<0.001$ ).

### 3.14. Changes in income

In most village types, it had been more common that the households' income had increased (35–45%) rather than decreased (13–28%). There had been no significant changes in income for more than a third (36–44%). The income increase in all electrified areas had been greater than in non-electrified areas. Likewise, income had decreased more in off-grid areas.

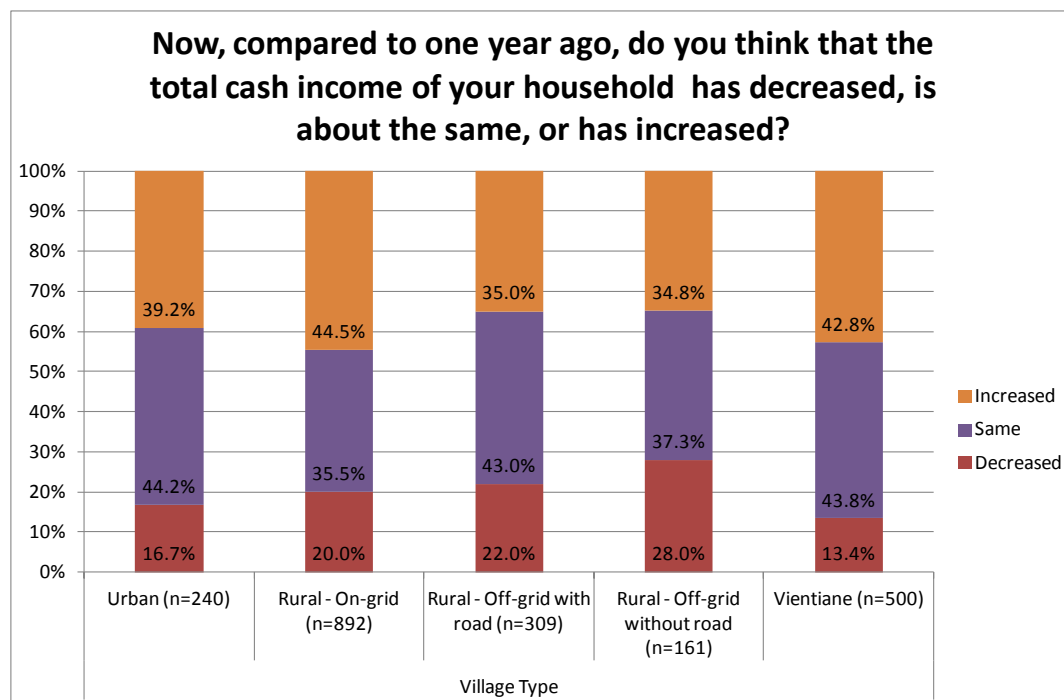


Figure 3.57. Changes in income in the past year by village type ( $\chi^2=33.4$ ,  $df=8$ ,  $p<0.001$ ).

Looking at the difference between households above and below the poverty line, the income differences seem to be growing. For households above the poverty line 38% said that their income had increased in the last year against 23% for households below the poverty line. On the other hand, 25% of the households already below the poverty line said that their income had decreased while the same was true only for 13% of households above the poverty line. In other words, while more than a third of the population already above the poverty line got richer in the last year, under a quarter of the people below the poverty line got closer to 'escaping' poverty.

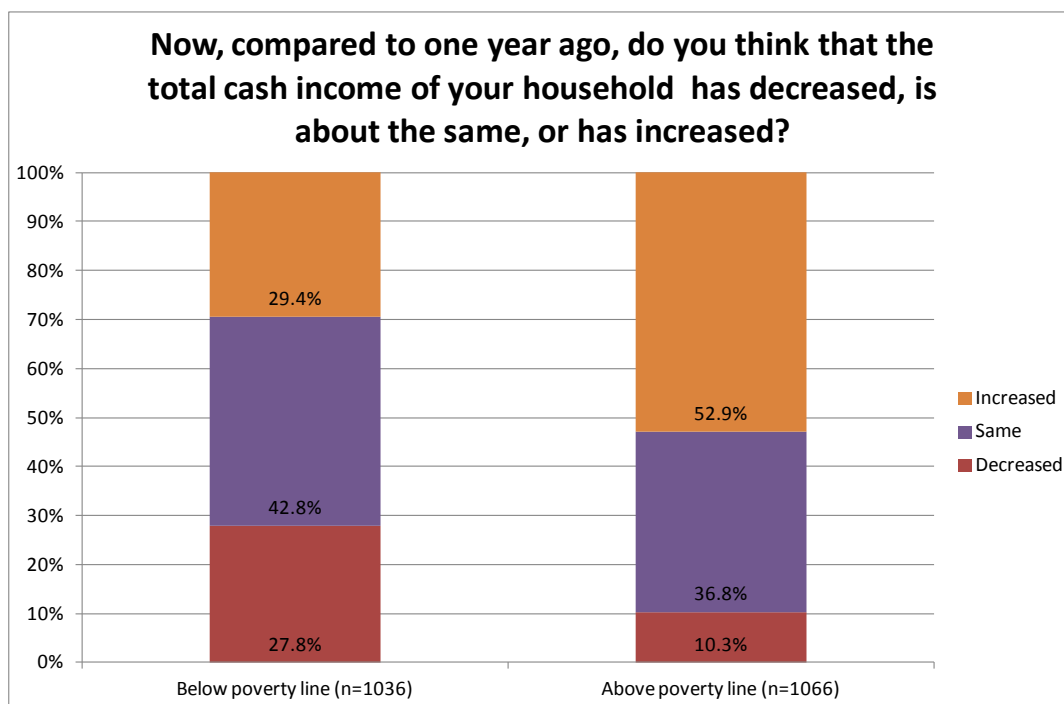


Figure 3.58. Changes in income in the past year by the poverty line ( $\chi^2=159.5$ ,  $df=2$ ,  $p<0.001$ )

The results regarding ability to save money compared to the situation one year ago are similar to the changes in income.

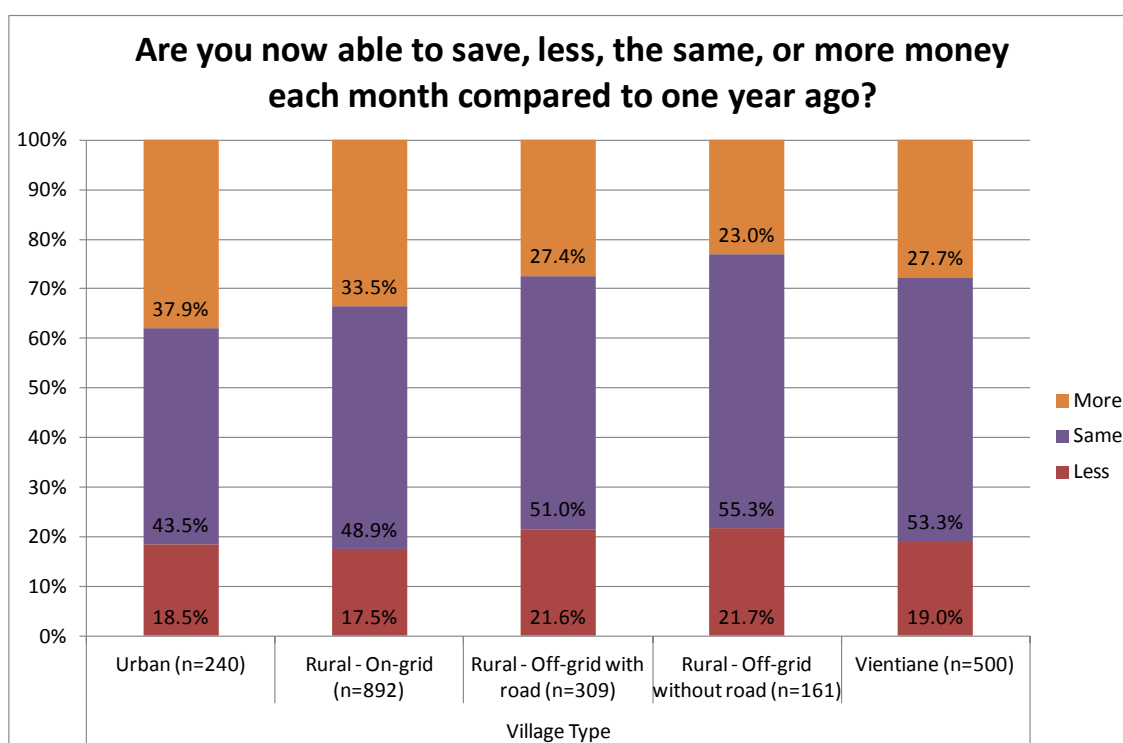


Figure 3.59. Changes in the ability to save money in the past year by village type ( $\chi^2=18.3$ ,  $df=8$ ,  $p=0.019$ ).

Compared to the situation one year earlier, 25% of the households below the poverty line were able to save less. The same was true for 13% of households above the poverty line.

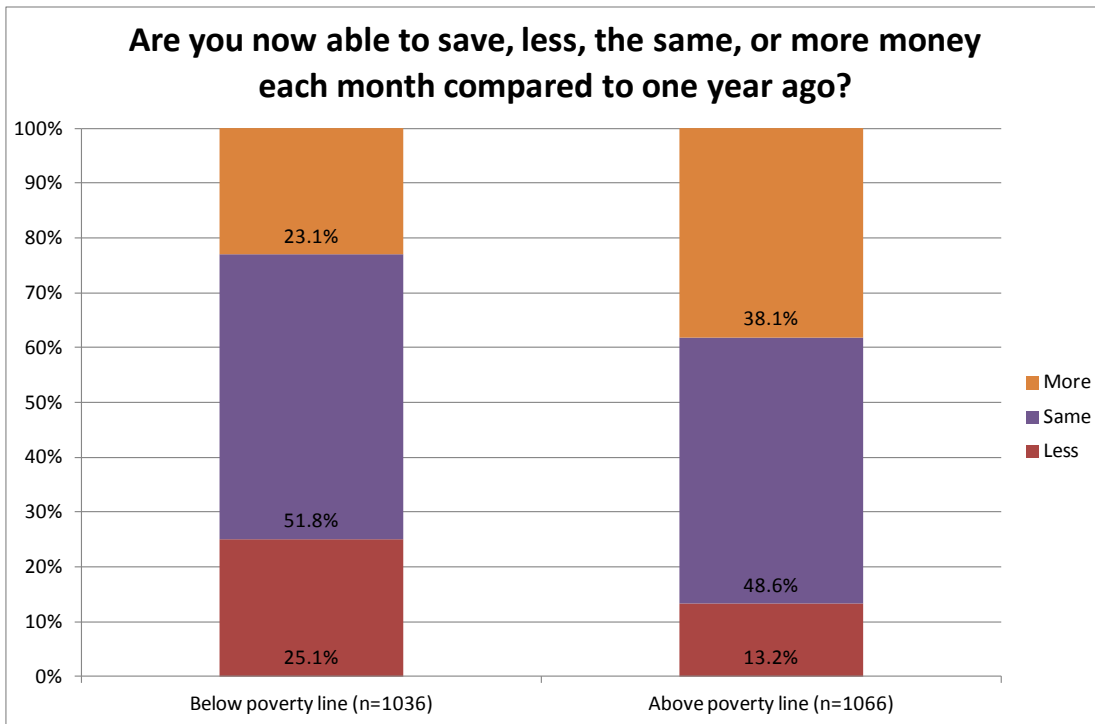


Figure 3.60. Changes in the ability to save money in the past year by the poverty line ( $\chi^2=76.4$ ,  $df=2$ ,  $p<0.001$ ).

## 4. FOOD SECURITY AND SURVIVAL STRATEGIES

Fig. 4.1 illustrates the population, aged ten years or older, whose main activity is not agriculture. This figure tells about modernization of Lao economy.

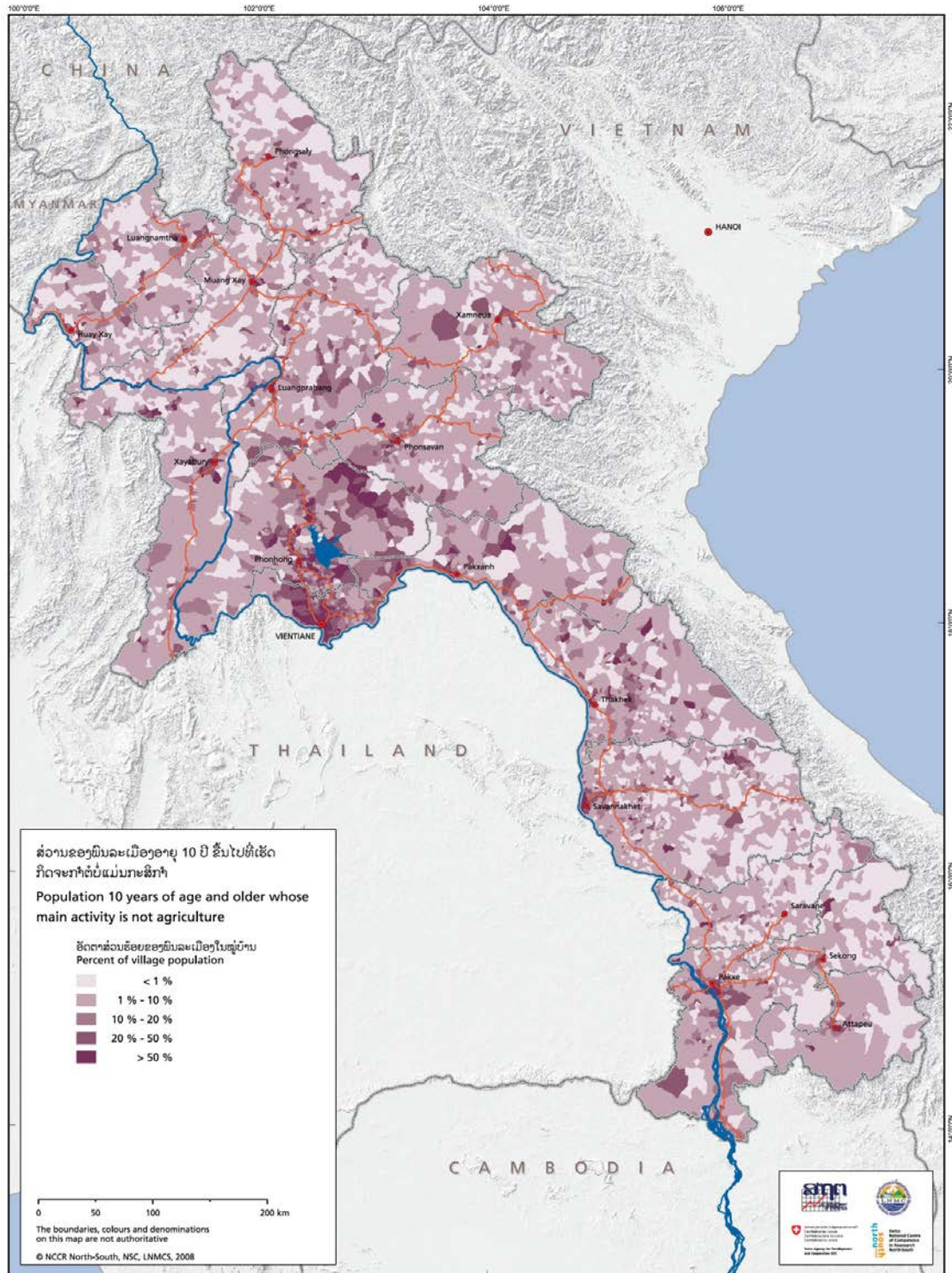


Figure 4.1. Map of population that are not working in agriculture in Laos (Messerli et al. 2008).

## 4.1. Production and gathering of food

All off-grid rural households gathered or produced food which they consumed themselves. The situation was slightly different for on-grid rural households with 1.5% of the respondents answering that they did not produce or gather food for their own consumption. Only in urban areas was the situation considerable different with nearly a third of the households not gathering or producing food.

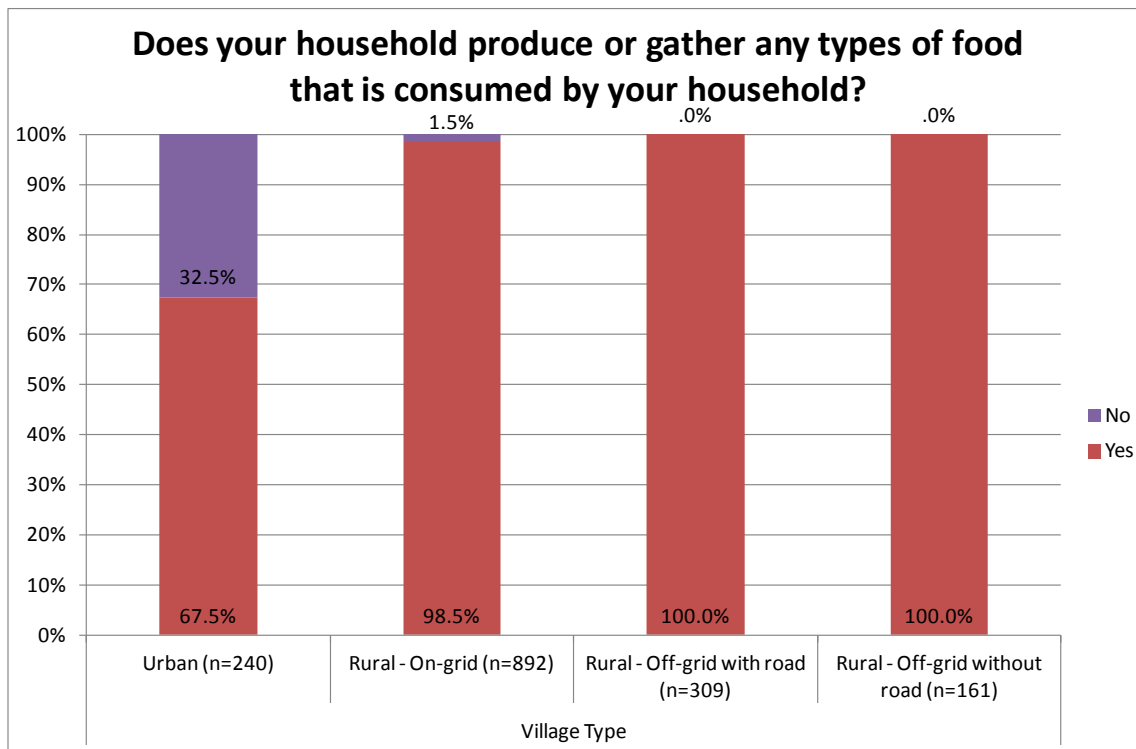


Figure 4.2. Producing or gathering food by village type ( $\chi^2=380.2$ ,  $df=3$ ,  $p<0.001$ , not asked in the Vientiane survey).

It was more common within the households below the poverty line to produce or gather food that they consume themselves (98%), compared with households above the poverty line (89%). However, most households produced or collected food for own consumption.

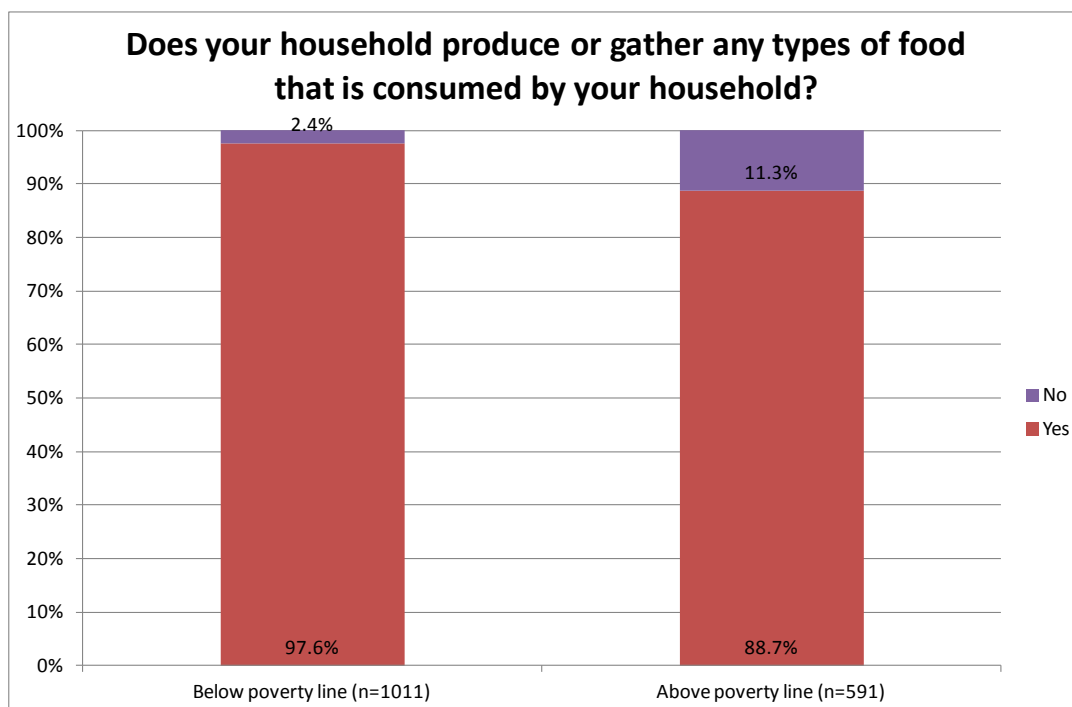


Figure 4.3. Producing or gathering food by the poverty line ( $\chi^2=55.9$ ,  $df=1$ ,  $p<0.001$ , not asked in the Vientiane survey).

## 4.2. Proteins in the diet

The differences in the consumption of meat, fish or egg products were clear between the village types. In Vientiane, basically everyone had meat, fish or eggs at least three times a week. 94% had meat, fish or eggs on a daily basis. Households in urban areas had more protein products than rural populations and on-grid households had a better access than off-grid households. While the proportion of rural households that had meat, fish or eggs less than once a week was between 2.7% and 6.5%, depending on the village type, the variation between different village types was bigger for the proportion of household that have meat, fish or eggs once or twice a week. In rural households this proportion was 20%, but for off-grid rural households without a road access this proportion was already 37%. Overall, it seemed that the better the access to services – like electricity and roads – the more protein products were eaten in a household.

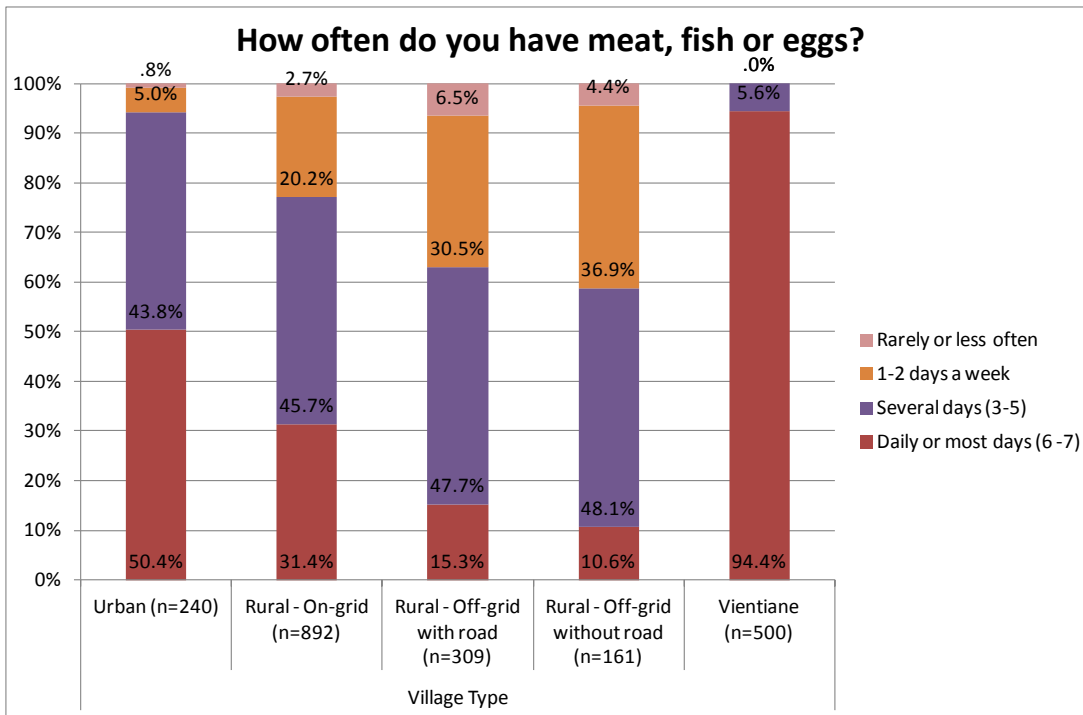


Figure 4.4. Frequency of having fish, meat or eggs by village type by village type ( $\chi^2=811.1$ ,  $df=12$ ,  $p<0.001$ ).

Whether the household was above or below the poverty line made a significant difference to how often they ate meat, fish or eggs, in other words, protein-rich food products. For households below the poverty line, over a third had meat, fish or eggs less than three times a week. 5.0% did not eat meat, fish or eggs even once a week. In households above the poverty line, only 3.3% had meat, fish or eggs less than three times a week and 69% consumed these products on a daily basis. In households below the poverty line, fewer than 20% responded that they could have these products on six or seven days a week.

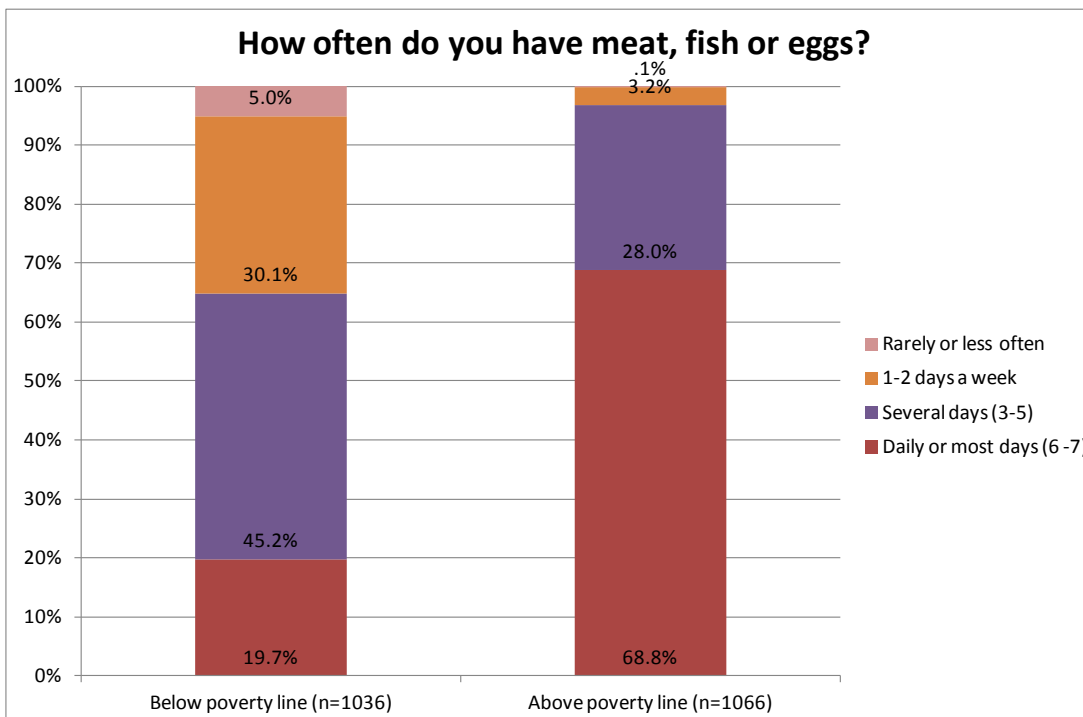


Figure 4.5. Frequency of having fish, meat or eggs by village type by the poverty line ( $\chi^2=607.1$ ,  $df=3$ ,  $p<0.001$ ).



### 4.3. Borrowing rice

Borrowing rice, or borrowing money for buying rice, was more common in the rural areas than in urban areas (14%) or Vientiane (11%). However, in rural villages without a road access borrowing was less common (15%) than in rural villages with road access (19–27%). This can, at least partly, be explained by the fact that without a road access there are also fewer opportunities for any financial activities. Hence, there are also fewer possible lenders in general, which could make borrowing possible in the first place.

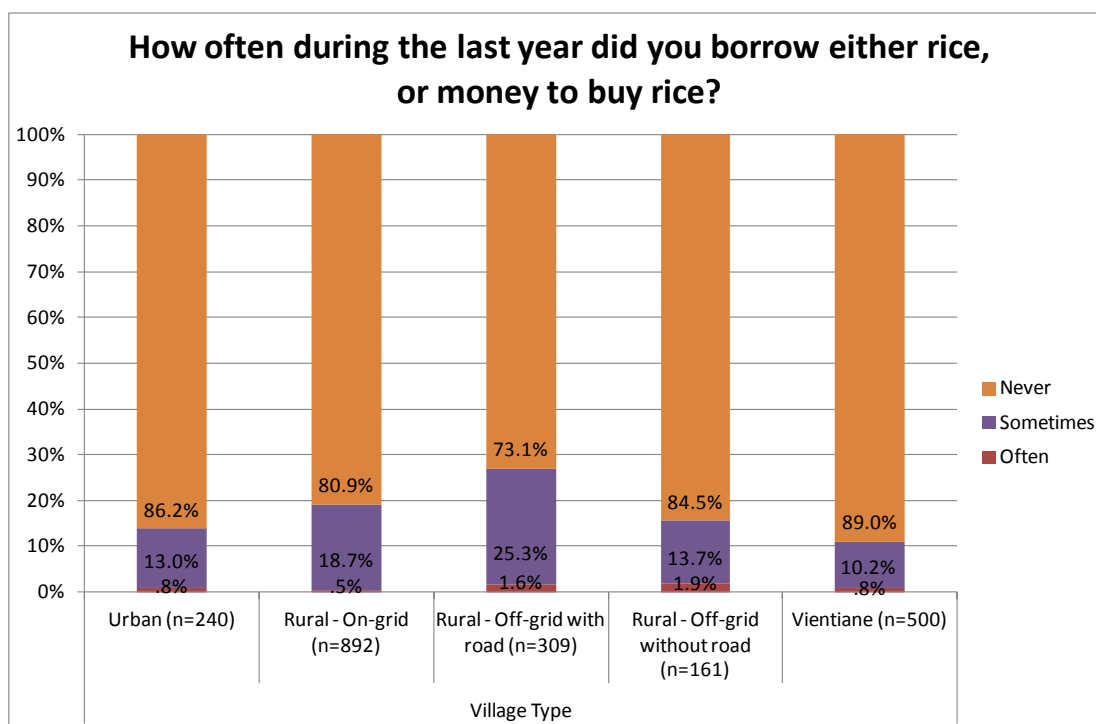


Figure 4.6. The frequency of having to borrow rice or borrow money to buy rice by village type (the assumptions of Pearson's chi-square test were not met).

Looking at borrowing rice for households below or above the poverty line, the difference was quite clear. People living below the poverty line were three times more likely to borrow rice or money to buy rice than people above the poverty line.

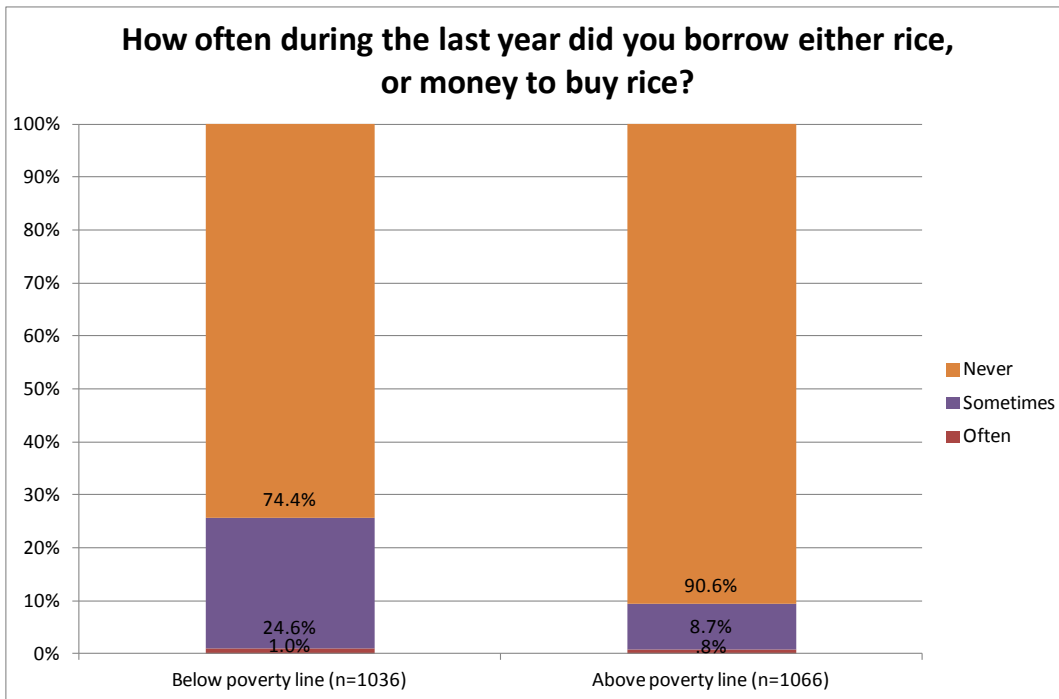


Figure 4.7. The frequency of having to borrow rice or borrow money to buy rice by the poverty line ( $\chi^2=96.8$ ,  $df=2$ ,  $p<0.001$ ).

#### 4.4. Coping strategies

Looking at survival strategies, the most common way to cope with lack of cash in rural areas was to sell animals. In urban areas, around 10% of households had resorted to borrowing money from relatives to be able to cope with immediate household needs, making it the most common survival strategy in the urban areas. Overall, in urban areas, resorting to selling assets or borrowing money to cover basic household needs was less common than in rural areas, where various coping strategies were used by households. Still, it is worth noticing that borrowing from a bank or a money lender was more common in urban areas. This could also be explained by the availability of such services.

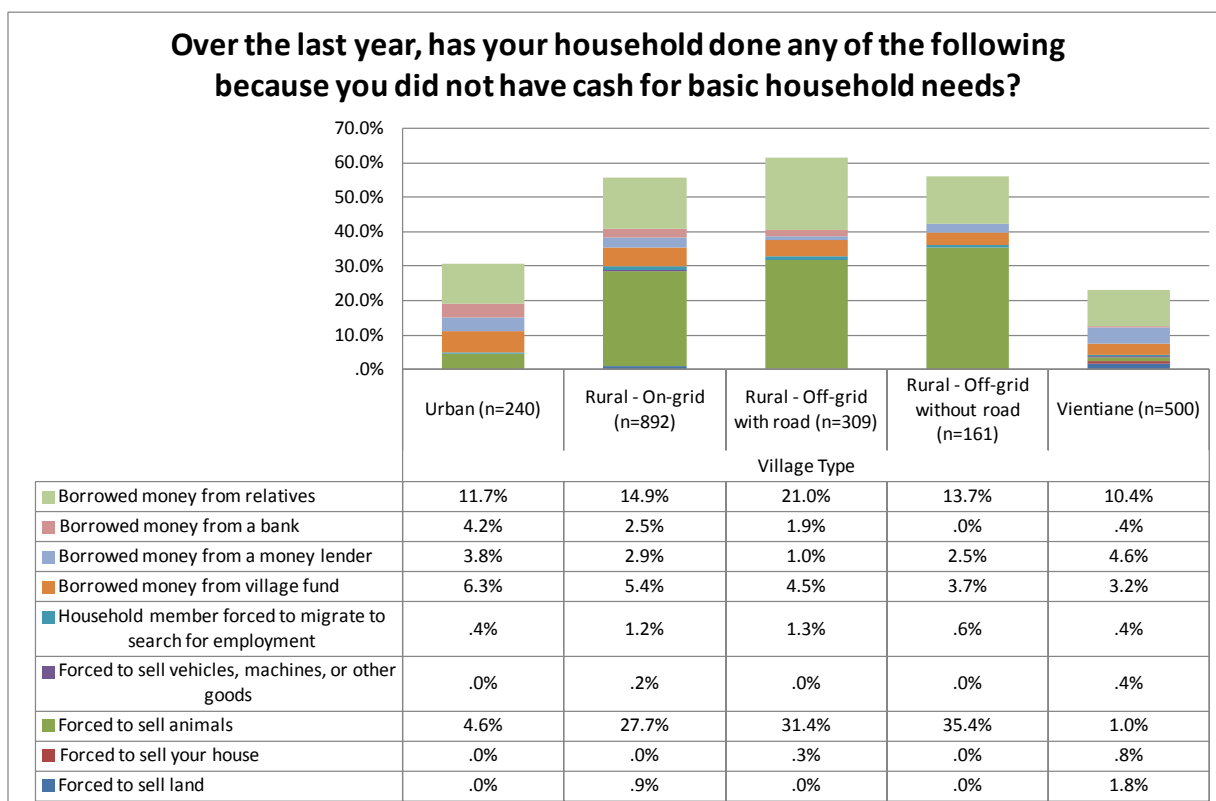


Figure 4.8. Coping strategies to meet the basic household needs in the past year by village type.

When comparing survival strategies between households above and below the poverty line the differences stand in stark contrast. Poor families had to resort to nearly all coping mechanisms more often than households above the poverty line. Borrowing money for basic needs was more than twice as common among households below the poverty line, compared with those above the poverty line. 28% of households below the poverty line had been forced to sell animals to pay for household expenses, while the same was true for 16% of households above the poverty line.

**Over the last year, has your household done any of the following because you did not have cash for basic household needs?**

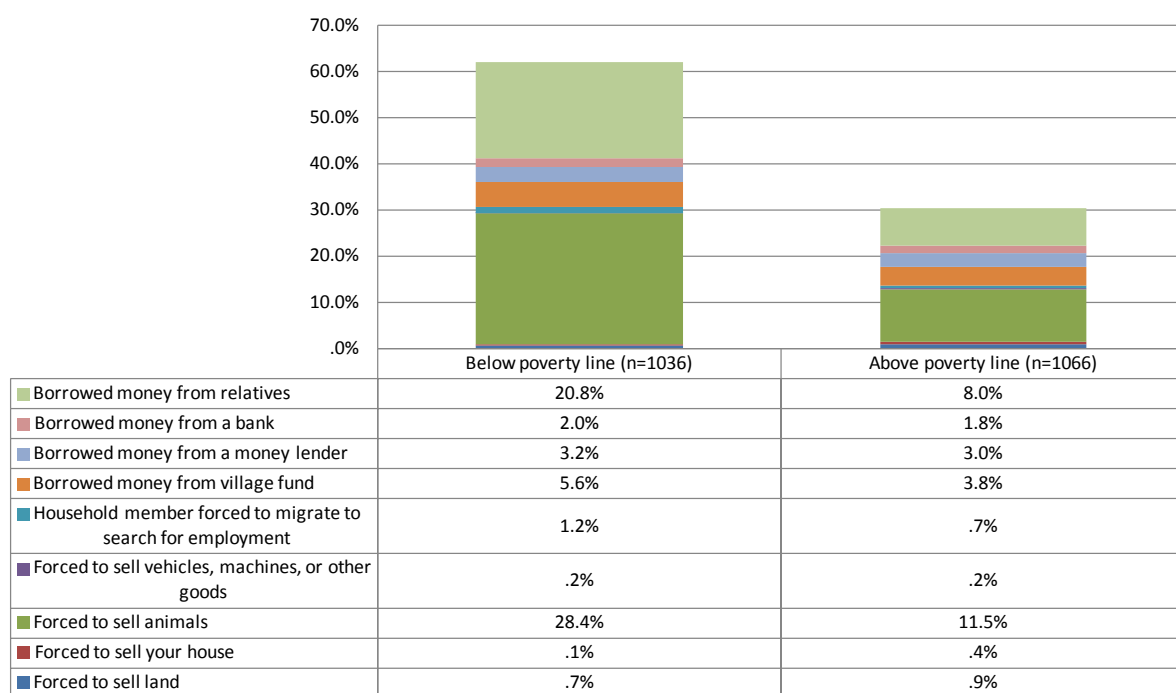


Figure 4.9. Coping strategies to meet the basic household needs in the past year by the poverty line.

## 5. ENERGY PROFILE

Energy consumption in Laos is mainly based on traditional forms of energy such as fuel wood, wood shavings, sawdust and charcoal, and, in addition, petroleum products and hydropower-based electricity are also common. According to the ASEAN report in 2010, traditional energy sources, mainly fuel wood and charcoal, accounted for 69% of the total energy consumption in the country in 2002. Petroleum products (LPG, gasoline, kerosene, diesel, fuel oil) followed the traditional energy resources with about 17% contribution to the total energy consumption. Finally, 12% of energy consumption was provided by hydro-based electricity. According to the Ministry of Energy and Mines statistics, the share of traditional fuels (fuelwood and charcoal) was about 72% in 2010 and the share of petroleum products (gasoline and diesel) about 25%.

Laos does not have proven oil or gas reserves or an oil refinery. Refined petroleum products used for transportation, industrial, commercial and household sectors are imported. The growth in petroleum products consumption in Laos is fast and it is increasing by more than 8% per year; even exceeding the GDP growth of the country.

The Democratic Republic of Laos possesses large intact rainforests and the largest hydropower potential of any of the four lower Mekong Basin countries at about 30,000 megawatts (MW). Laotian planners intent to increase the number of dams in Laos from 14 to 55, making the country “the battery of Southeast Asia” (Case 2011). Hydropower development started with a hydropower plant called Nam Ngum with 40 MW installed capacity near the capital city of Vientiane in 1975. However, today the installed capacity of hydropower plants is over 2000 MW.

42% of electricity generated in hydropower plants throughout the country was consumed domestically and the rest was exported in 2008. Today the share of exports is even larger. The government has a policy to increase the installed capacity of hydropower plants through foreign investments to 3000 MW by 2013. In the future Laos plans to export energy especially to Thailand. Thailand is committed to the purchase of 5.0 Gigawatts (GW) of hydropower by 2015. Four hydropower plants (Theun Hinboun, Houay Ho, Nam Thuen 2 and Nam Ngum) provided about 1.9 GW of electricity to Thailand in 2009. Recent scenario calculations of the AIT experts indicate that the TPES of Laos is estimated to increase by five folds during 2000-2035. During 2000-2035 total final energy consumption in Laos is estimated to increase by about four times. The service sector is expected to hold the largest share of total energy consumption after 2025, followed by the industrial and transportation sectors. Compared to Laos, the TPES of Thailand is estimated to increase four folds during 2000-2035. In the long run the more power exported from Laos is estimated to very advantageous to the Lao economy giving 14% of the total GDP (Watcharejyothin & Shrestha 2009).

Electricity consumption is also increasing very rapidly. The total electricity consumption of Laos has increased to 2257 GWh in 2010, while it was 767 GWh in 2002. Moreover, the access to electricity has soared from 17% in 1995 to more than 70% in 2012. The value is still not enough to keep the country from having low electricity access ratio compared to other countries in the region (Asian Development Bank 2010).

Despite of the rapid electrification, the main energy consumption in Laos is in the form of traditional fuels, mainly fuel wood (56%) and charcoal (12%), which are used for heating and cooking purposes in rural areas. Household energy consumption accounts for more than half of the total energy consumption in the country; and the transport sector (26%) is the second largest energy consumer (Country Paper 2011).

The government has electrification policy for the households in rural areas which will not have electricity access in short term. The policies concentrate on mainly off-grid electrification based on solar, micro and pico hydro, and biomass (World Bank 2012).

Laos has a low carbon footprint and it relies on almost exclusively on renewable energy for electricity, but must import practically all of its petroleum. Laos' dependency on large-scale dams has involved local destruction of land and fisheries (Smits 2011).

PV solar was first introduced into the country in the 1980s. Nowadays, it is one of the main components of off-grid electrification systems. Biomass, on the other hand, has a huge potential in the country and most of the energy consumption is provided by biomass. However, excessive use of biomass resources, mainly in the form of fuel wood, causes deforestation in the country. Therefore, it is important to use these sources in a sustainable manner (Acceptnce & Sustain 2006). According to a study, Laos can cover part of its energy consumption by using agricultural and forestry residues. The energy potential of rice husk, corn cob, cassava, sugarcane residues and logging residues, mill residues is considerable and can reach up to 0.6 Mtoe of energy generation when the total energy consumption is about 2 Mtoe in 2006.

This chapter presents the results related to households' energy use. The energy section in the survey was fairly extensive with 14 different question types on energy use, energy sources and related problems. Besides residential consumption, the consumption of home-based business energy usage was investigated. Some of the questions are related to the future of energy use and awareness of new technologies which reduce energy consumption.

Electricity in Laos is generated mainly by hydropower (98.6%), with the remaining 1.4% produced from fossil fuels (CIA World Factbook 2012). While the country has ambitious targets of electrifying 90% of the households by 2020, the households still rely heavily on fuel wood use. The main energy-consuming activity is cooking, although cooling and heating are becoming more and more common within the wealthier households. The official estimates of residential wood use vary. There are vast differences in energy consumption patterns in households depending on the village type and household income. In urban areas there is more variety as electricity, charcoal, wood and others are consumed intertwined, whereas rural households still mainly fulfill their energy needs by fuel wood..

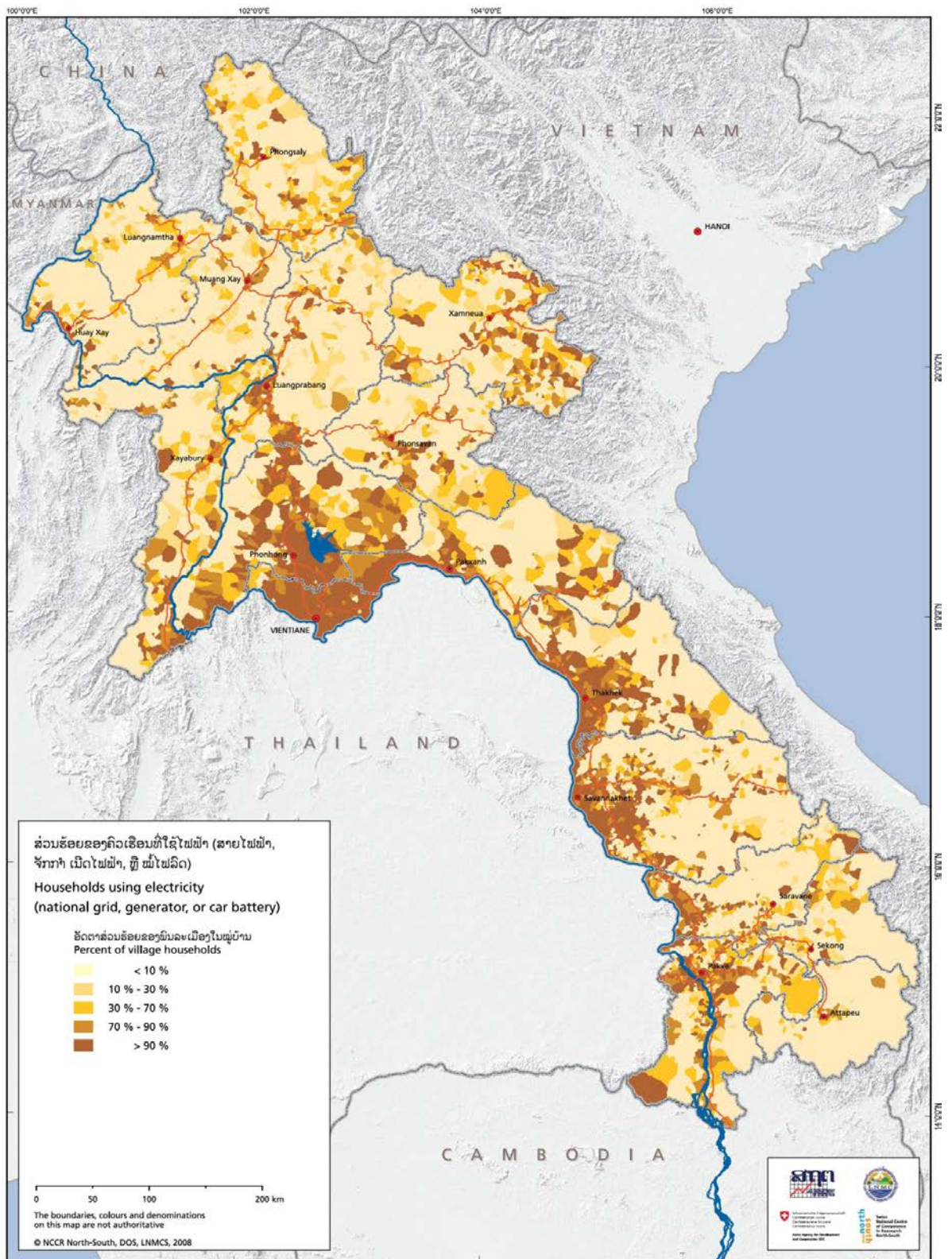


Figure 5.1. Map of households' electricity usage in Laos (Messerli et al. 2008).

## 5.1. Energy sources

### 5.1.1. Firewood

In rural areas, most (94–99%) of the households used firewood as an energy source while the respective figures in Vientiane and other urban areas were 45% and 63%.

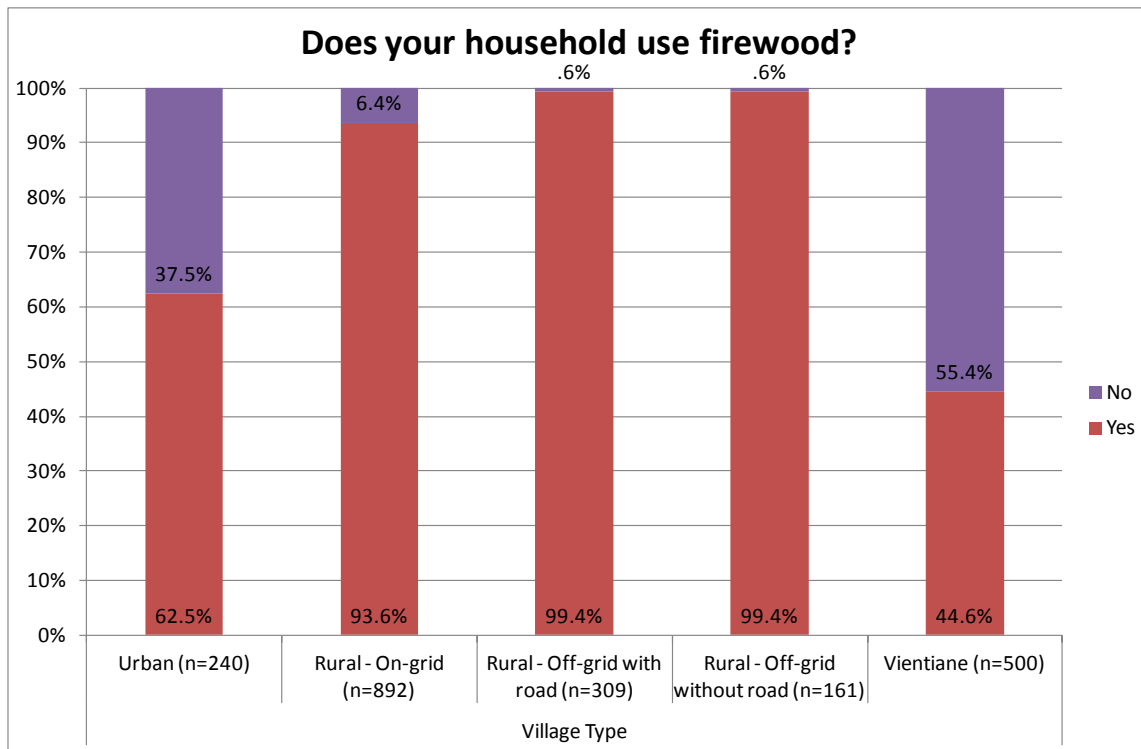


Figure 5.2. Using firewood by village type ( $\chi^2=643.3$ ,  $df=4$ ,  $p<0.001$ ).

Similar trend was seen in the comparison of households below and above the poverty line, as 93% of the former and 66% of the latter group used firewood as an energy source.



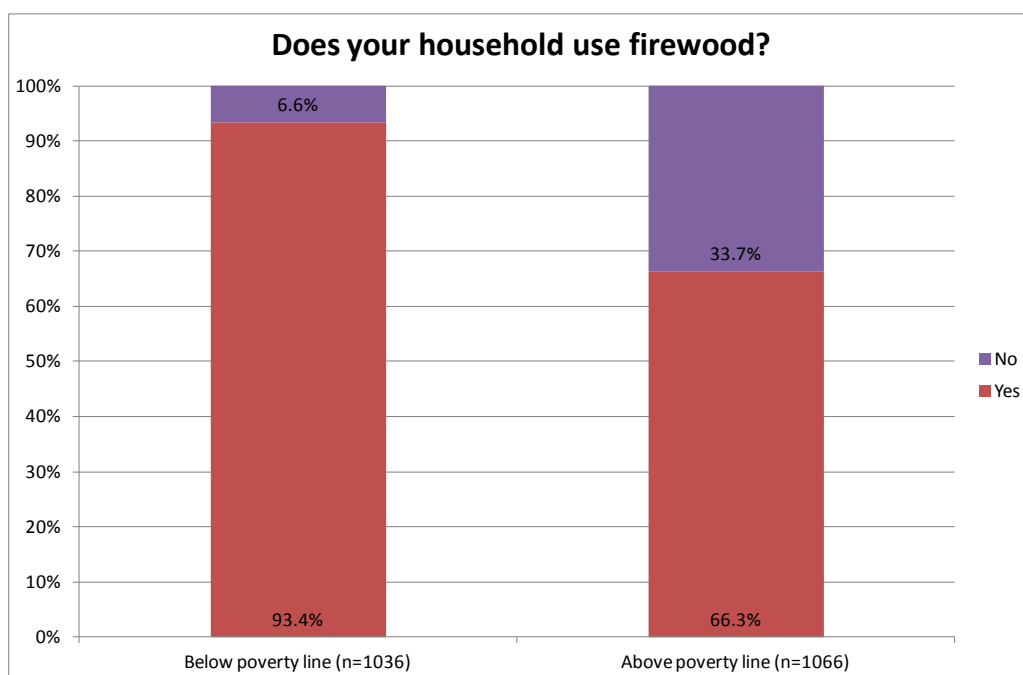


Figure 5.3. Using firewood by the poverty line ( $\chi^2=238.6$ ,  $df=1$ ,  $p<0.001$ ).

Most Laotian households in rural villages (93–99%) used firewood for cooking. In urban households, the respective figure was 63%, and in Vientiane it was 45%. The second most common usage of wood was heating, practiced by 47% in rural off-grid villages without road, 37% in rural off-grid villages with road, 35% in rural on-grid villages, 27% in urban areas, and only 0.2% in Vientiane. In the rural off-grid areas not connected to a road many used wood for lighting (17%), while in other village types lighting by wood was less common (0–3.9%).

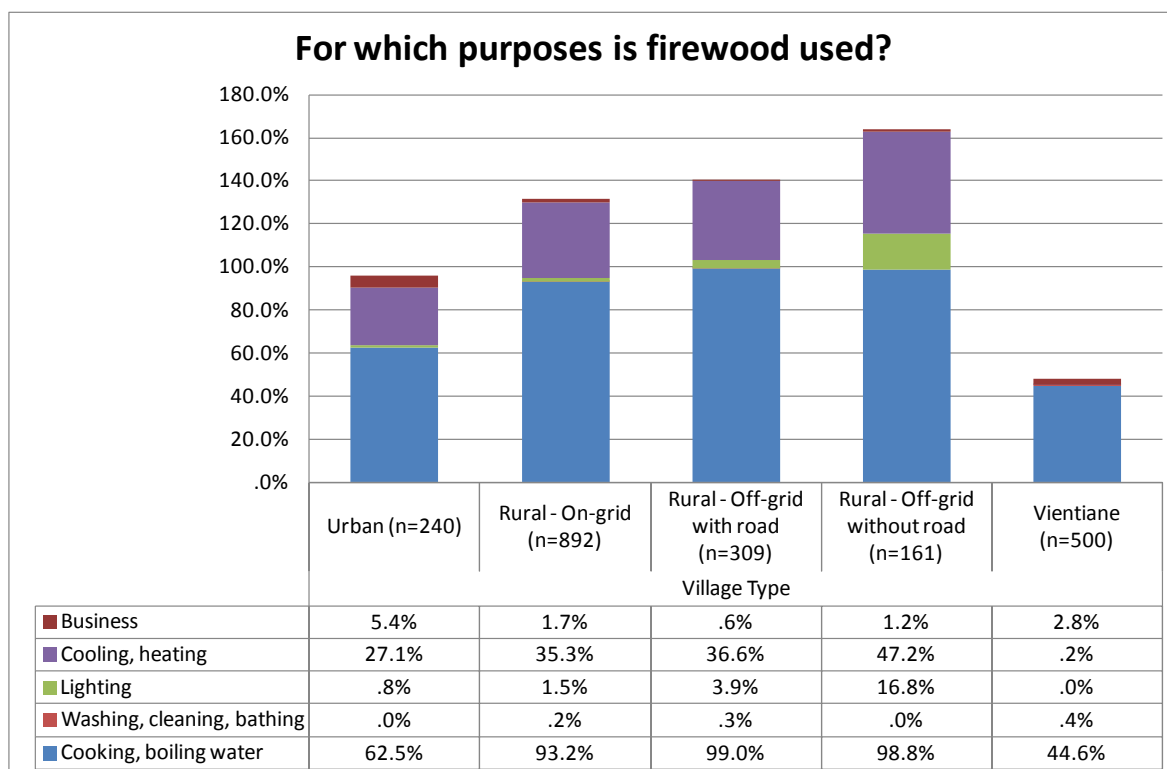


Figure 5.4. Purposes of using firewood by village type.

The households below the poverty line used firewood for more purposes than the households above the poverty line: 93% (compared to 66% within the households above the poverty line) used it for cooking, 29% (26%) for heating, and 4.1% (1.1%) for lighting. Households above the poverty line used wood slightly more often for business purposes, 3.1% compared to 1.3%.

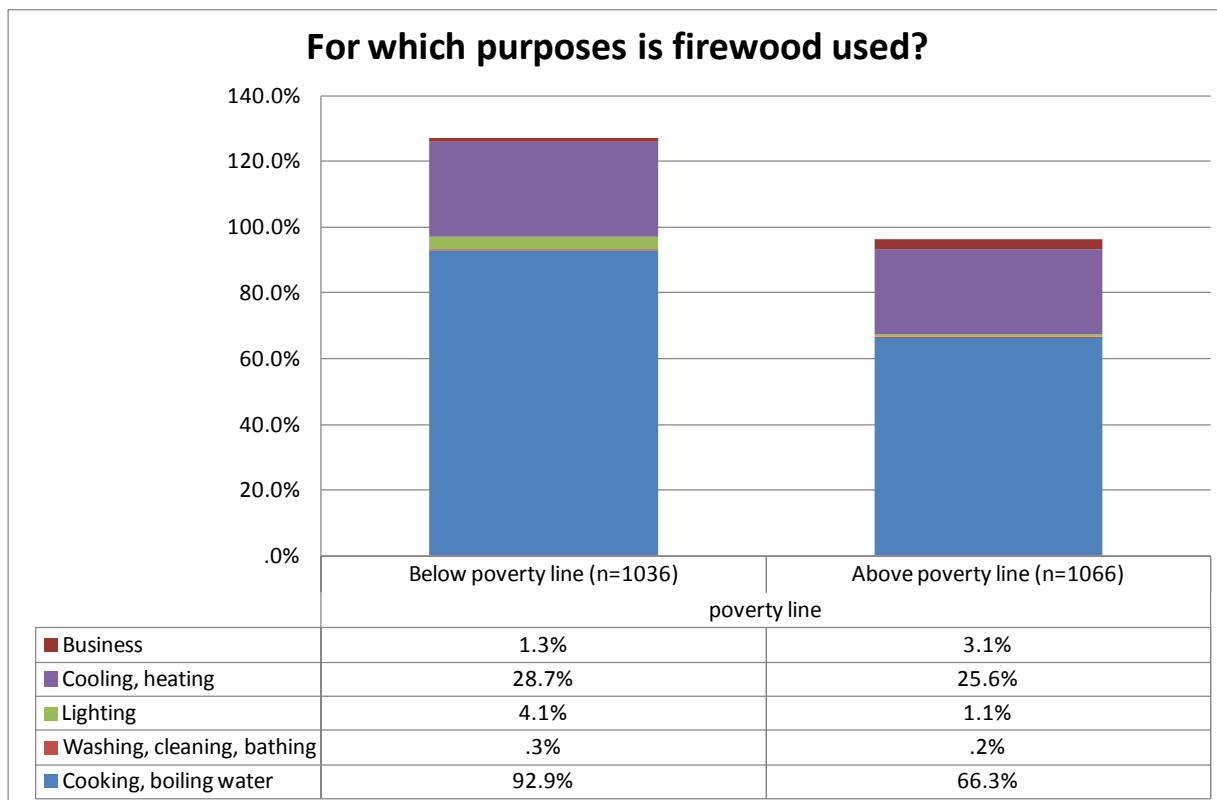


Figure 5.5. Purposes of using firewood by the poverty line.

### 5.1.2. Vegetal wastes

It was more common for the households in Vientiane (29%) to use vegetal wastes (that is, leaves, bark, branches, straw and husk) than for the households living elsewhere in Laos (7.9-27%). Households in rural off-grid villages without road used vegetal wastes the second most, while other urban households used leaves, bark, branches, straw and husk the least (7.9%).

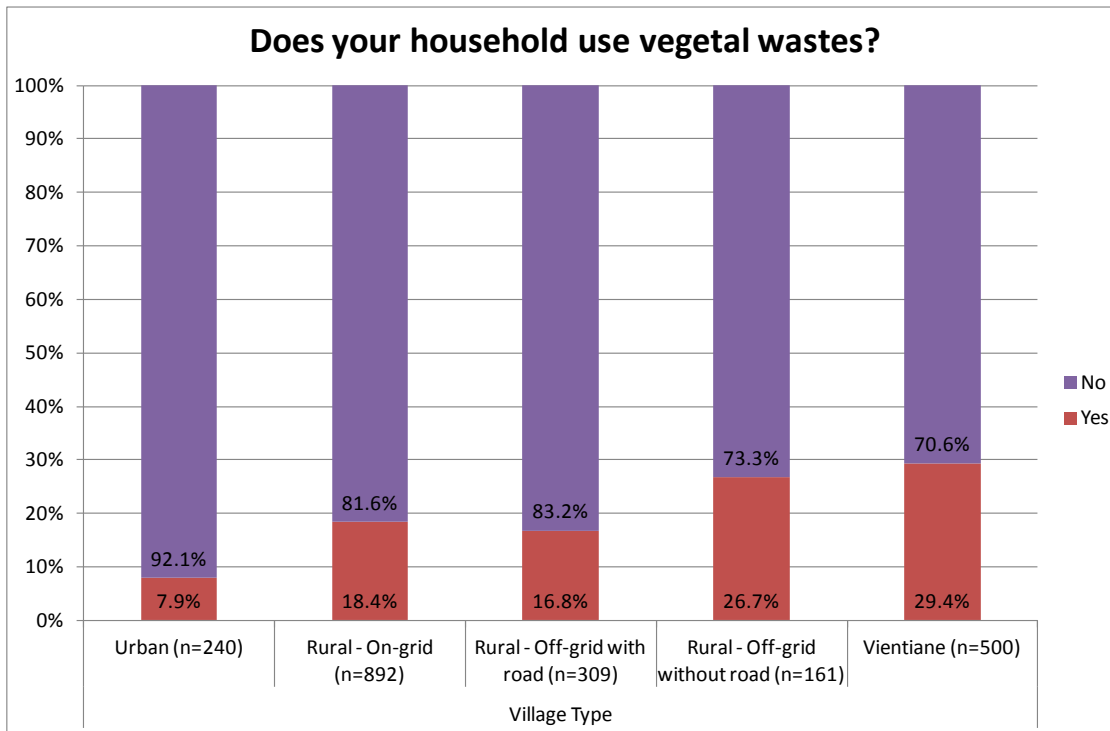


Figure 5.6. Using vegetal wastes by village type ( $\chi^2=56.9$ ,  $df=4$ ,  $p<0.001$ ).

Households above the poverty line were using vegetal wastes for energy almost twice as much as households below the poverty line, 26% compared to 15%.

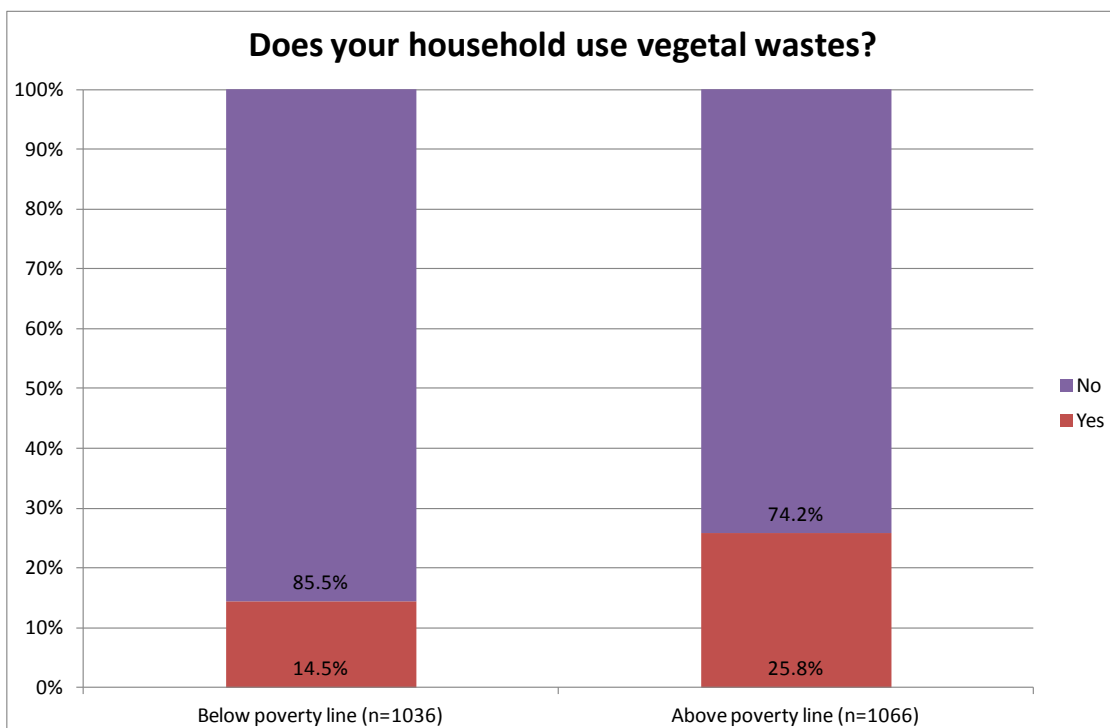


Figure 5.7. Using vegetal wastes by the poverty line ( $\chi^2=41.7$ ,  $df=1$ ,  $p<0.001$ ).

Cooking and boiling water was the most common usage for vegetal wastes, such as leaves, bark, branches, straw, and husk. Unexpectedly, households in Vientiane used vegetal wastes for cooking more often than

the others, 29% compared to 7.9% in urban areas, 18% in rural on-grid villages, 17% in rural off-grid villages with road access, and 26% in rural off-grid villages without road access. The second most common type of use for vegetal wastes was lighting, practiced by 0%, 2.5%, 10%, 7.1%, and 16% of the households in the respective order.

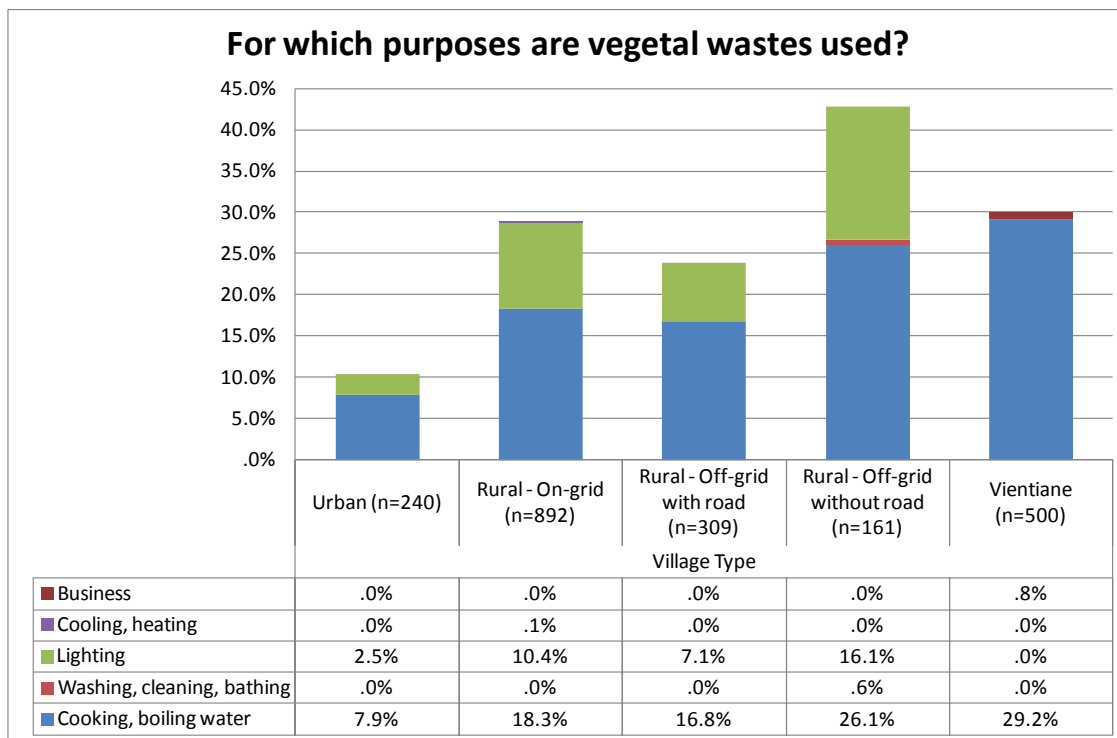


Figure 5.8. Purposes of using vegetal wastes by village type.

Households above the poverty line used vegetal wastes more than households below the line. A quarter (26%) of the former used vegetal wastes for cooking and 9.1% for lighting, while 14% of the latter cooked and 4.8% lighted the house with vegetal wastes.

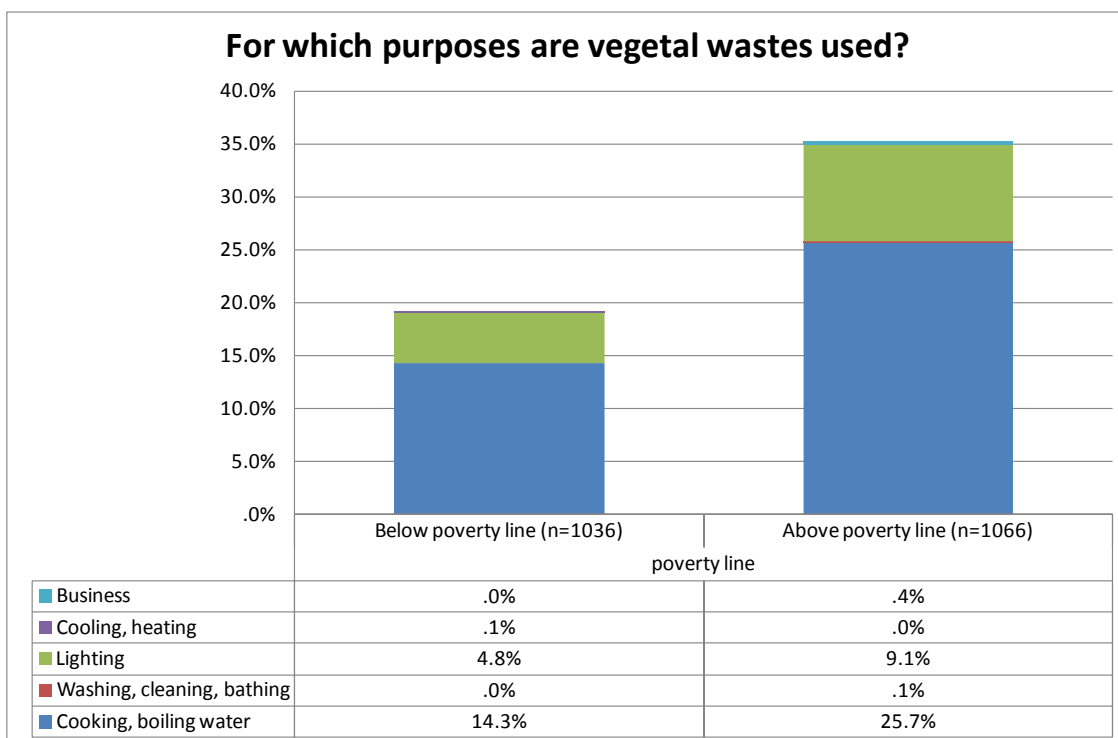


Figure 5.9. Purposes of using vegetal wastes by the poverty line.

### 5.1.3. Candles and vegetable oil

Households in rural off-grid villages used less candles or vegetable oil for energy (32–34%) than households in the electrified areas of Laos. The same share was 60% in rural on-grid areas, 65% in urban areas and 93% in Vientiane.

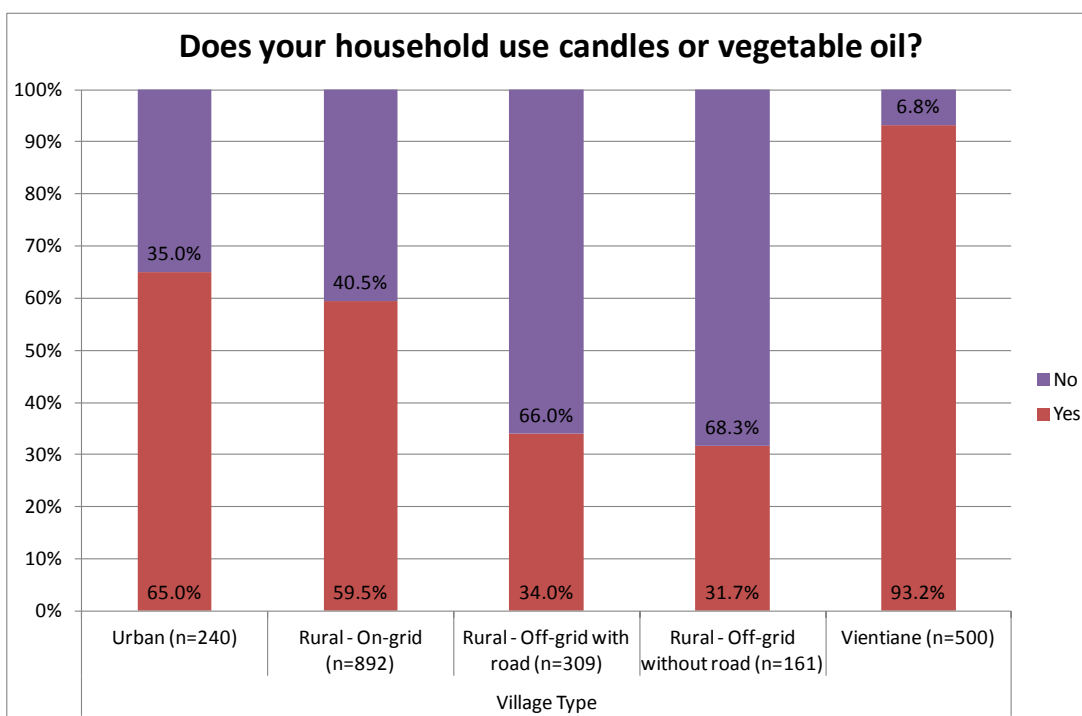


Figure 5.10. Using candles or vegetable oil by village type ( $\chi^2=376.6$ ,  $df=4$ ,  $p<0.001$ ).

Households above the poverty line used candles or vegetable oil almost twice as commonly as households below the poverty line: 81% versus 43%.

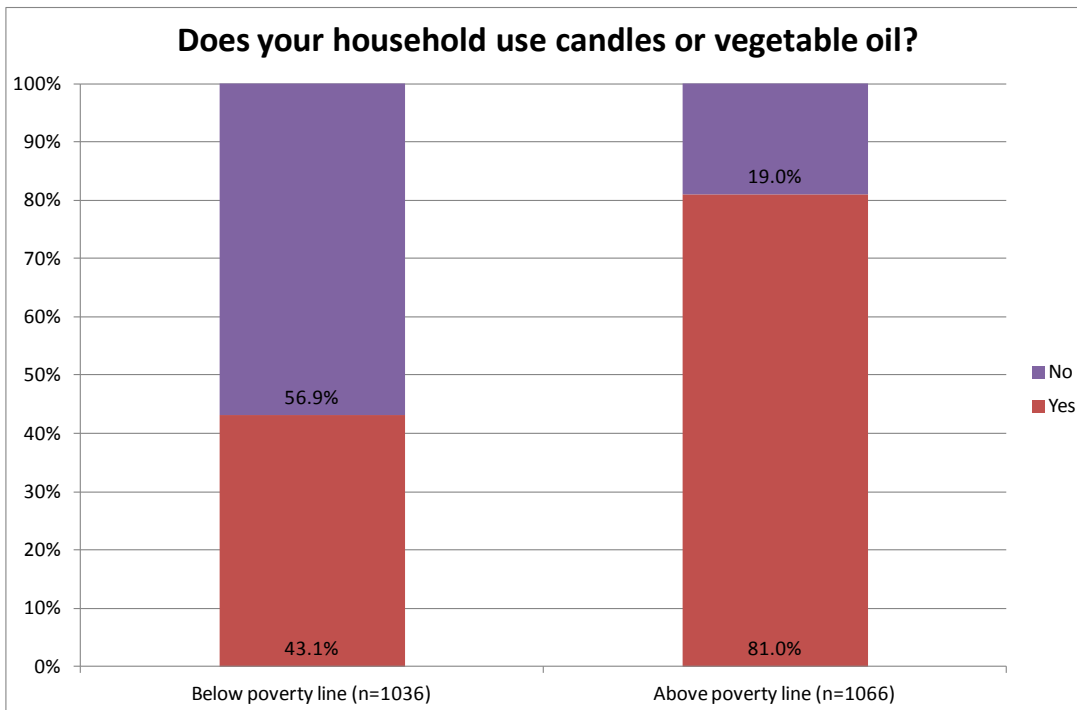


Figure 5.11. Using candles or vegetable oil by the poverty line ( $\chi^2=321.3$ ,  $df=1$ ,  $p<0.001$ ).

Households in Vientiane used candles more than households in other parts of Laos. In Vientiane, 91% said they use candles or vegetable oil for communication and entertainment, and 89% said they use them for lighting. Outside Vientiane, candles and vegetable oil were mainly used for lighting: 65% of the households in urban areas, 59% of rural on-grid, 33% of rural off-grid with road access, and 32% without road access lighted their houses either by candles or by vegetable oil.

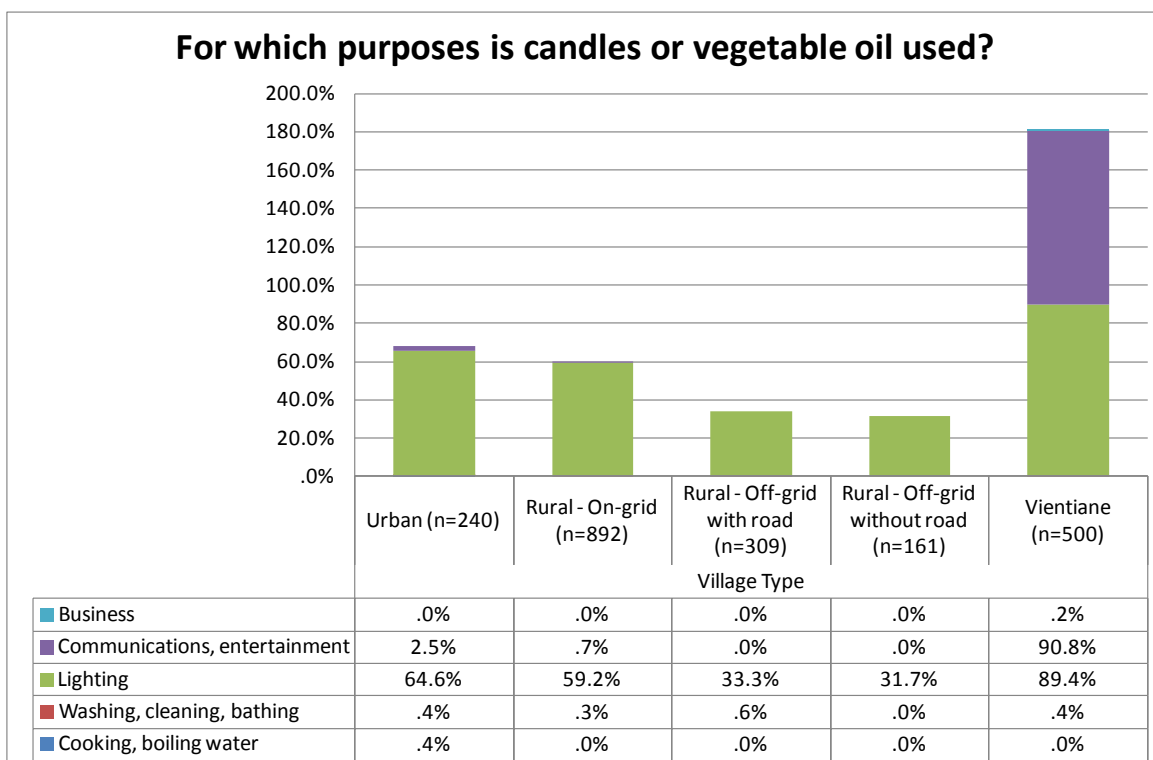


Figure 5.12. Purposes of using candles or vegetable oil by village type.

Households above the poverty line used candles and vegetable oil more than households below the line: 79% used them for lighting and 41% for communication and entertainment, while the respective figures within households below the poverty line were 43% and 2.9%.

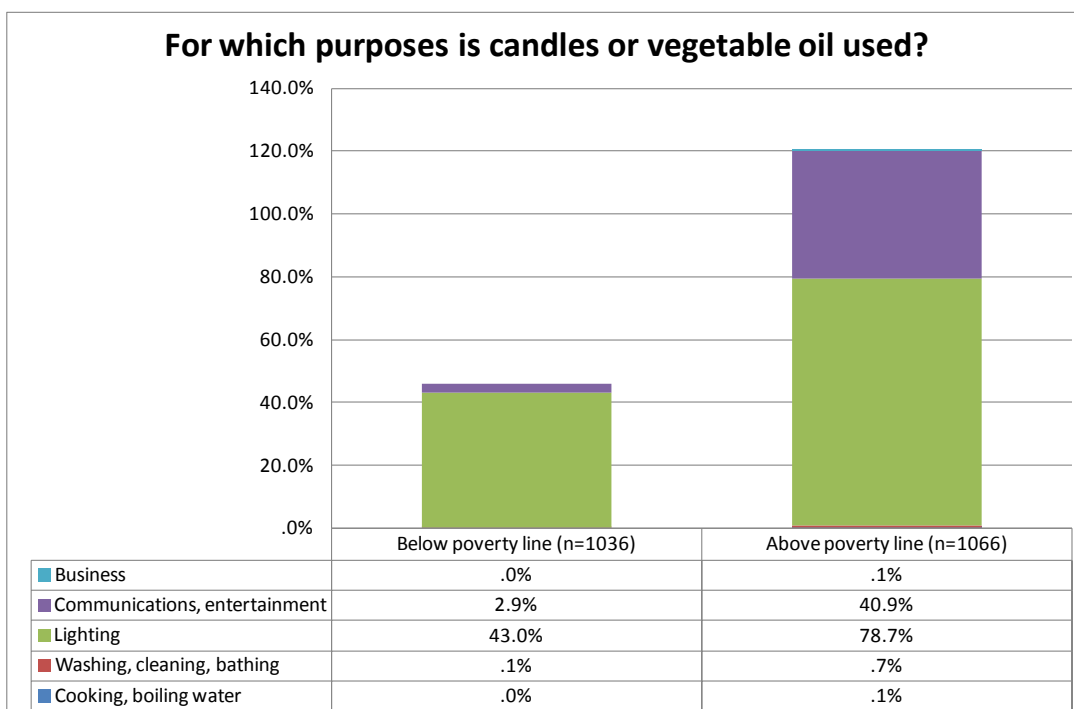


Figure 5.13. Purposes of using candles or vegetable oil by the poverty line.

### 5.1.4. Charcoal

The differences in the frequency of using charcoal were striking. 93% of the households in Vientiane and 81% in urban areas used charcoal, while the usage in rural areas was less common (36% in rural on-grid, 28% in rural off-grid with road and 16% in rural off-grid without road).

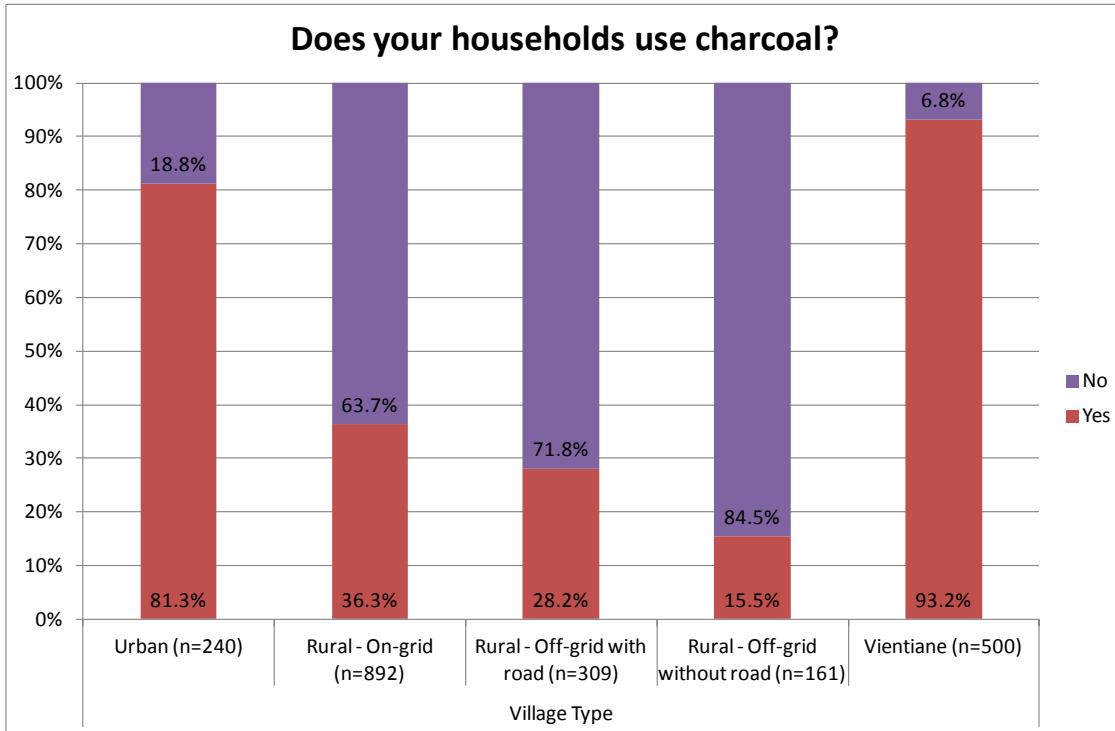


Figure 5.14. Using charcoal by village type ( $\chi^2=666.5$ ,  $df=4$ ,  $p<0.001$ ).

It was more common for households above the poverty line to use charcoal (68%) than for households below the poverty line (36%). The difference is statistically significant.

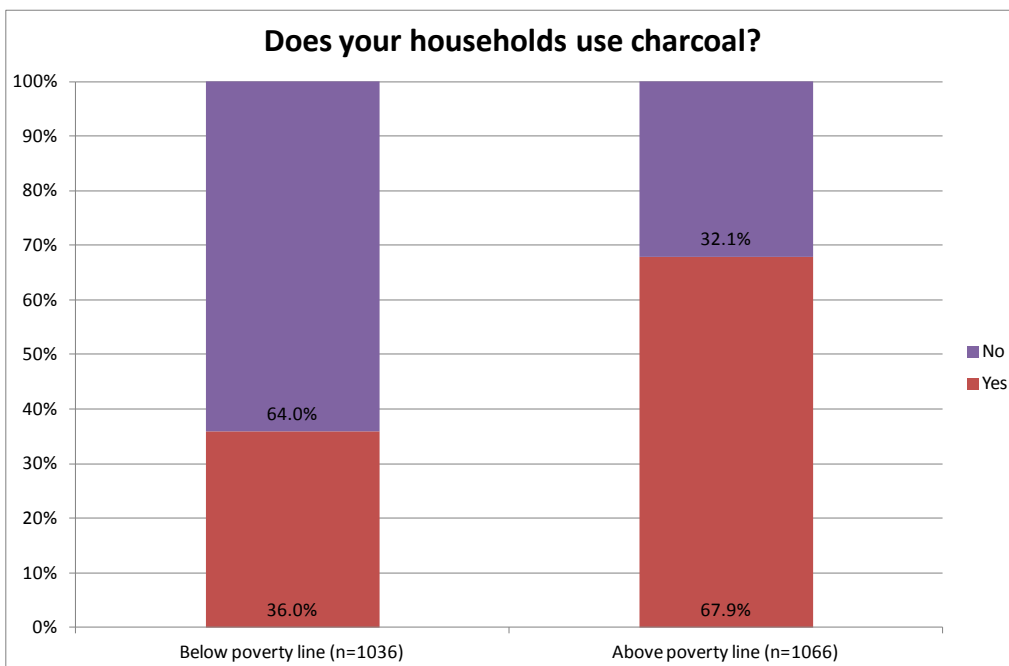


Figure 5.15. Using charcoal by the poverty line ( $\chi^2=214.5$ ,  $df=1$ ,  $p<0.001$ )



Charcoal was used mainly in urban areas, and the most common purpose for using it was cooking and boiling water. In Vientiane, 93% used charcoal for cooking and 5.0% for business activities. In other urban areas, 81% used charcoal for cooking, 12% for heating, 4.6% for business activities and 1.3% for lighting. In rural on-grid villages, over a third (36%) cooked or boiled water by charcoal, 5.5% heated their house with it and 1.1% used it for their businesses. In rural off-grid villages with road access, the respective figures were 20%, 8.7% and 1.9%, and in rural villages without road access, these figures were 9.3%, 6.2% and 0.0%.

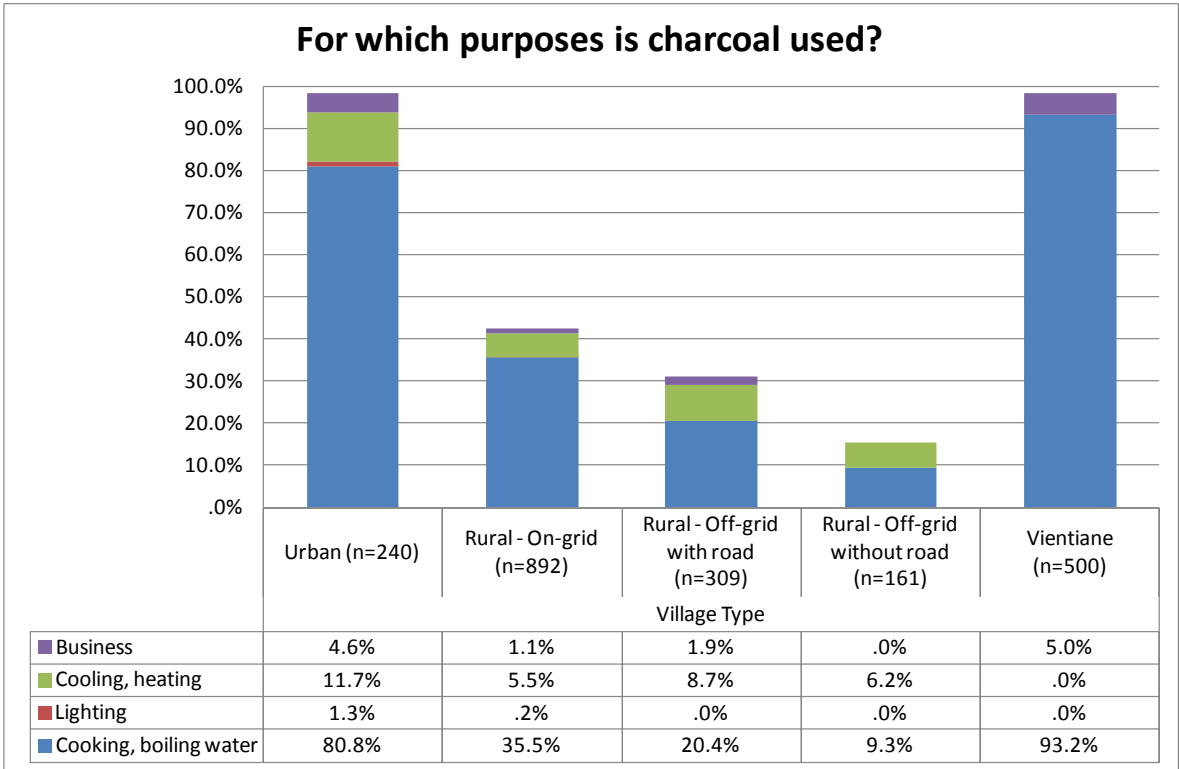


Figure 5.16. Purposes of using charcoal by village type.

Similarly, two thirds of the households above the poverty line and one third of households below the poverty line used charcoal for cooking. Regarding heating, the difference was much smaller: 6.5% compared to 4.3%, respectively. The wealthier households also used charcoal slightly more often for business purposes, 3.7% as opposed to 1.3% within the households below the poverty line.

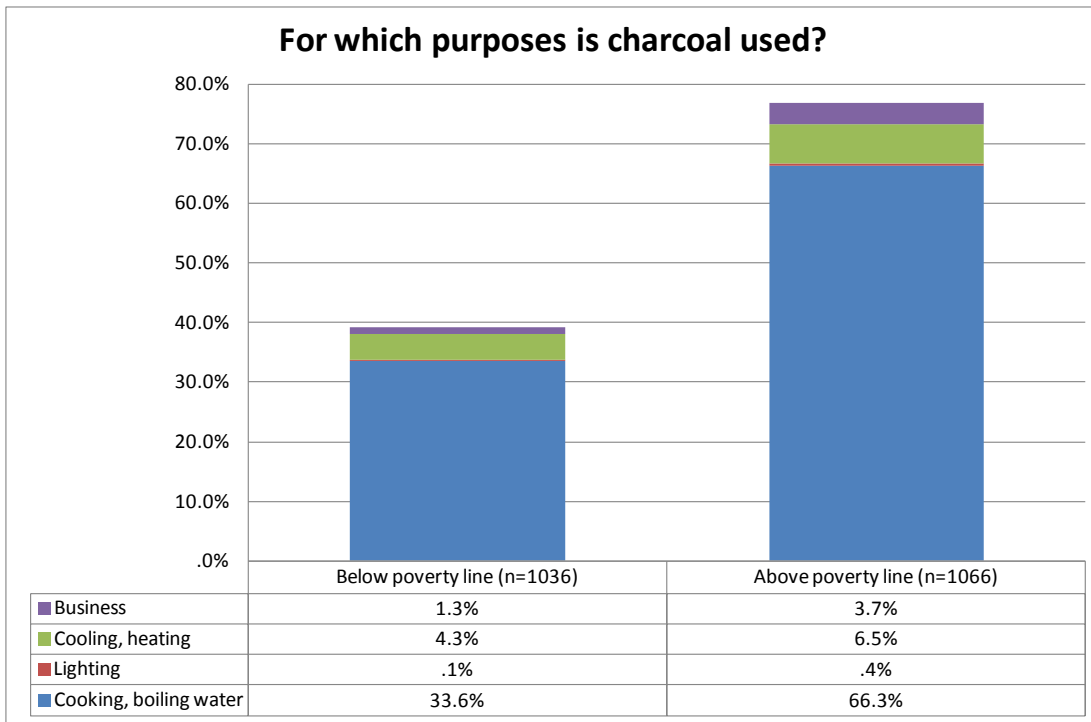


Figure 5.17. Purposes of using charcoal by the poverty line.

### 5.1.5. Kerosene

Overall, kerosene was used fairly little in Laos, and mainly in non-electrified areas. The shares of households using kerosene were 15% in rural off-grid without road, 11% in rural off-grid with road, 1.6% in rural on-grid, 0.8% in urban areas and 0% in Vientiane. It seems that households that had access to the electricity grid did not need to use kerosene.

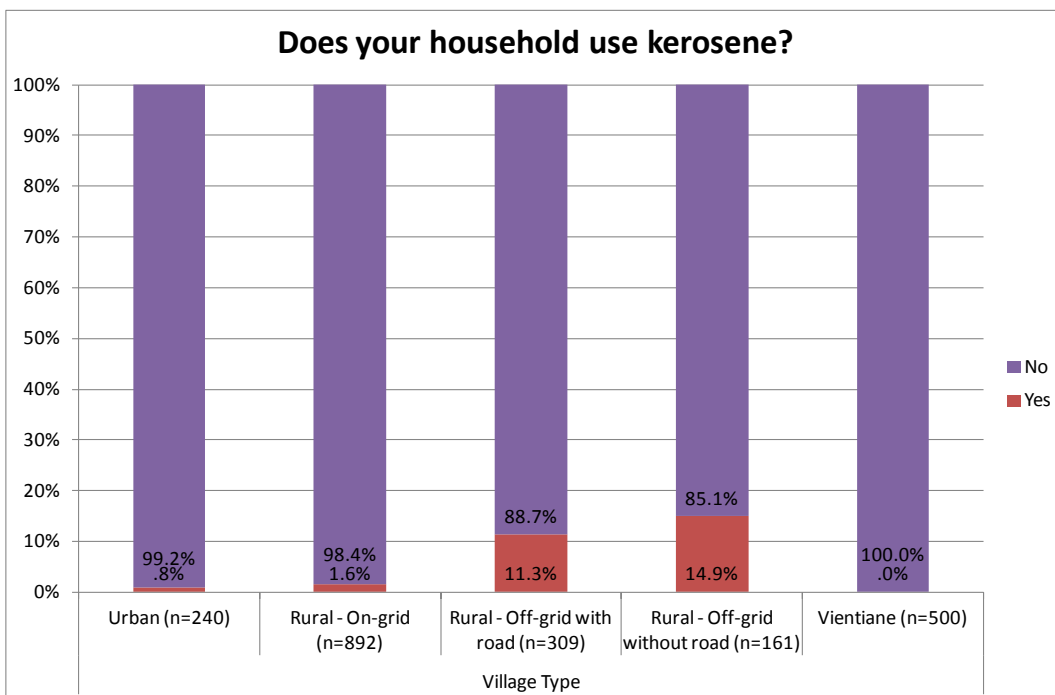


Figure 5.18. Using kerosene by village type ( $\chi^2=148.3$ ,  $df=4$ ,  $p<0.001$ ).

Households above the poverty line barely used kerosene as an energy source (0.8%), while households below the poverty line used kerosene considerably more (6.4%). The only purpose of using kerosene was lighting.

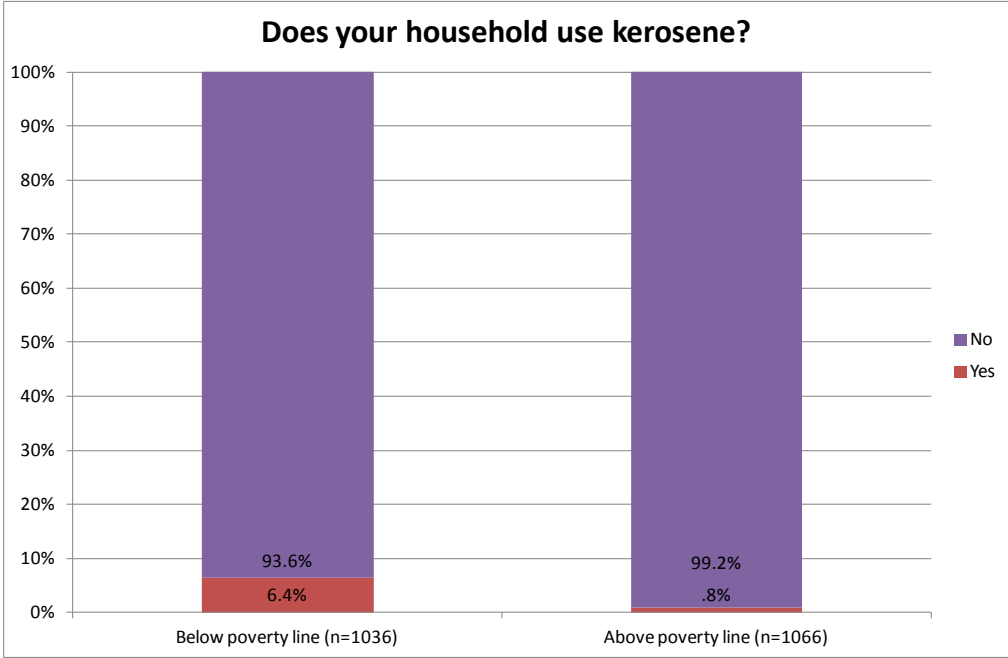


Figure 5.19. Using kerosene by the poverty line ( $\chi^2=46.6, df=1, p<0.001$ ).

### 5.1.6. Electricity

As expected, almost every household connected to an electricity grid used electricity. In addition, more than half of the off-grid households utilized some form of electricity. 61% of rural off-grid households with road access and 48% without road access had access to some electricity source other than national grid.

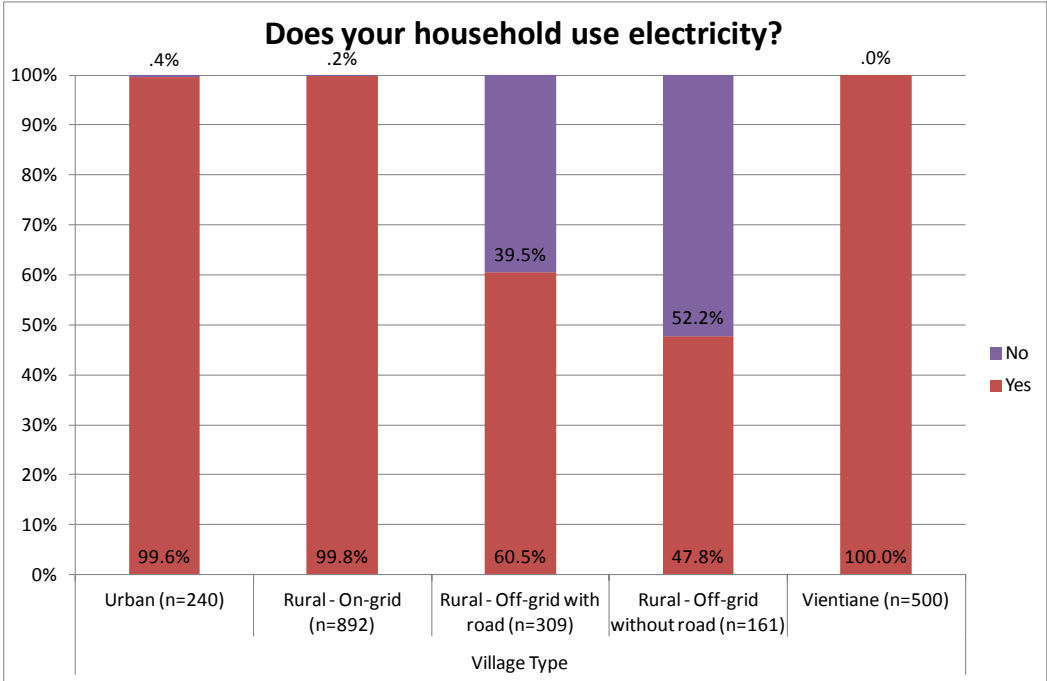


Figure 5.20. Using electricity by village type ( $\chi^2=795.4, df=4, p<0.001$ ).

97% of households above the poverty line were using electricity from some source. On the other hand, households below the poverty line were using electricity a little less often (83%). There is statistically significant difference between these two groups.

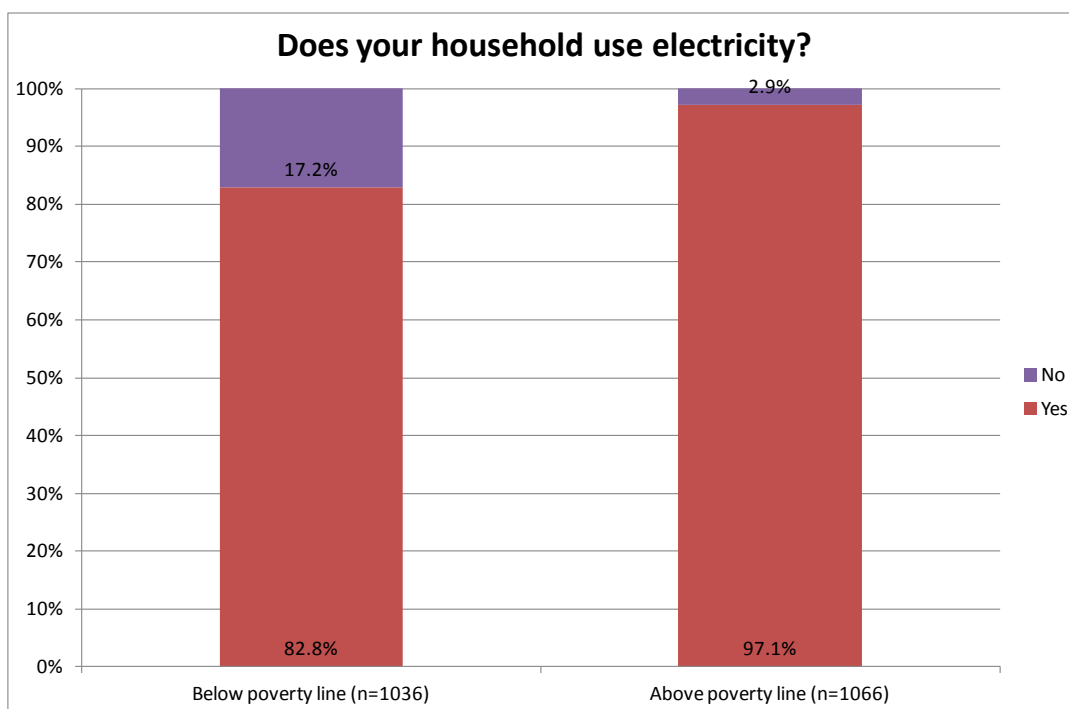


Figure 5.21. Using electricity by the poverty line ( $\chi^2=119.5$ ,  $df=1$ ,  $p<0.001$ ).

As can be expected, in electrified areas, the purposes of using electricity had a larger variety, compared to areas outside electricity grid. In Vientiane, all households used electricity for lighting, cooling or heating, and communications and entertainment. Most (96%) used electricity for cooking or boiling water, 61% for washing and cleaning, and nearly a third (31%) for their businesses. In other urban areas, 99% used electricity for lighting, 92% for entertainment, 89% for cooling or heating, 70% for cooking or boiling water, 27% for washing and cleaning, 21% for business, and 2.1% for agricultural activities. In rural on-grid villages, the purposes of use are similar but the rates of use are slightly lower: 99% lighting, 87% entertainment, 77% cooling or heating, 45% cooking or boiling water, 7.4% business use, 5.2% washing and cleaning, and 1.6% agriculture. Off-grid villages used electricity mainly for lighting and communication or entertainment: in villages with road access, 58% used electricity for lighting and 35% for communications, while in villages without road access, the respective shares were 46% and 15%.

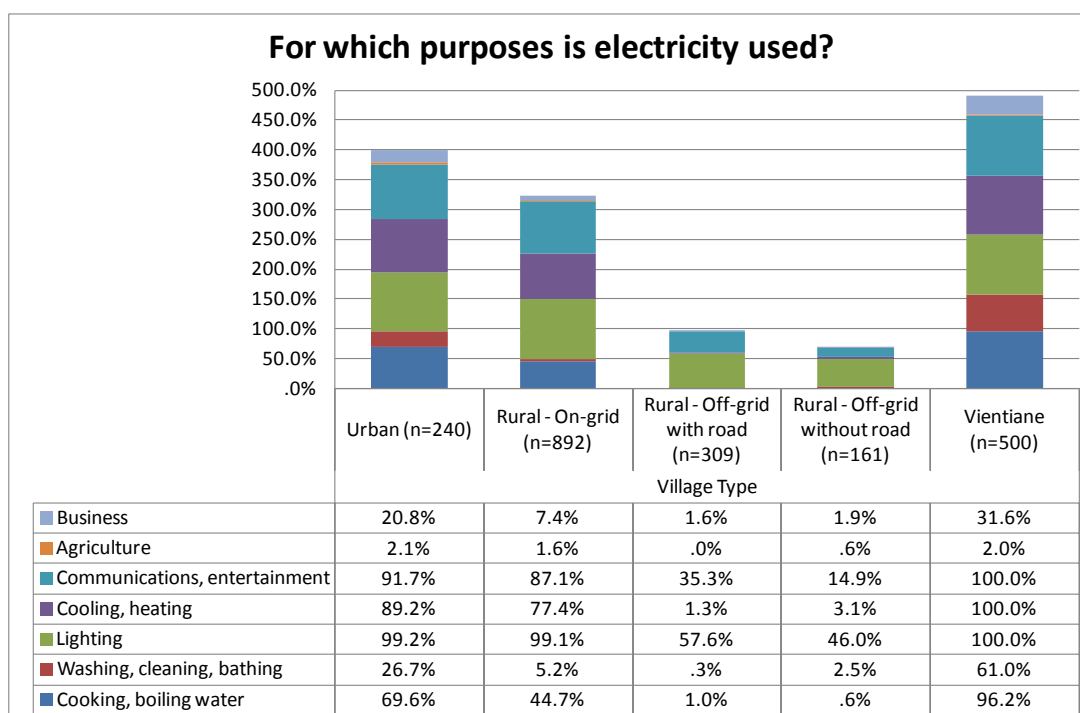


Figure 5.22. Purposes of using electricity by village type.

Households above the poverty line used electricity more commonly for each of the specified purposes. The greatest difference was related to cooking, which was practiced by 73% of the households above the poverty line and 26% of the households below the poverty line. The following largest differences were related to cooling or heating (practiced by 86% of the households above the poverty line and 47% below it), communication and entertainment (93% and 62%), washing and cleaning (35% and 4.3%), business use (21% and 5.4%), lighting (97% and 81%), and finally, agriculture (1.9% and 1.0%).

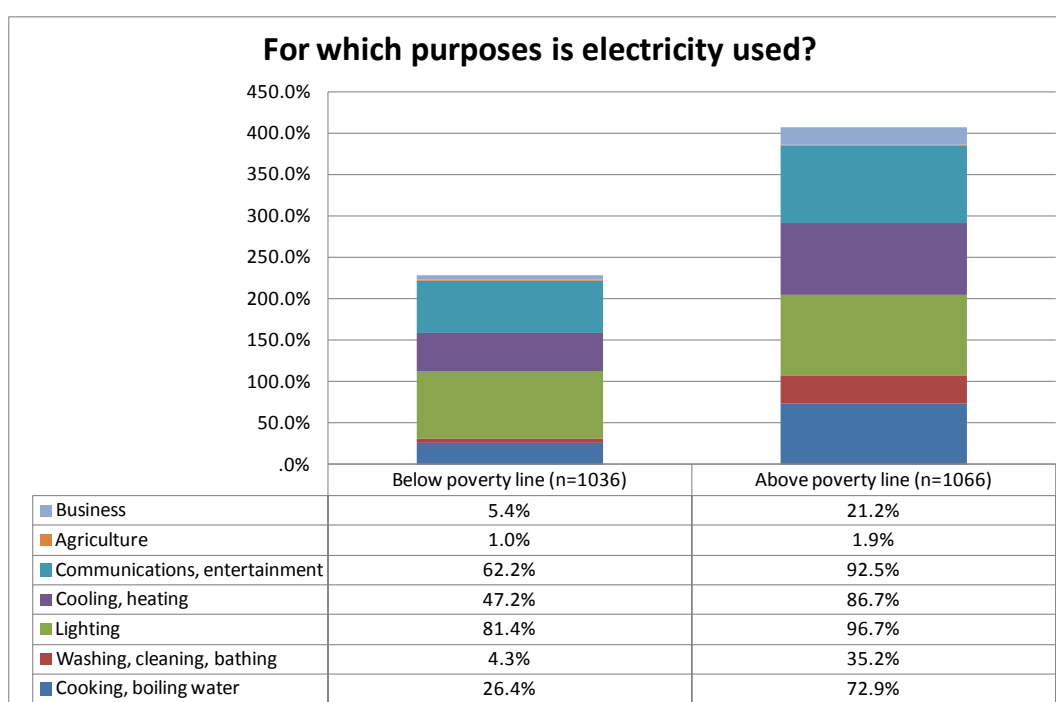


Figure 5.23. Purposes of using electricity by the poverty line.

### 5.1.7. LPG

Almost none of the households in rural areas used liquid petroleum gas (LPG). LPG was more common in urban areas with 4% of households utilizing it. In Vientiane, fifth of the households used LPG.

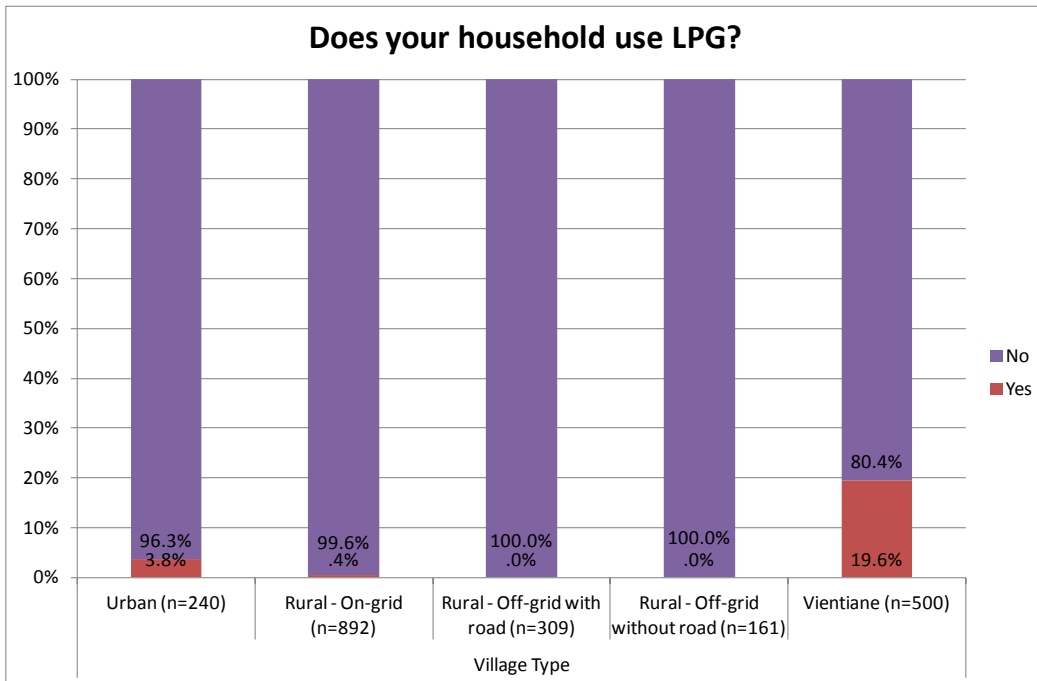


Figure 5.24. Using LPG by village type ( $\chi^2=273.9$ ,  $df=4$ ,  $p<0.001$ ).

Only 0.8% of the households below the poverty line used LPG. The situation was different in households above the poverty line with 10% using gas for cooking. Difference between these two groups is statistically significant.

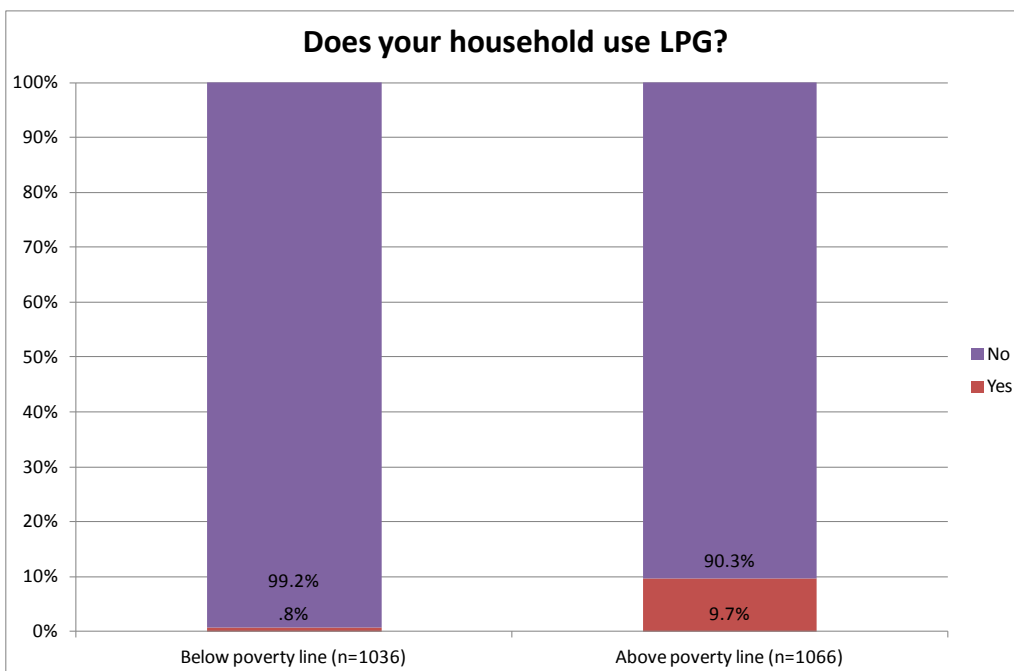


Figure 5.25. Using LPG by the poverty line ( $\chi^2=83.0$ ,  $df=1$ ,  $p<0.001$ ).

LPG was used only in the electrified, mainly urban villages, with the main purpose of use being cooking or boiling water. In Vientiane, 20%, and in other urban areas, 3.8% of the households cooked or boiled water with LPG. The other purposes of use were only marginal. Similarly, 9.7% of households above the poverty line cooked or boiled water with LPG, while the respective figure within households below the poverty line was only 0.8%.

### 5.2. Sources of electricity

In the locations where the households were connected to an electricity grid, nearly every household received the electricity they used from the grid, and rarely from other sources. In off-grid villages, on the contrary, there was a variety of electricity sources. Comparing off-grid households with and without road access, micro or pico hydro was the most common electricity source (utilized by 20% and 26%), followed by batteries (20% and 6.2%), solar panels (16% and 6.8%), and diesel or petrol generators (5.8% and 7.5%). Some off-grid households also stated using grid electricity, which presumably refers to small local grids.

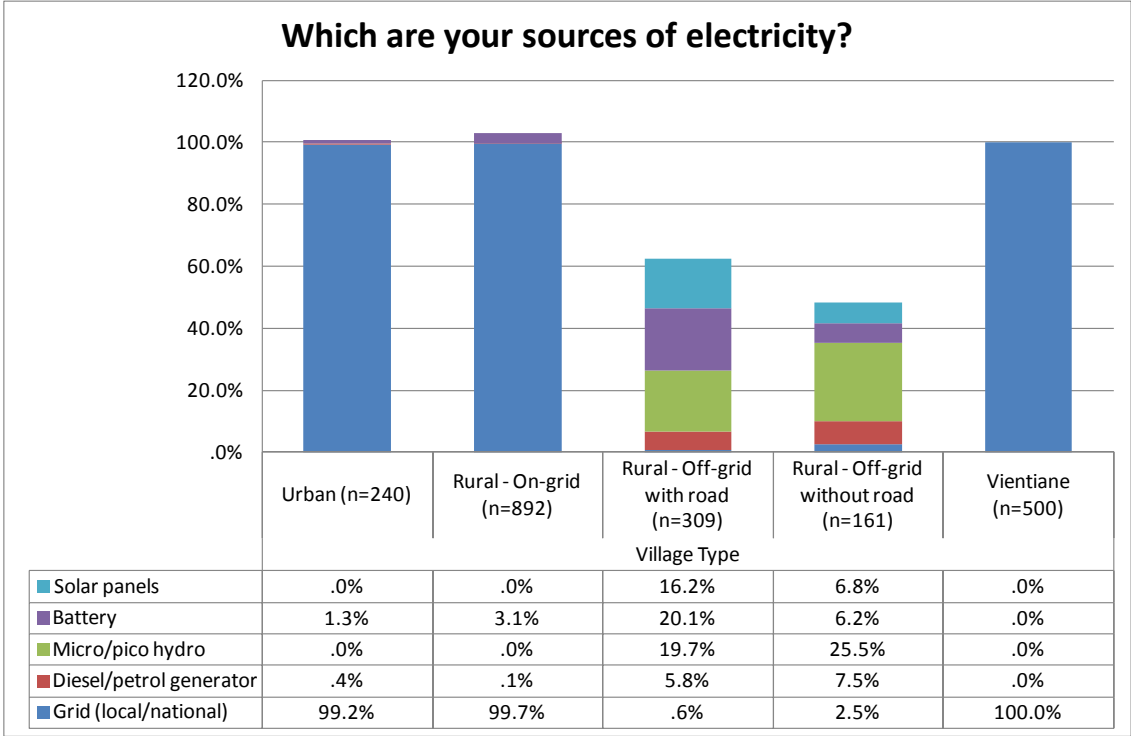


Figure 5.26. Sources of electricity by village type.

Most households above the poverty line received their electricity from grid (93%), and only a few percent from other sources. As for households below the poverty line, grid was the source of electricity for 62%, battery for 8.2%, micro or pico hydro for 8.3%, solar panels for 4.4%, and diesel or petrol generators for 2.1%.

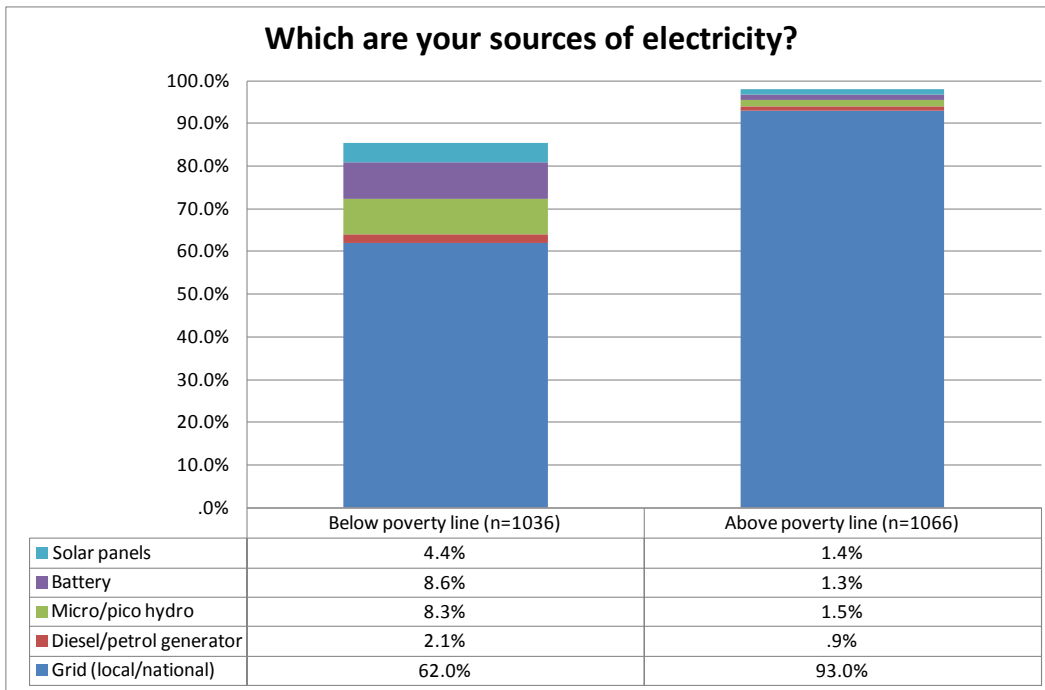


Figure 5.27. Sources of electricity by the poverty line.

We also asked the households whether there had been accidents in their village related to pico hydro. Out of 173 households whose villages were using pico hydro, only three (1.7%) had experienced this type of accidents.

### 5.3. Collected or produced energy

Almost every household in rural areas (94–100%) collected or produced firewood, plant residues or charcoal for their own energy use. In urban areas the situation was completely different with 35% of the households in urban areas and 38% in Vientiane collecting or producing one or more of the listed energy types.

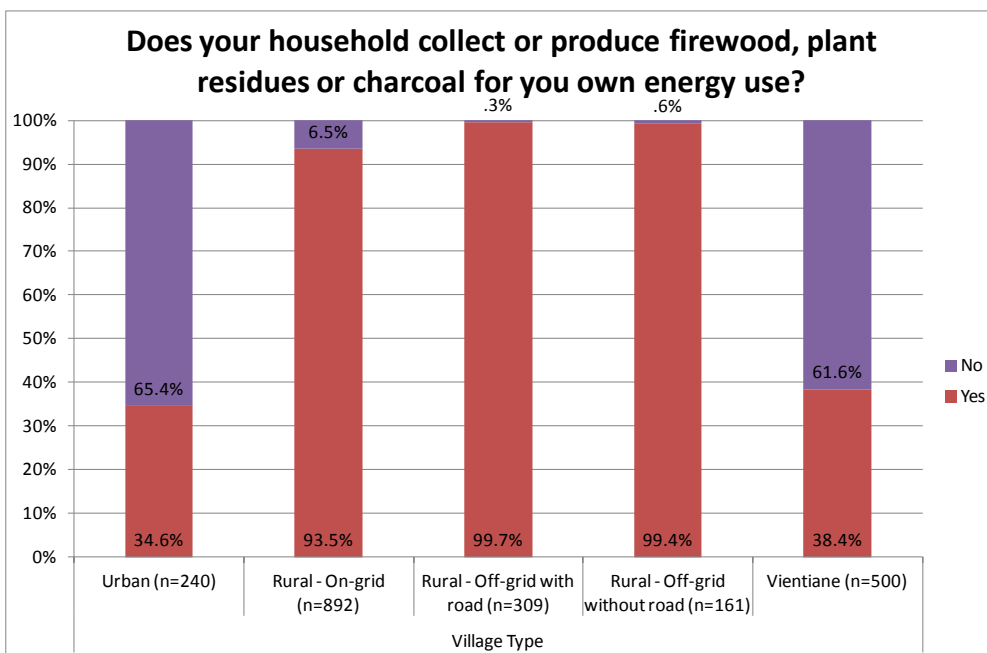


Figure 5.28. Collecting firewood or vegetal wastes, or producing charcoal for own use by village type ( $\chi^2=881.0$ ,  $df=4$ ,  $p<0.001$ ).



Almost every (93%) household below the poverty line collected firewood or plant residues, or produced charcoal. The respective percentage for the households above the poverty line was significantly less, 58%.

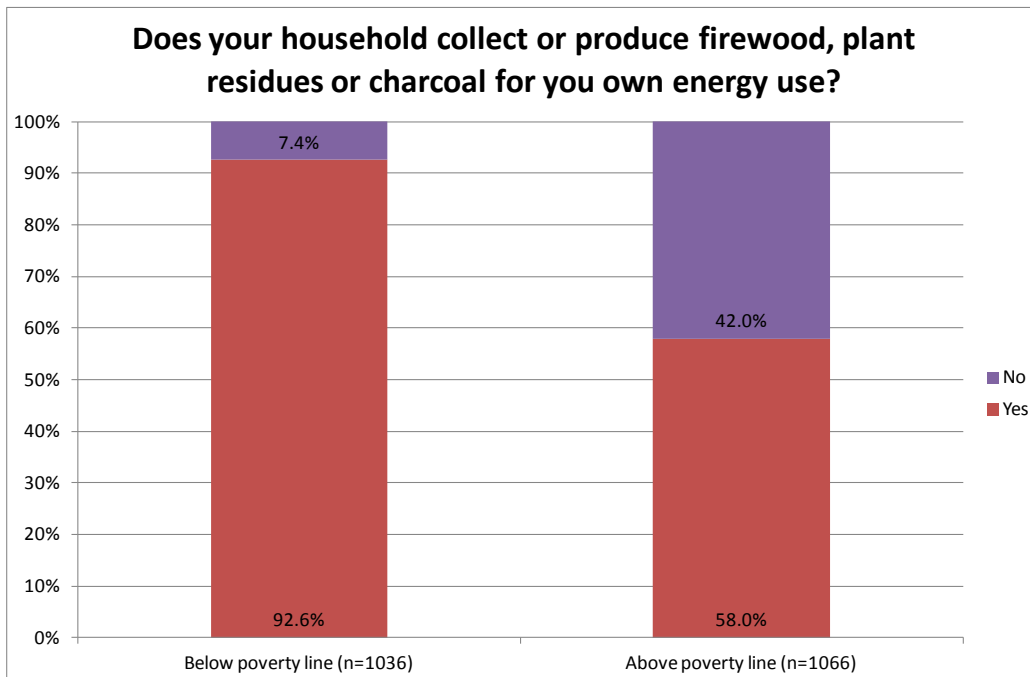


Figure 5.29. Collecting firewood or vegetal wastes, or producing charcoal for own use by the poverty line ( $\chi^2=335.5$ ,  $df=1$ ,  $p<0.001$ ).

Out of the collected or produced energy, firewood collection was the most common. While a third of urban households collected firewood, nearly all (99%) rural off-grid, and most rural on-grid (92%) households, practiced this activity. Plant residues were collected by 6.7% in urban areas, and 15–27% in rural villages. Producing charcoal at home was the most common in rural off-grid villages with road access (23%), followed by rural on-grid (15%), rural off-grid without road access (11%), and urban (5.8%).

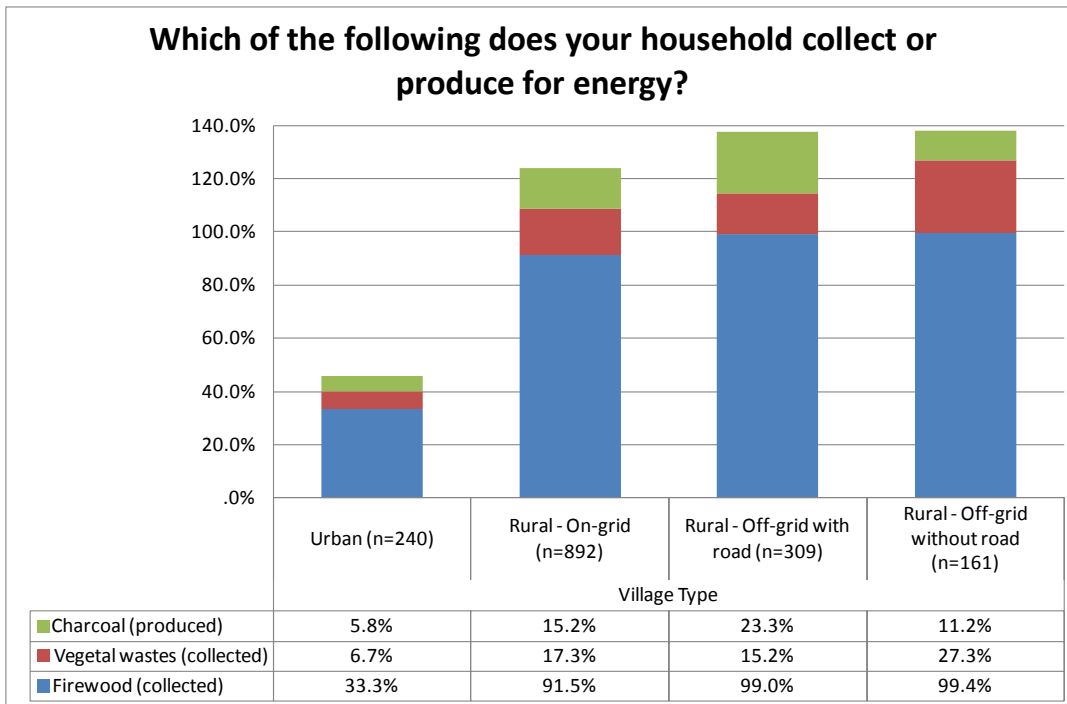


Figure 5.30. Collecting firewood or vegetal wastes, or producing charcoal for own use by village type (not asked in the Vientiane survey).

Households below the poverty line collected firewood (93%) and produced charcoal (17%) more often than the household below the poverty line (72% and 11%, respectively), although it was more common for the latter to collect vegetal wastes (practiced by 22%, compared to 13% within the households below the poverty line).

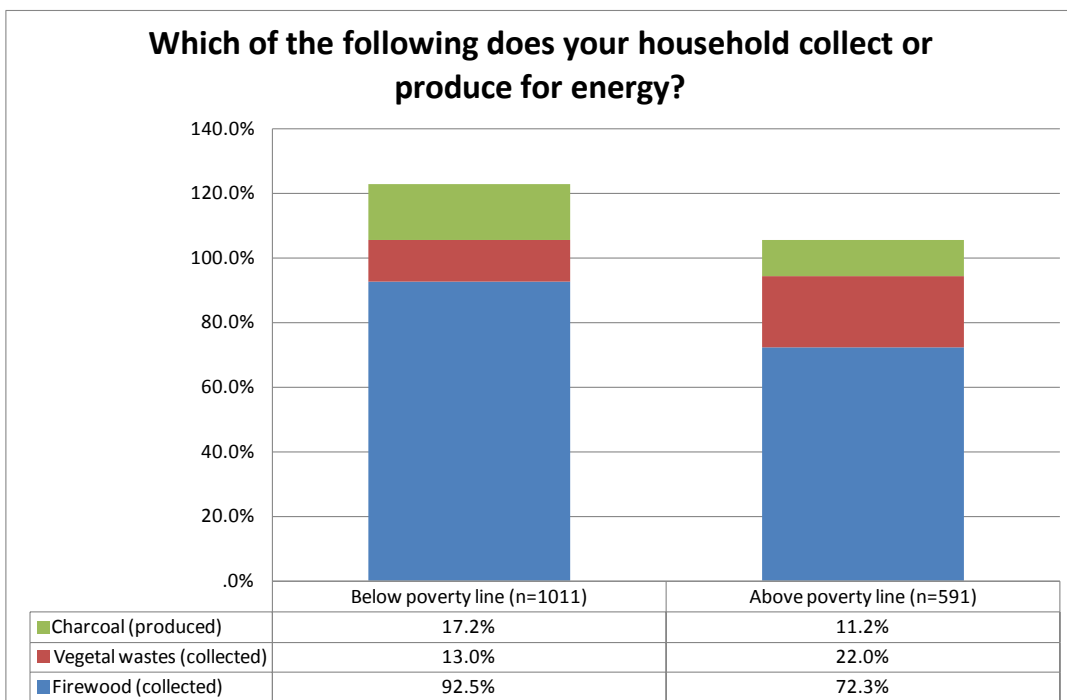


Figure 5.31. Collecting firewood or vegetal wastes, or producing charcoal for own use by the poverty line.

### 5.4. Purchased energy

It was more common for the households in Vientiane to buy charcoal (93%) and plant residues (15%) than for others. Three quarters of other urban households bought charcoal, while rural households bought charcoal substantially less (22% in on-grid villages, 4.9% in off-grid villages with road, and 3.7% in off-grid villages without road). Wood was bought by 30% of urban households, 10% of households in Vientiane, and 3.6% by rural on-grid households. Outside Vientiane hardly anyone bought plant residues. In rural villages, especially non-electrified, buying any of these fuels was uncommon.

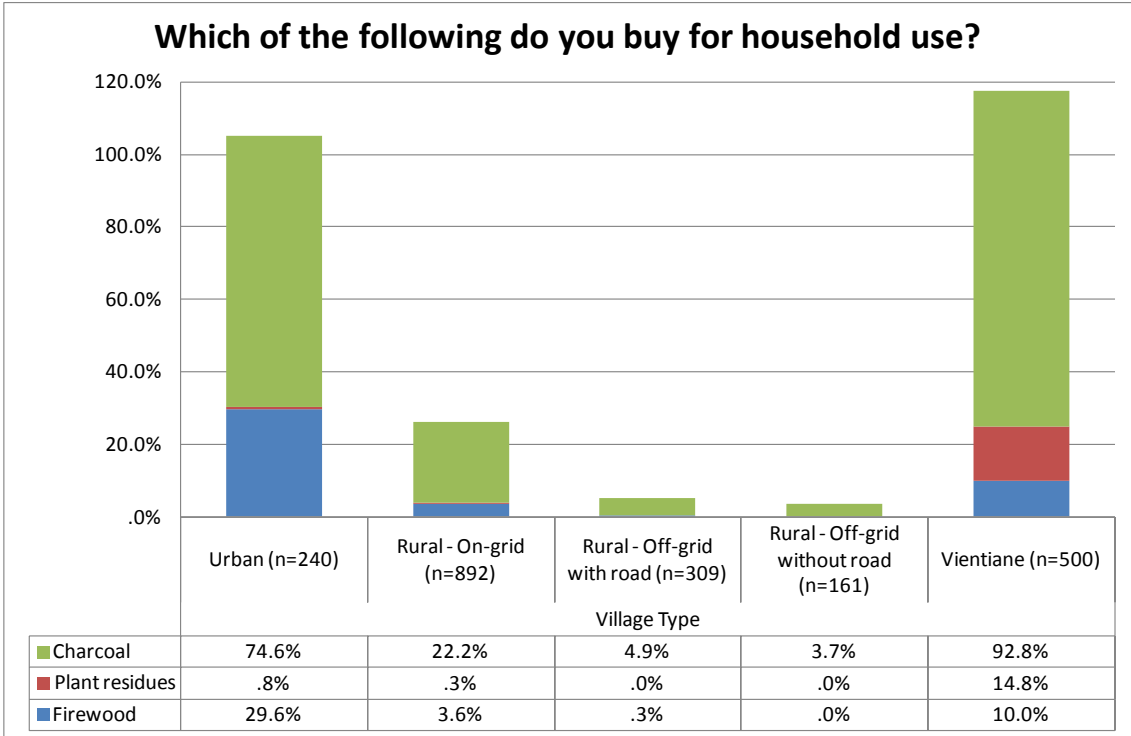


Figure 5.32. Purchased firewood, plant residues or charcoal by village type

Overall, households above the poverty line bought more charcoal, vegetal wastes and firewood for domestic purposes. A fifth of households below the poverty line and 62% of households above the poverty line bought charcoal, and the respective figures for firewood were 3.1% and 11%, and for vegetal wastes, 0.8% and 6.7%. In the Vientiane capital region plant residues were also purchased in 14,6 % of households.

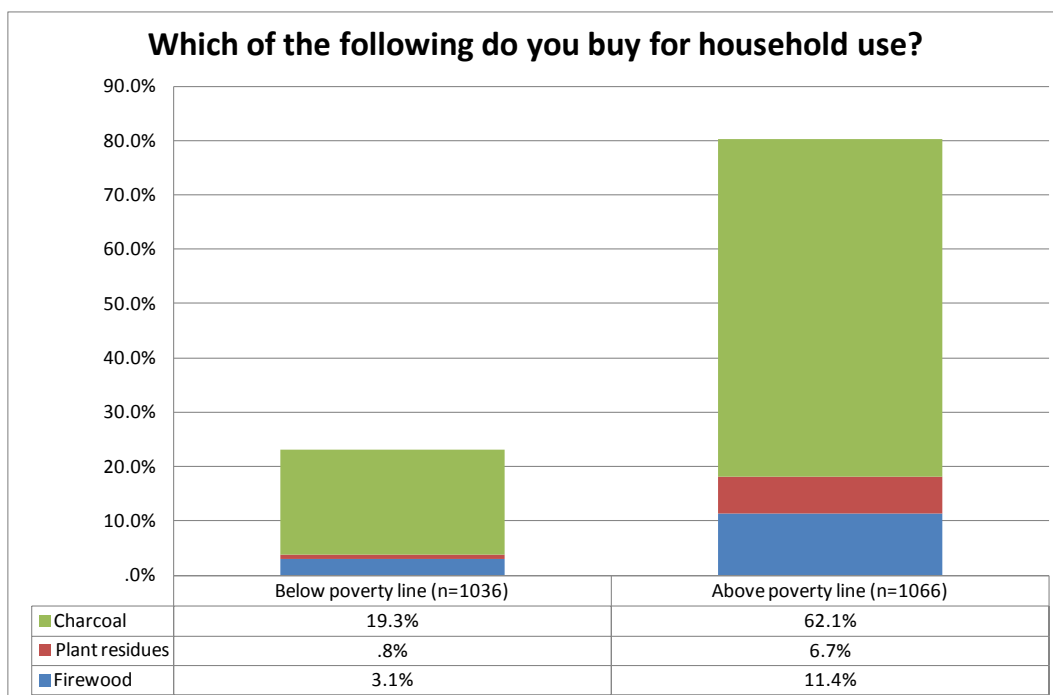


Figure 5.33. Purchased firewood, plant residues or charcoal by the poverty line.

Households were asked which commercial fuels they buy for their own use. The most common items were petrol (for transport), grid electricity, candles, and diesel (for transport). In Vientiane, the households bought more commercial fuels than elsewhere in Laos: nearly all bought petrol, grid electricity, and candles (94%-98%), 40% bought diesel, and 19% bought LPG. The shares in other urban and rural on-grid areas were similar, but generally slightly lower. Kerosene, petrol or diesel (for a generator), and solar and battery electricity were bought, in principle, only in off-grid areas.

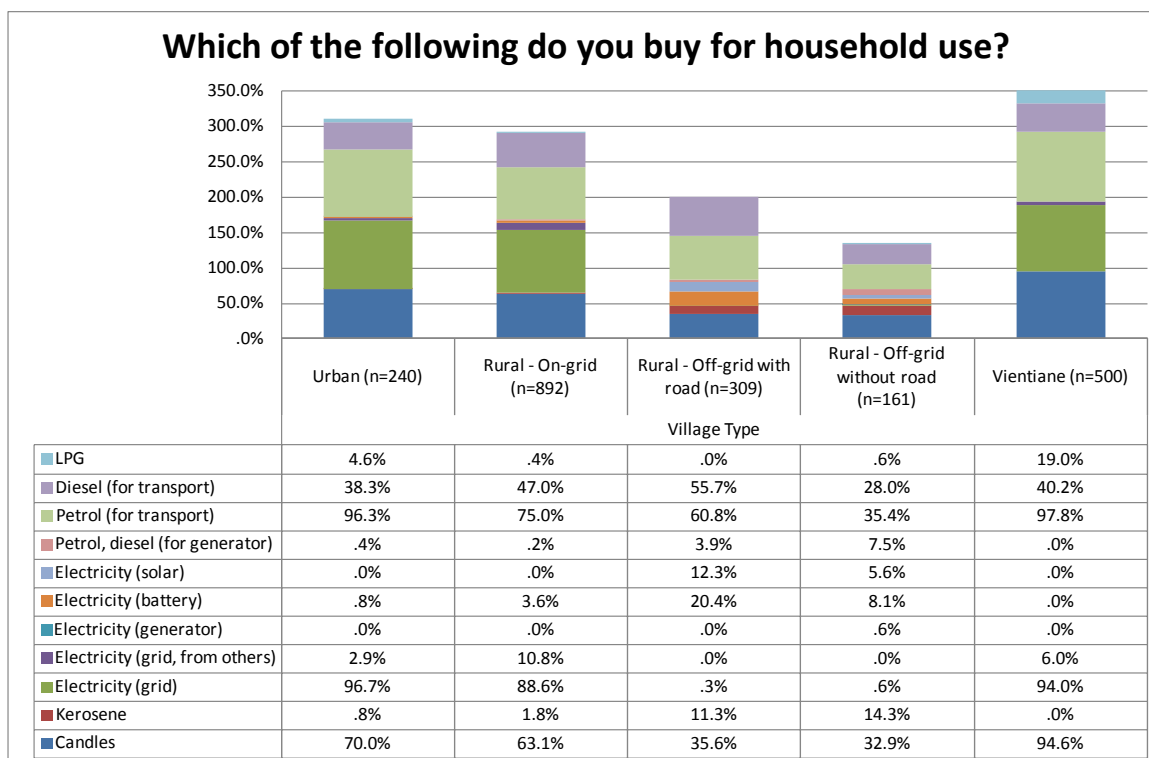


Figure 5.34. Purchased commercial fuels by village type.

Buying commercial fuels was more common within the households above the poverty line. For them, the four most common fuels were petrol (for transport, 89%), grid electricity (86%), candles (84%), and diesel (for transport, 40%). As for households below the poverty line, the most common fuels bought were petrol (for transport, 67%), grid electricity (55%), diesel (for transport, 49%), and candles (46%).

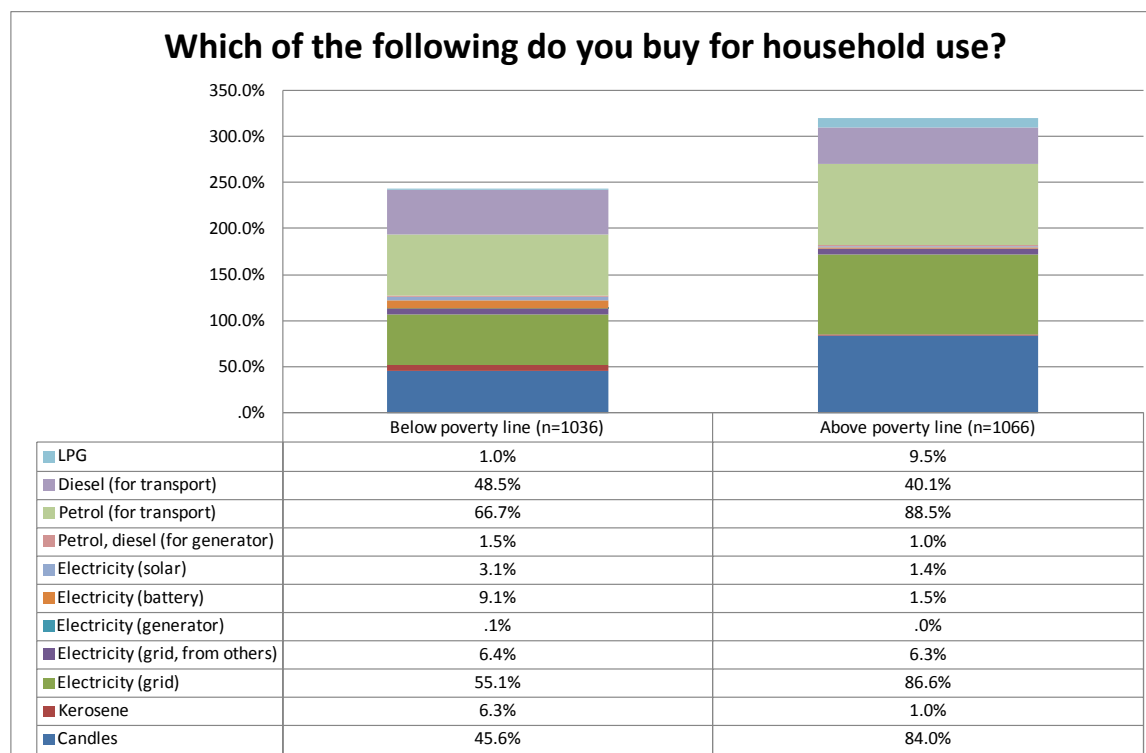


Figure 5.35. Purchased commercial fuels by the poverty line.

## 5.5. Ownership of petrol or diesel machinery

Most households operated petrol or diesel powered machinery for domestic, agriculture or business use. However, there were major differences between the village types: almost every (99%) household in Vientiane, 96% in other urban, 84% in rural on-grid, 76% in rural off-grid and 54% in rural off-grid without road operated petrol or diesel powered machinery. The difference between the village types is statistically significant.

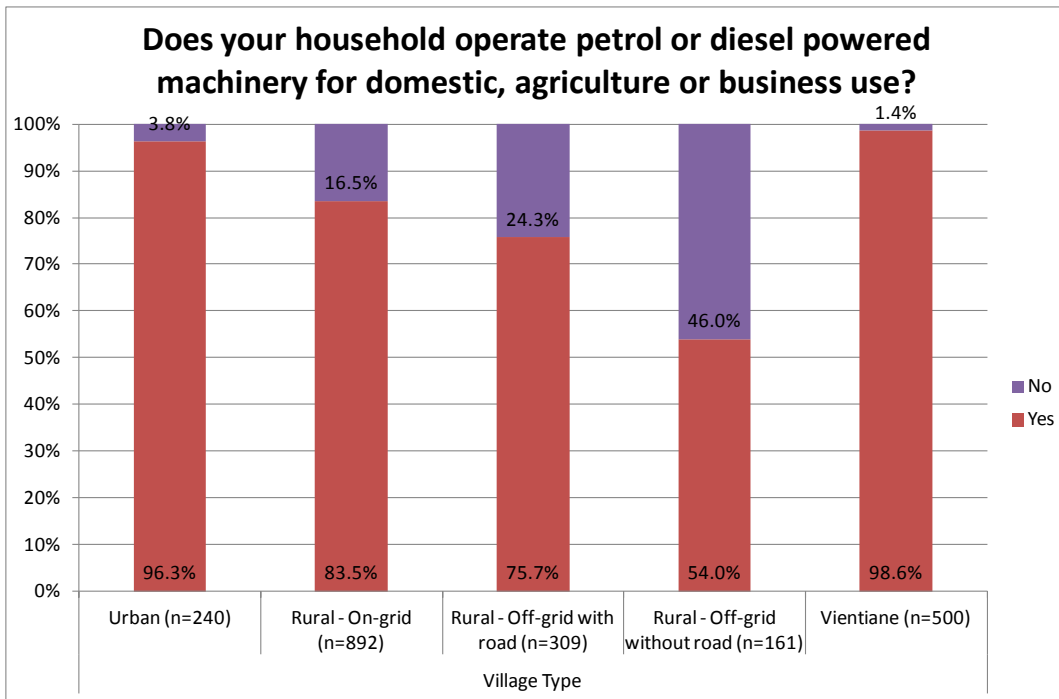


Figure 5.36. Ownership of any petrol or diesel machinery by village type ( $\chi^2=241.8$ ,  $df=4$ ,  $p<0.001$ ).

Households above the poverty line (92%) operated petrol or diesel powered machinery for domestic, agriculture or business significantly more than households below the poverty line (78%).

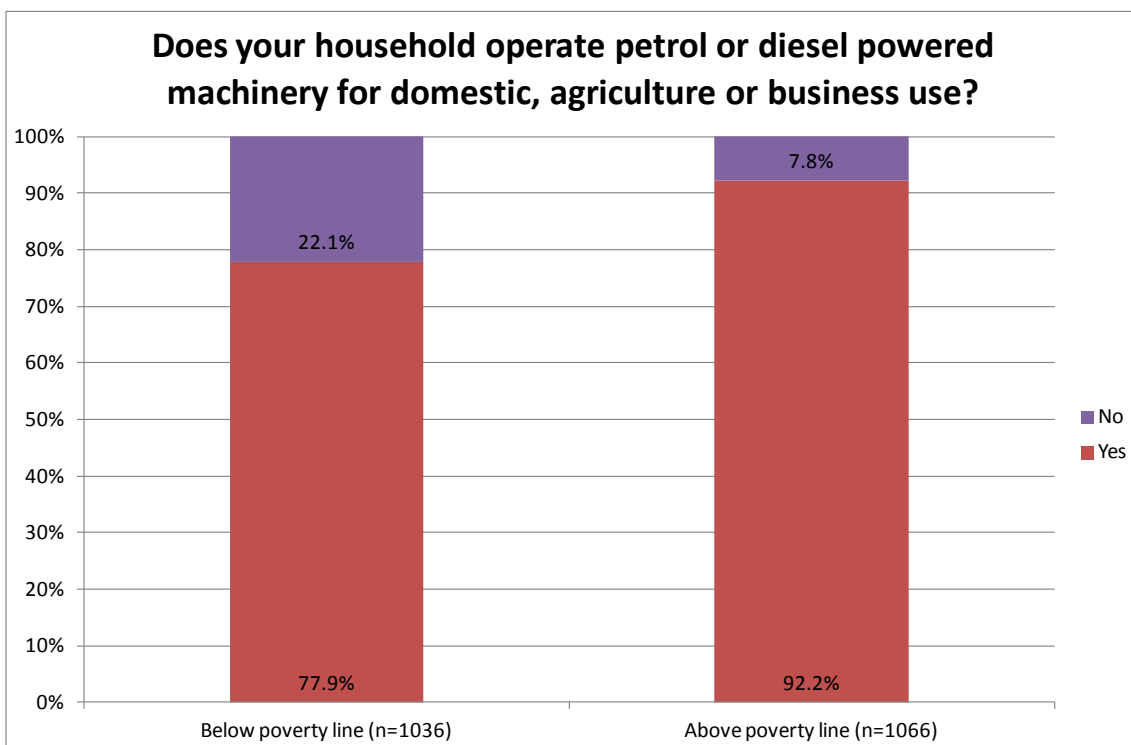


Figure 5.37. Ownership of any petrol or diesel machinery by the poverty line ( $\chi^2=85.2$ ,  $df=1$ ,  $p<0.001$ ).

Cars, motorbikes, pick-ups or trucks were the most common machinery that the Laotian households owned. Almost every household in Vientiane (98%) and other urban areas (95%) owned at least one of them.

In rural on-grid villages, the share was 75%, and in rural off-grid villages there shares were 62% for those with road access and 27% for those without road access. In off-grid households, generators, rice mills, and motor boats were possessed more commonly than in the electrified households. In all rural villages there were more two-wheel tractors and hand-tractors (28–55%) than in the urban areas (22%, and 1.6% in Vientiane). Hardly anyone had petrol or diesel powered irrigation pumps, water pumps, four-wheel tractors, or petrol saws.

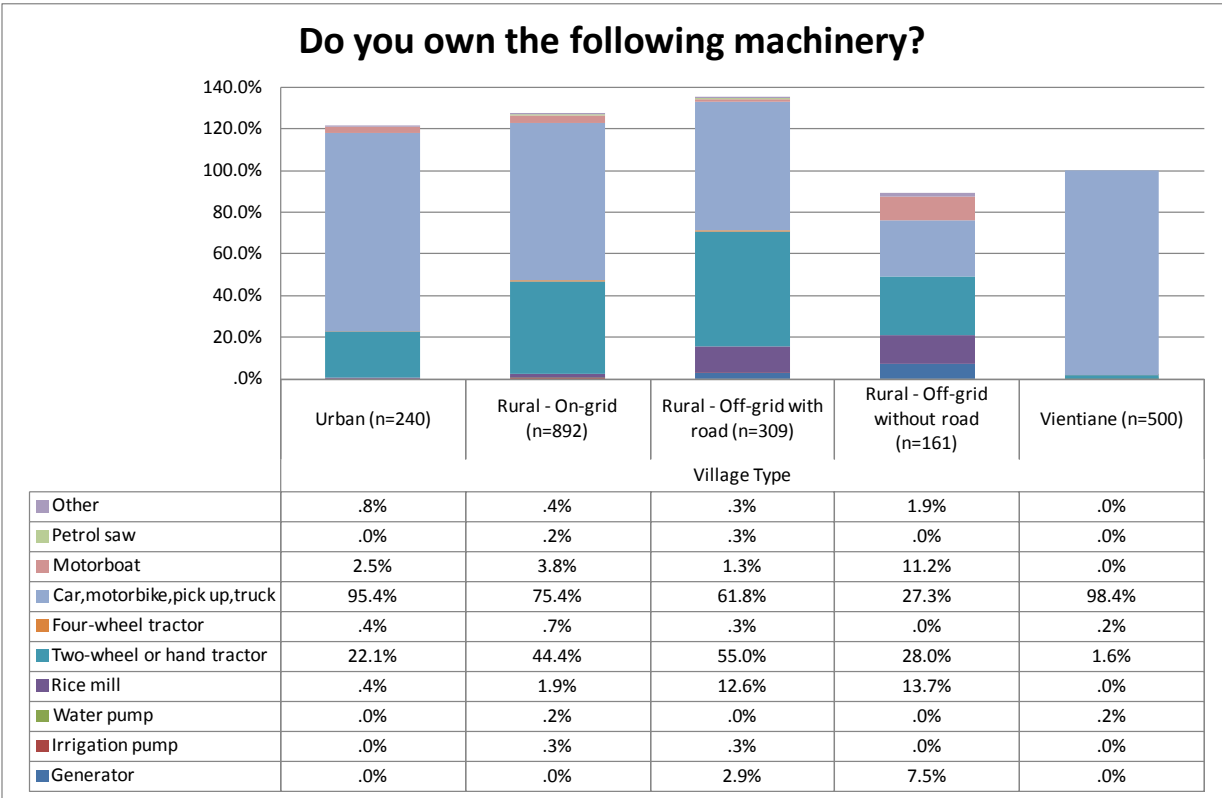


Figure 5.38. Ownership petrol or diesel machinery by village type.

Households above the poverty line had more cars, motorbikes, pick-ups and trucks (89%) than households below the poverty line (66%). All other types of petrol or diesel powered machinery was more common within the poorer households: the shares for two wheel tractors (or, hand tractors) were 47% and 18%, for rice mills 5.5% and 2.1%, and for motorboats 3.7% and 2.3%. Other differences in the shares were smaller than one percent unit.

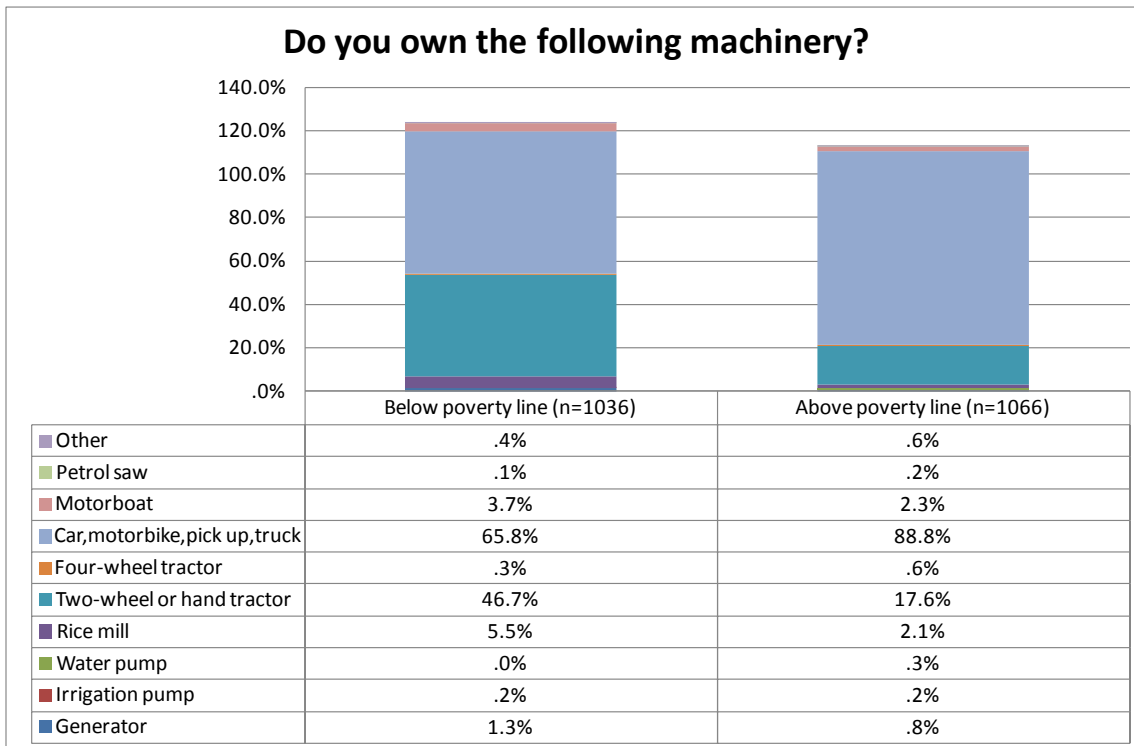


Figure 5.39. Ownership petrol or diesel machinery by the poverty line.

## 5.6. Power cuts

Approximately three quarters of households in urban areas said that electricity or power cuts affected negatively their business activities. In rural areas the percentage was significantly lower, 52%.

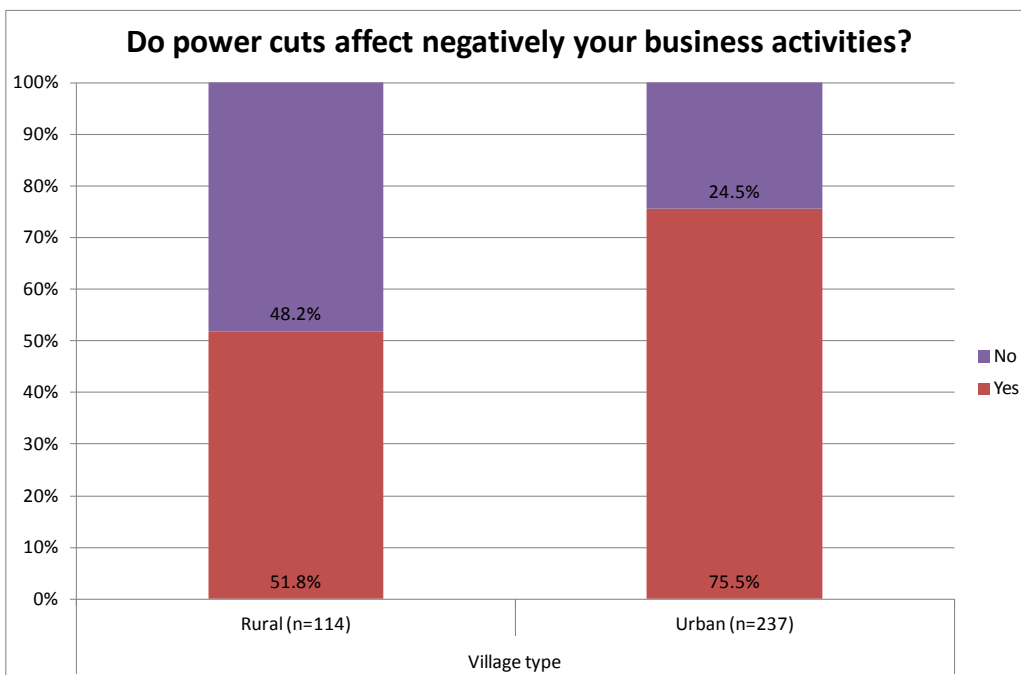


Figure 5.40. Experiencing power cuts that disturb business activities by urbanisation ( $\chi^2=19.9$ ,  $df=1$ ,  $p<0.001$ ).



75% of households above the poverty line said that electricity or power cuts affect negatively their business activities. Within households below the poverty line the share was much smaller, 45%. As reliable supply of electricity utilities is important for urban settlements and households, this result could be relevant for policy-makers and urban planners in the Lao PDR. It is also a question of the development of industrial and service economy in urban areas.

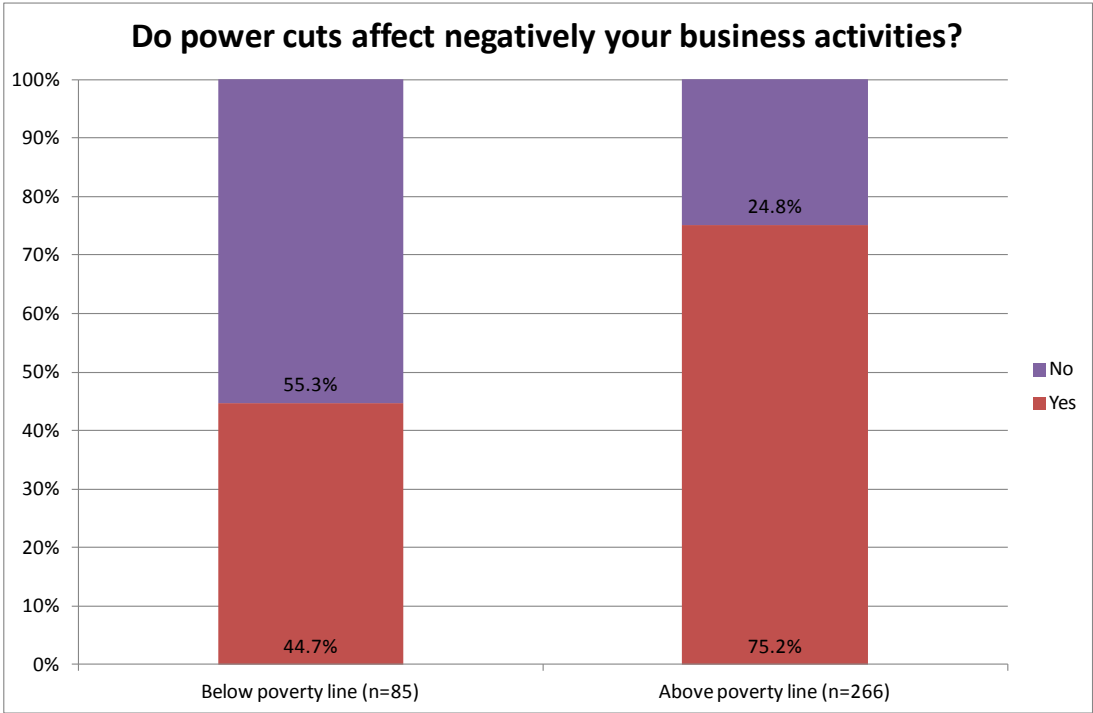


Figure 5.41. Experiencing power cuts that disturb business activities by the poverty line ( $\chi^2=27.4$ ,  $df=1$ ,  $p<0.001$ ).

### 5.7. Access to internet

The respondents were asked whether they had access to the internet and where they had access. On total, 10% of respondents had access to the internet. There were major differences between rural and urban areas: in rural areas only 1.4% and in urban areas 14% of the households had at least some access to the internet. 7.5% of urban households could use the internet at work or at an internet café, 3.2% at home and 3.1% at both.

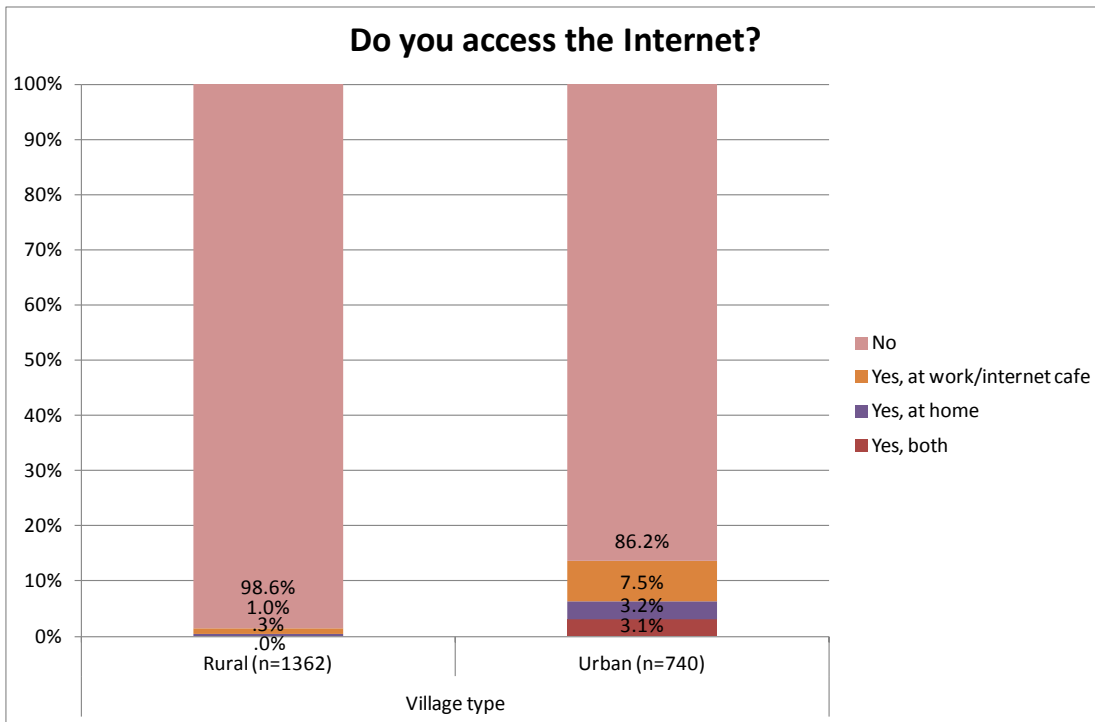


Figure 5.42. Access to internet by urbanization ( $\chi^2=34.9$ ,  $df=3$ ,  $p<0.001$ ).

There were major differences between households below and above the poverty line regarding how they accessed the internet. Less than one percent of the people who lived below the poverty line have internet access, while among the households above the poverty line, 13% used the internet. In most cases, people used the internet either at work or at an internet café.

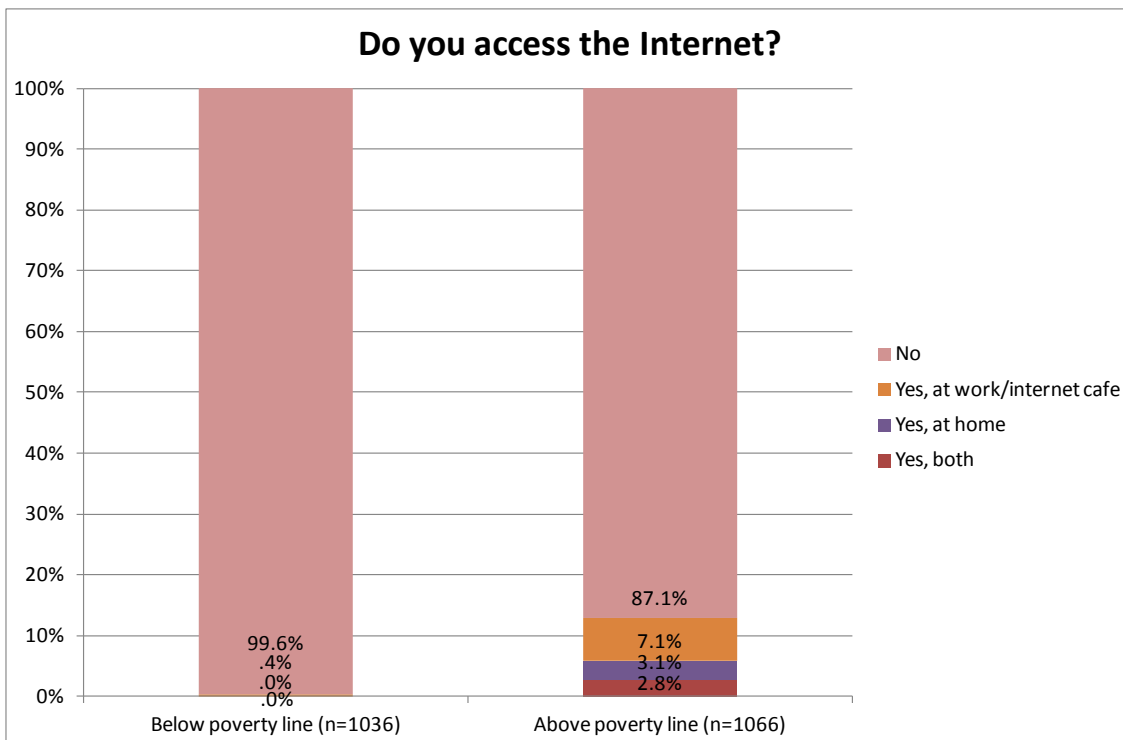


Figure 5.43. Access to internet by the poverty line ( $\chi^2=31.0$ ,  $df=3$ ,  $p<0.001$ ).

## 5.8. Cooking fuels and stoves

Nearly all respondents used firewood, plant residues or charcoal for cooking. In rural areas all of the households used at least one of these energy sources for cooking, whereas the share in urban areas was 98%.

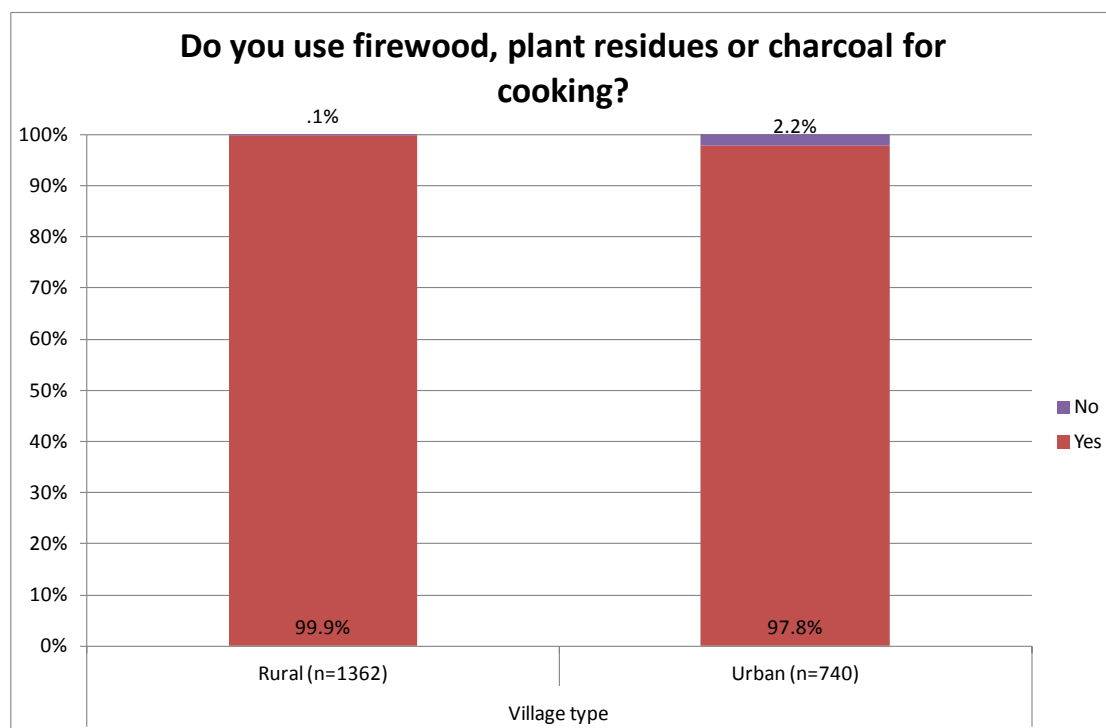


Figure 5.44. Using firewood, plant residues or charcoal for cooking by urbanization ( $\chi^2=26.1$ ,  $df=1$ ,  $p<0.001$ ).

Below the poverty line, nearly all of the households used firewood, plant residues or charcoal for cooking, and the percentage among the households above the poverty line was 99.

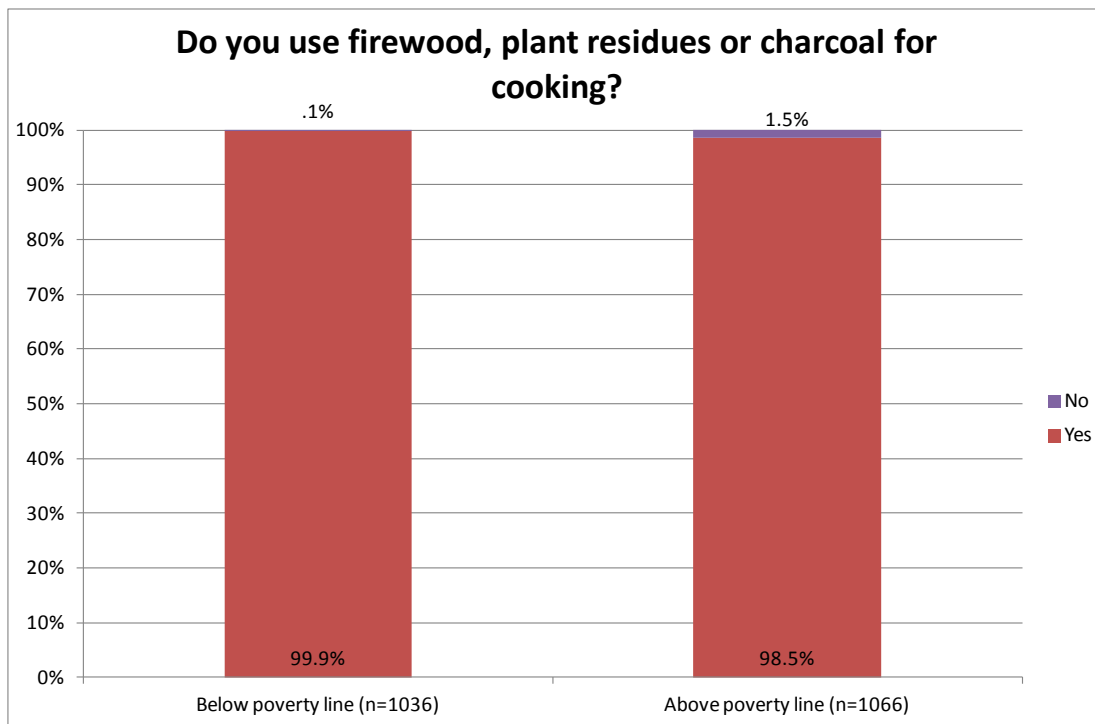


Figure 5.45. Using firewood, plant residues or charcoal for cooking by the poverty line ( $\chi^2=12.9$ ,  $df=1$ ,  $p<0.001$ ).

In Vientiane, the variety of stoves was the most extensive: most households possessed more than one type of cooking stove. Most common was an electric cooker (94%), followed by improved cooking stoves (72%), brick/clay/mud/earth stoves (45%), gas stoves (20%), and tripods (4.2%). In the more extensive survey (that excluded Vientiane), gas stove and electric cooker were not specified options, but could have been mentioned under the final, other (specify), option. Only two households, both urban, mentioned owning a gas stove. Improved cooking stoves were common in urban villages (owned by 66%), and their ownership rate decreased as the village type became more remote: 33% of the households in rural on-grid, 18% in rural off-grid with road access and 15% in rural off-grid without road connection owned an improved cooking stove. The situation was the opposite regarding tripods, the respective figures being 24% (urban), 60% (rural on-grid), 84% (rural off-grid with road), and 85% (rural off-grid without road). On-grid households owned also somewhat more brick/clay/mud/earth stoves (30%) than off-grid households (15%-19%).

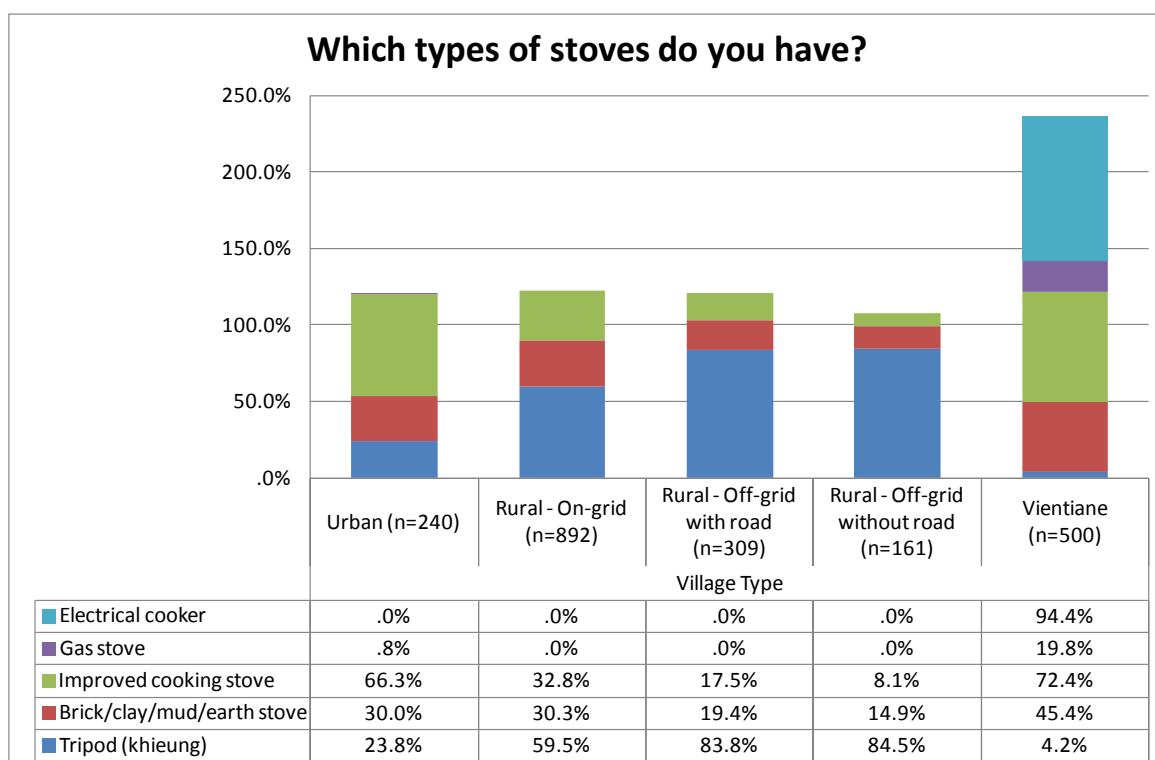


Figure 5.46. Ownership of different cooking stoves by village type.

Improved cooking stoves, electric cookers, gas stoves, and brick/clay/mud/earth stoves were more common in the households above the poverty line than in the households below the line. Improved cooking stoves were the most common type of stove within the households above the poverty line (possessed by 57%), and within the households below the poverty line, tripods were the most common (71%).

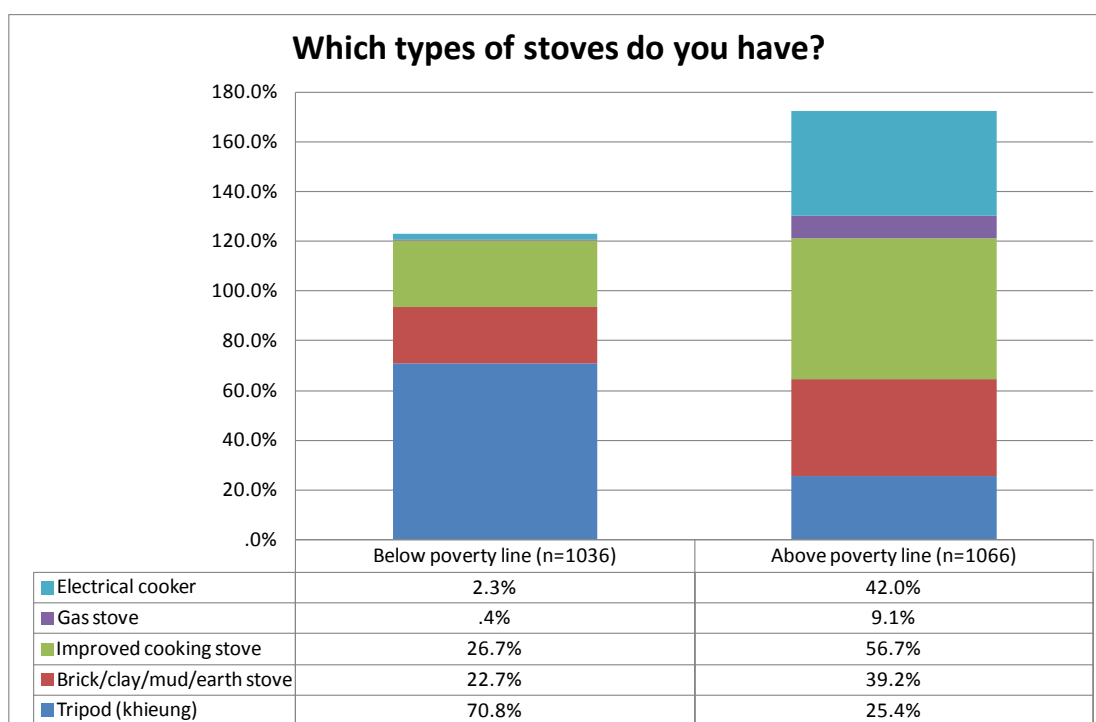


Figure 5.47. Ownership of different cooking stoves by the poverty line.

In rural areas, households used mainly firewood for cooking: in rural on-grid 82%, rural off-grid with road 93% and in rural off-grid without road 95% specified wood as the main energy source for cooking. No one used electricity as the main energy source. In urban areas, the main energy source for cooking was charcoal with 63% of the households in Vientiane and 51% in other urban areas mainly using it. In Vientiane, 10% of the households used both gas and electricity as the main energy sources for cooking.

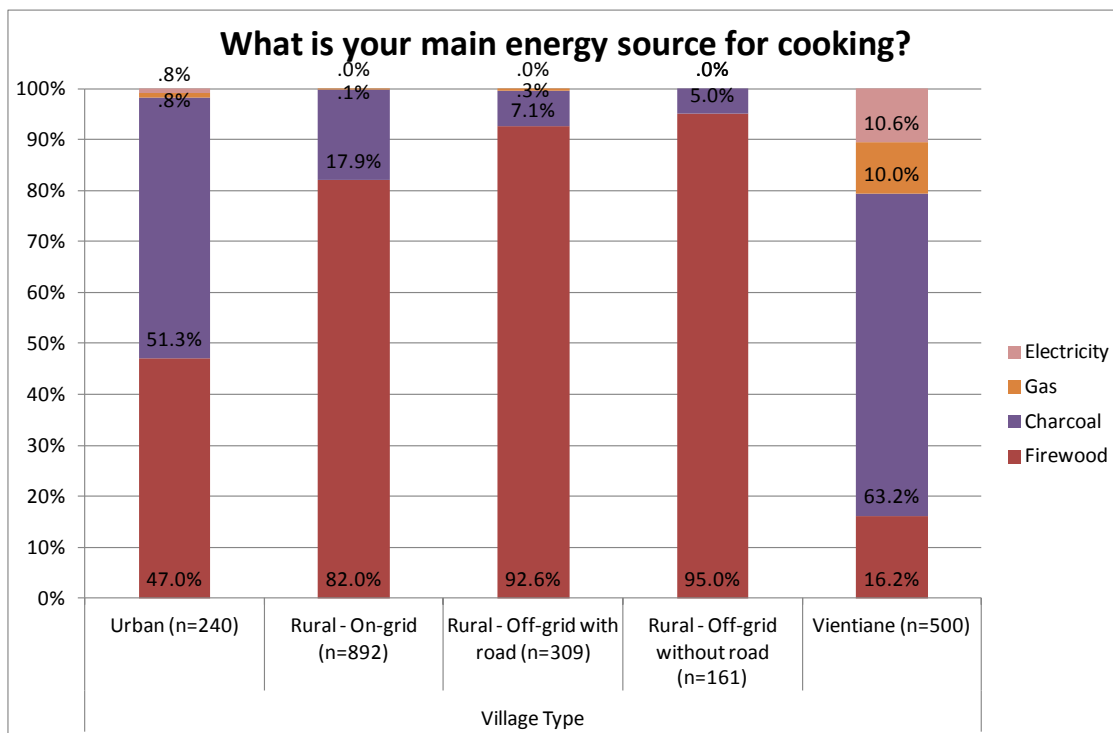


Figure 5.48. Main energy source for cooking by village type ( $\chi^2=945.4$ ,  $df=12$ ,  $p<0.001$ ).

Households above the poverty line used primarily firewood (47%) and charcoal (43%) for cooking. Gas and electricity had nearly 5% share each. Households below the poverty line used more often wood (83%) and less often charcoal (16%), gas (0.3%) and electricity (0.3%).

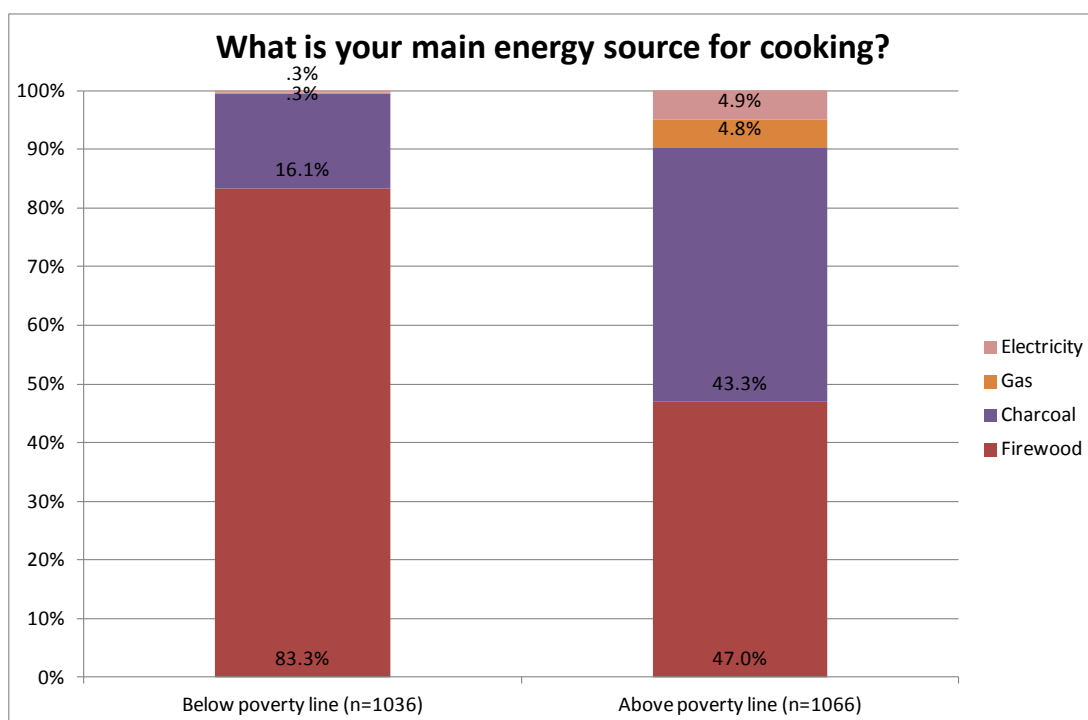


Figure 5.49. Main energy source for cooking by the poverty line ( $\chi^2=320.4$ ,  $df=3$ ,  $p<0.001$ ).

The tripod was the most common stove in rural off-grid areas, with 75% - 80% stating they used tripod the most. The same share in rural on-grid was 48%. In urban areas and in Vientiane, the most used stoves were improved cooking stove (61% and 54%, respectively) and brick/clay/mud/earth stove (26% and 23%). In Vientiane, households also used electric cookers (11%) and gas stoves (10%) as their main stove.

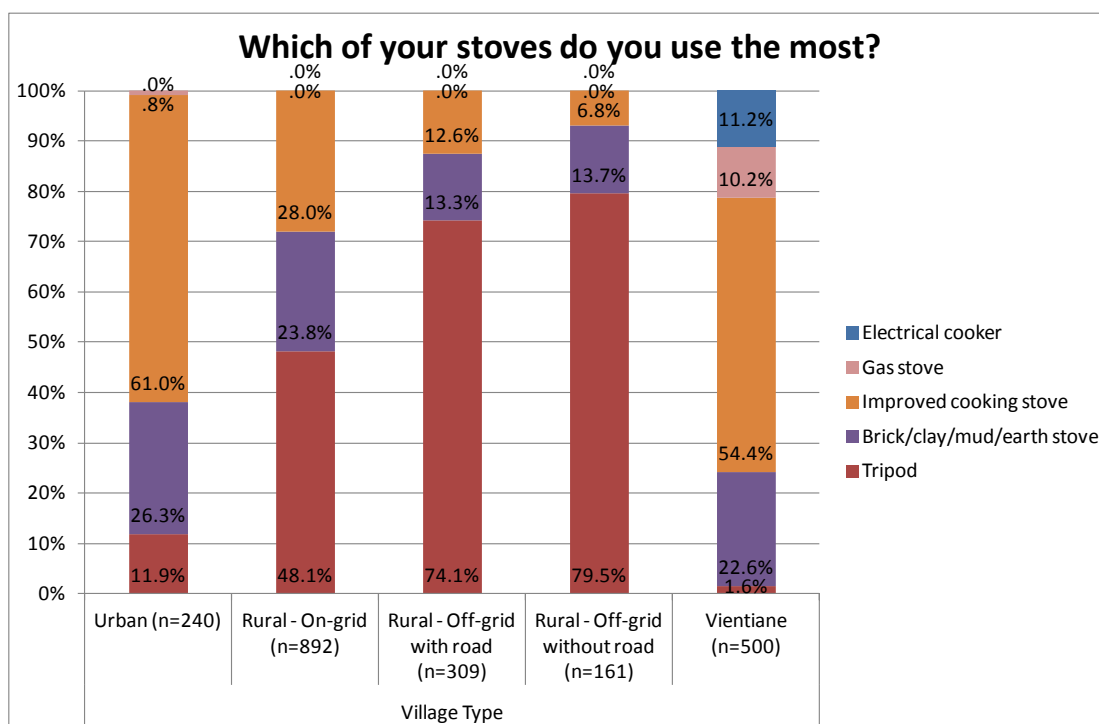


Figure 5.50. Most used stove by village type ( $\chi^2=954.7$ ,  $df=16$ ,  $p<0.001$ ).

Households below the poverty line used mainly tripods (61%), improved cooking stoves (22%) and brick/clay/mud/earth stoves (17%). The most used stoves among households above the poverty line were improved cooking stove (46%), brick/clay/mud/earth stove (26%) and tripod (18%).

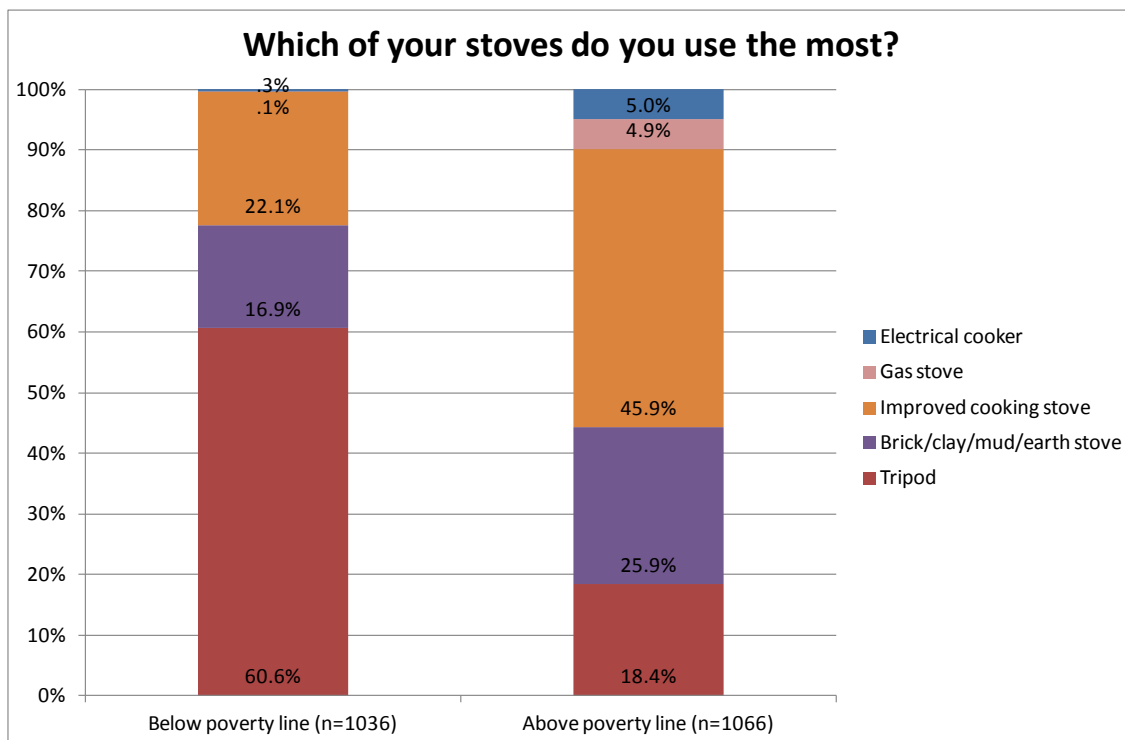


Figure 5.51. Most used stove by the poverty line ( $\chi^2=435.7$ ,  $df=4$ ,  $p<0.001$ ).

## 5.9. Collecting firewood

Nearly two thirds of urban households stated that no one collects firewood in their household, whereas in rural areas most households collected wood. Adults collected firewood more often than children, and children collected most frequently (28%) in rural off-grid villages without road access. Furthermore, women collected wood more often than men (93% compared to 77%) in rural off-grid households without road access, while the difference was much smaller in other village types.



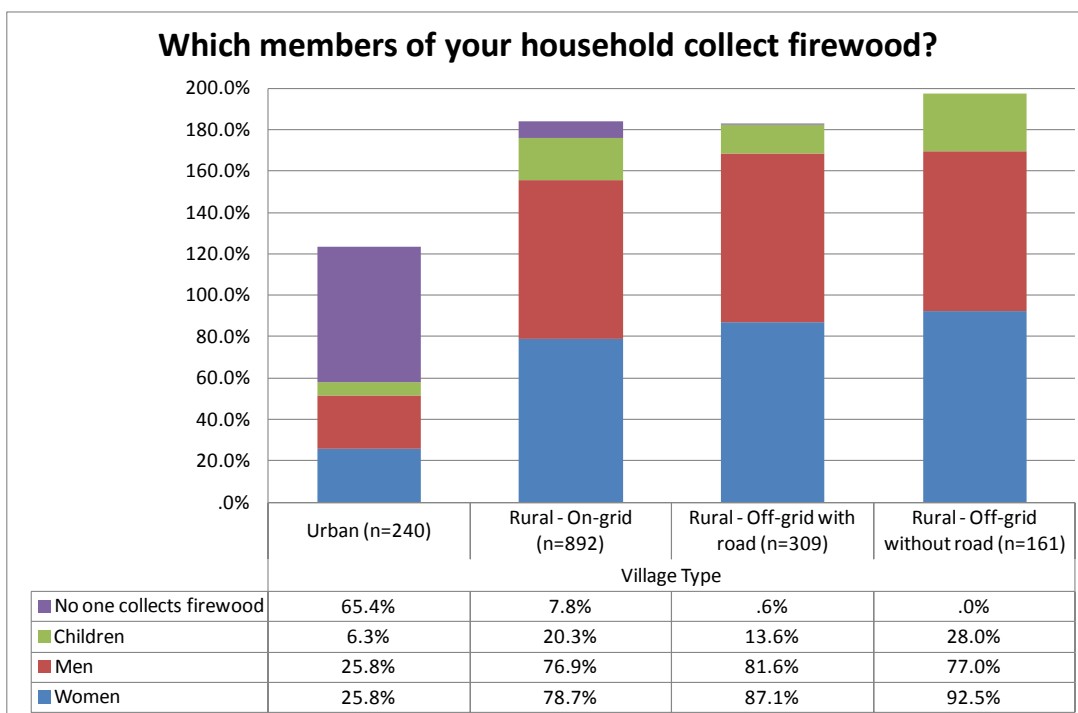


Figure 5.52. Which members of the household collect firewood by village type (not asked in the Vientiane survey).

Unsurprisingly, collecting firewood was less common within the households above the poverty line (27%) than within the households below the poverty line (6.8%). Men and women collected equally often in households above the poverty line (63%), while there was a slight difference in firewood collection of women (80%) and men (75%) within households below the poverty line.

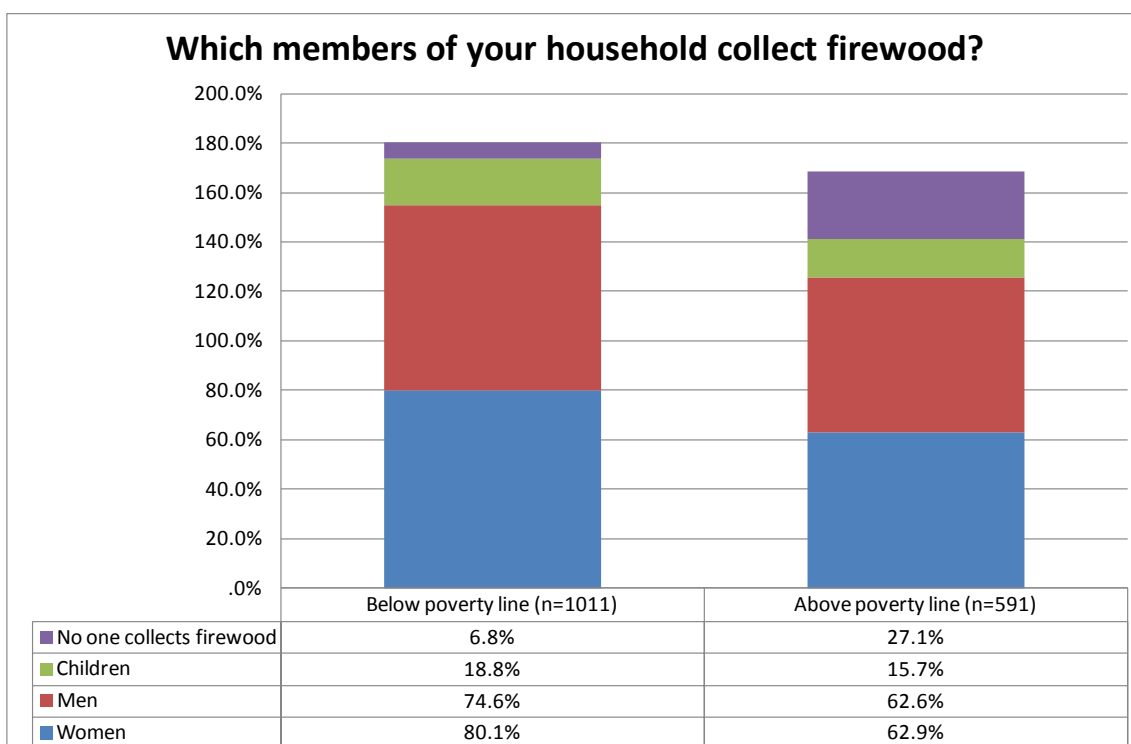


Figure 5.53. Which household members collect firewood by the poverty line.

## 5.10. Cooking indoors

Households in all village types cooked mainly inside: the shares were 98% in urban, rural on-grid and rural off-grid with road, and 95% in rural off-grid villages without road.

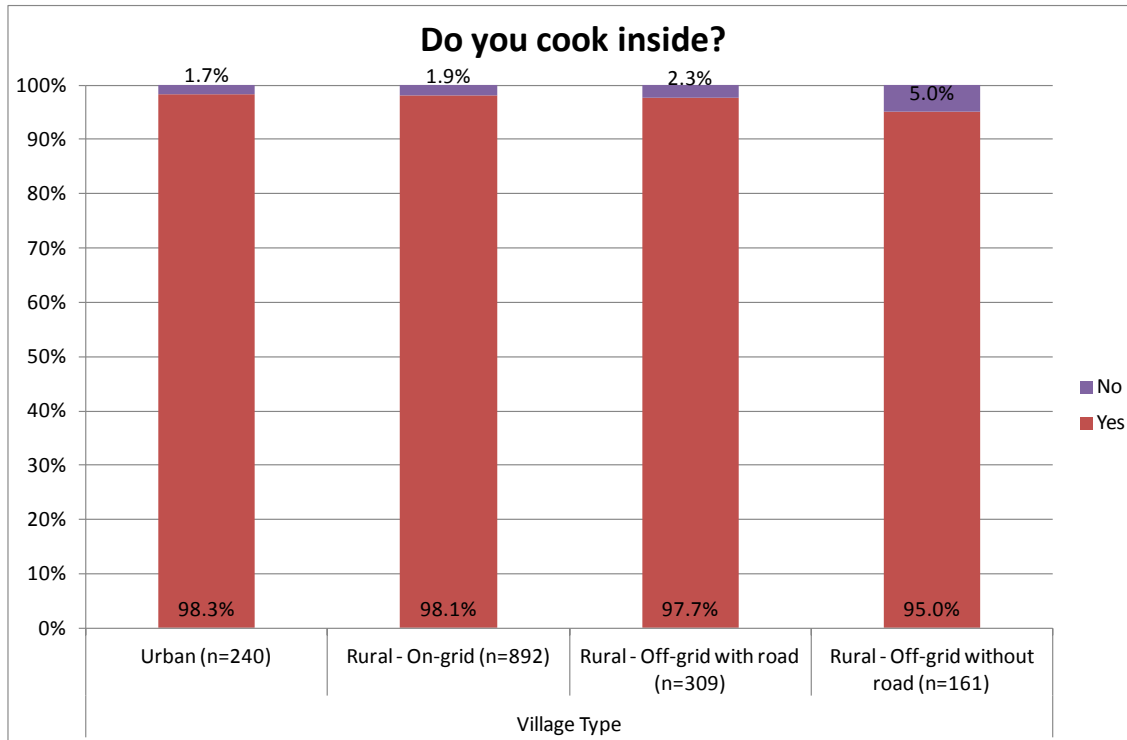


Figure 5.54. Cooking indoors by village type ( $\chi^2=6.2$ ,  $df=3$ ,  $p=0.10$ ).

Households below and above the poverty line cooked inside equally often, 98% and 97%, respectively.

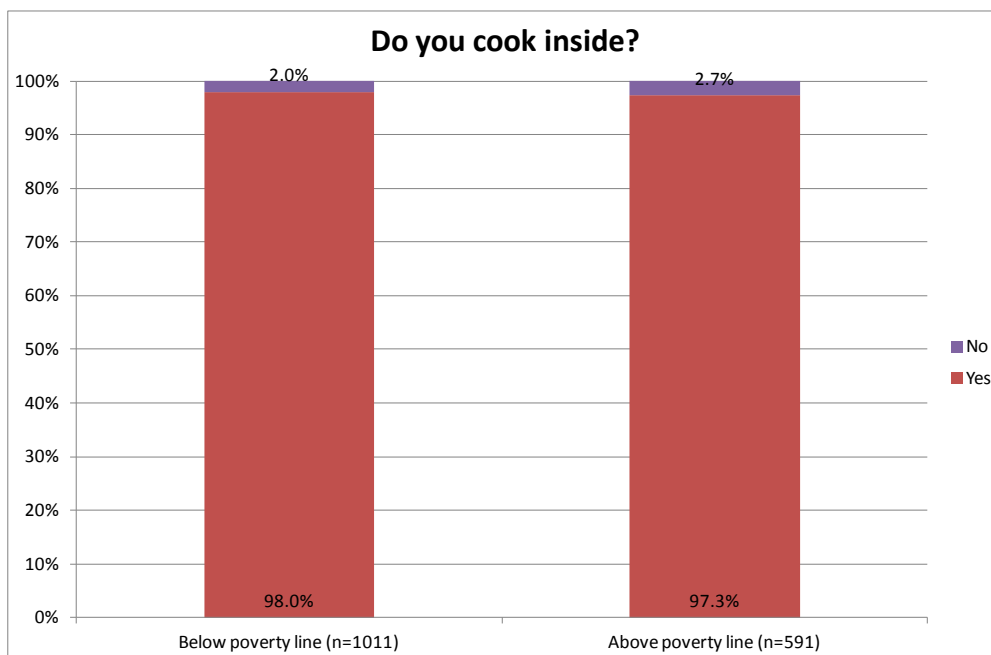


Figure 5.55. Cooking indoors by the poverty line ( $\chi^2=0.9$ ,  $df=1$ ,  $p=0.34$ ).

Concerning cooking indoors, the households were also asked in which type of location they cook. Village type provided hardly any differences between the households in this regard: 63–66% cooked in a room inside the house, 29–36% in a shed outside and 0.4–4.6% in a special area downstairs.

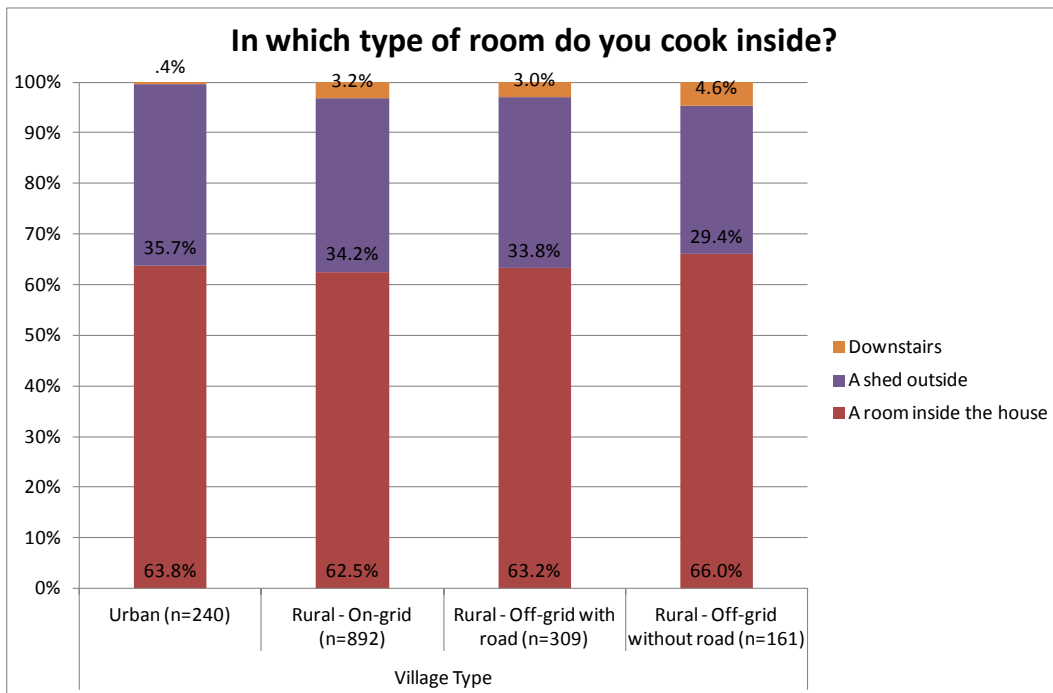


Figure 5.56. Location of the indoor cooking by village type ( $\chi^2=8.2$ ,  $df=6$ ,  $p=0.22$ ).

The poverty line did also not divide the households in terms of indoor cooking locations. A room inside the house was the most common place to cook with 61–67% share of the households stating this, followed by a shed outside (31–36%) and downstairs (2.3–3.2%).

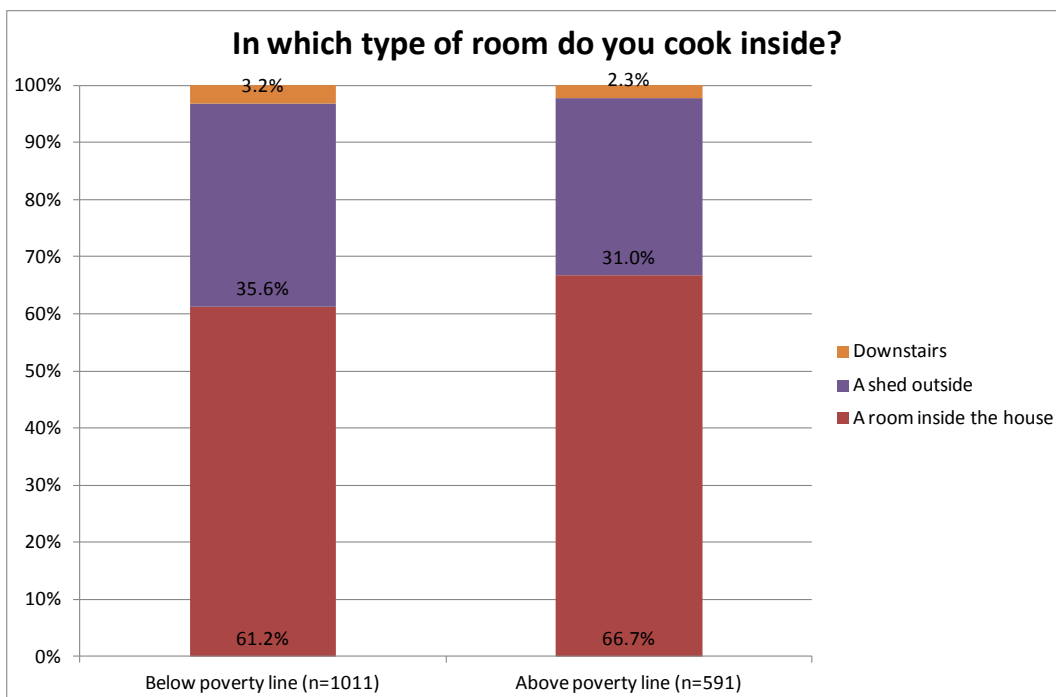


Figure 5.57. Location of the indoor cooking by village type ( $\chi^2=5.2$ ,  $df=2$ ,  $p=0.074$ ).

## 5.11. Persistent health problems

Fairly few households in all village types had experienced persistent health problems: in Vientiane, 4.0%, in other urban 5.9%, in rural on-grid 7.9%, in rural off-grid with road 9.1% and in rural off-grid without road 17%. Health problems were less common in urban than rural areas, especially in off-grid villages without road. The interpretation what is a persistent health problem can vary among the respondents and in this regard these results should be interpreted with caution.

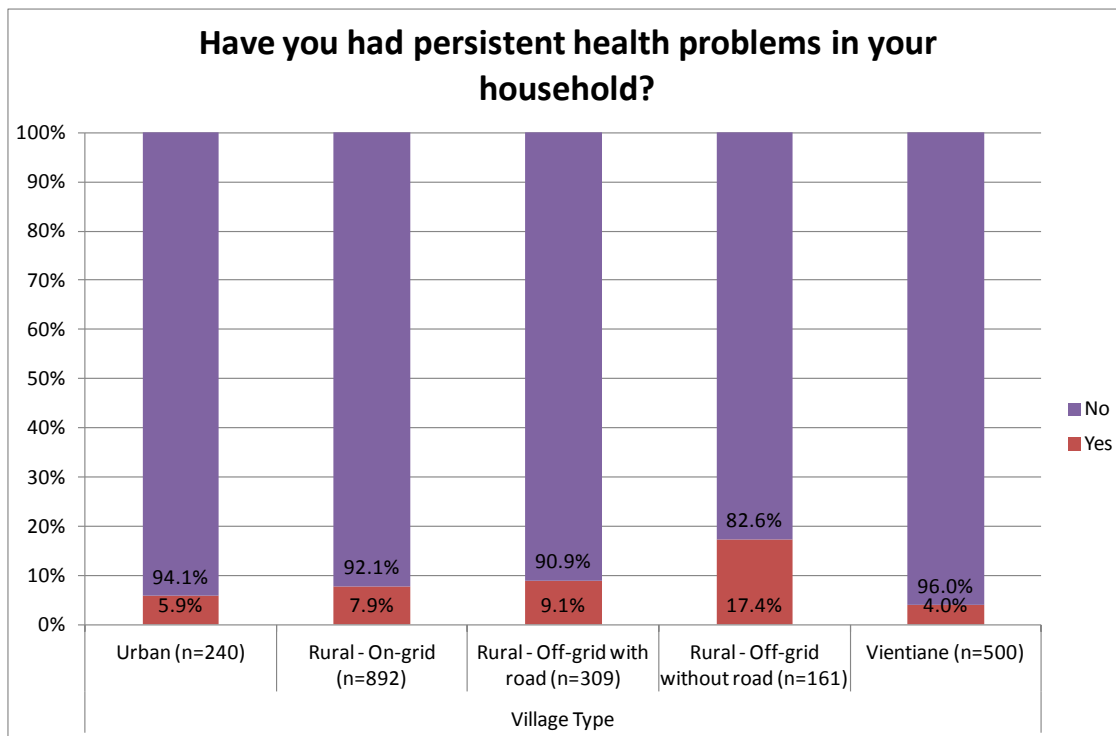


Figure 5.58. Occurrence of persistent health problems by village type ( $\chi^2=33.2$ ,  $df=4$ ,  $p<0.001$ ).

Households below the poverty line had had significantly more health problems (11%) than households above the line (4.2%).

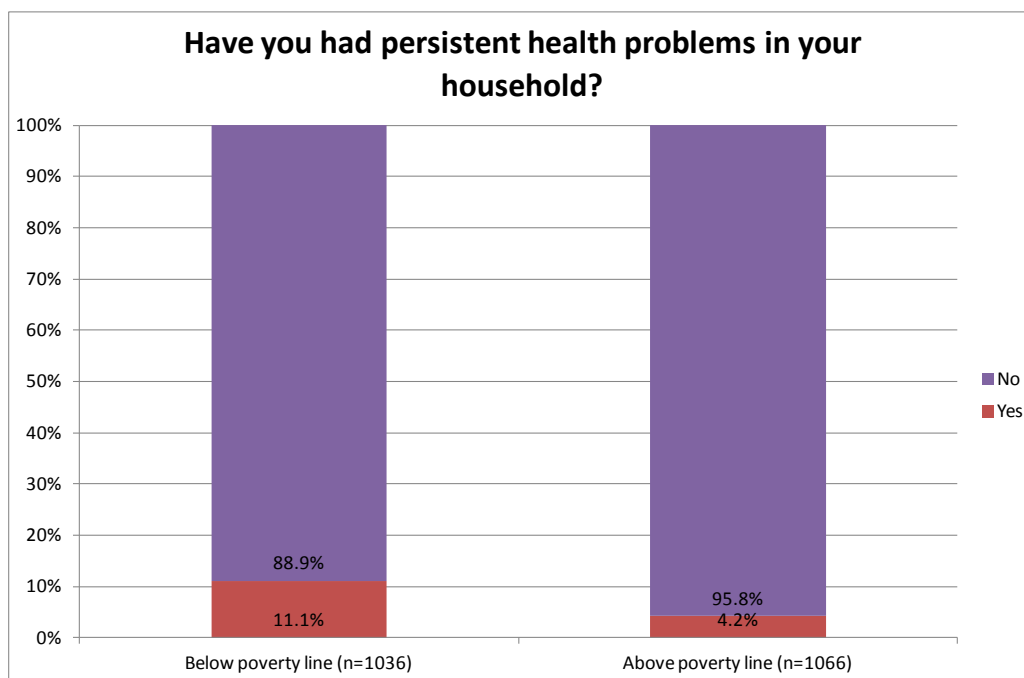


Figure 5.59. Occurrence of persistent health problems by the poverty line ( $\chi^2=35.4$ ,  $df=1$ ,  $p<0.001$ ).

Overall, having persistent health problems seemed uncommon in the Laotian households. Hardly anyone had suffered from undernourishment. Households in rural off-grid households without road access had experienced more health problems than others. For them, the most common problem had been diarrhea (6.8%), followed by respiratory problems (5.6%), skin problems (4.3%), and eye problems (3.1%). There was only a little variation in the occurrence of these problems in other village types excluding Vientiane: 1.3–3.2% of households in each village type had experienced each problem. In Vientiane, these health problems were even less common.

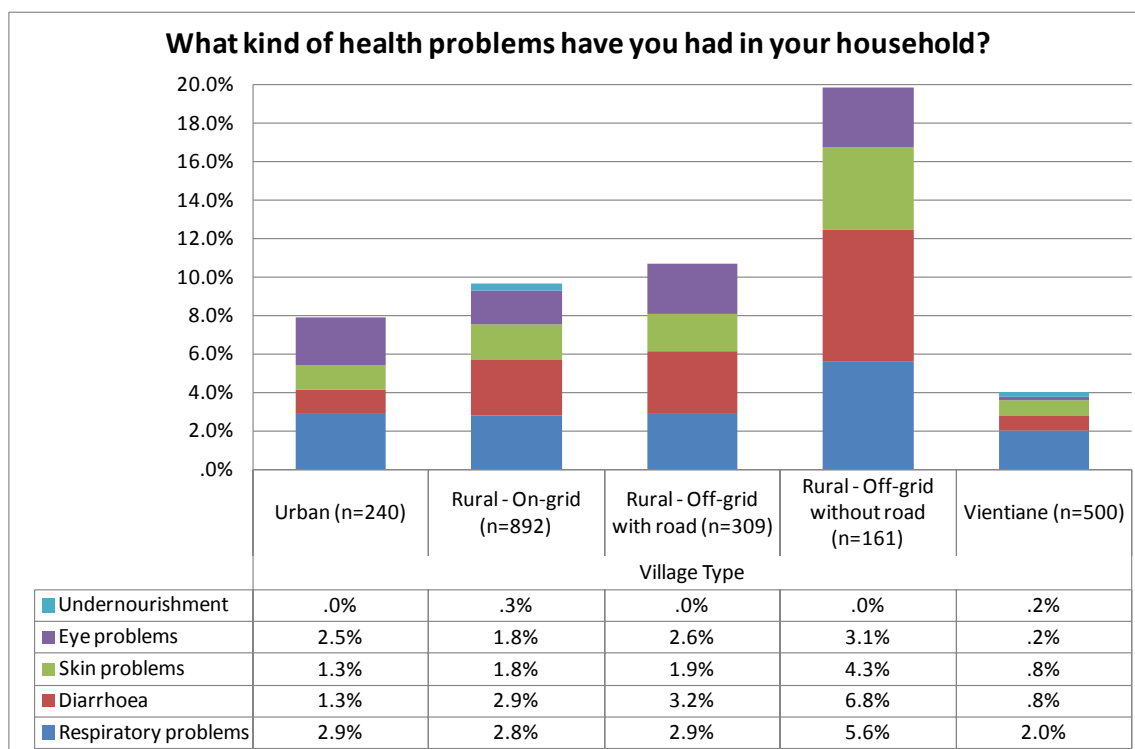


Figure 5.60. Experienced health problems by village type.

Households below the poverty line had suffered from persistent health problems more than households above the poverty line. The former had encountered most often diarrhea (4.1%), respiratory problems (3.7%), eye problems (3.2%), and skin problems (2.7%), while respiratory problems had been most common for the latter (2.1%). All other health problems had been experienced by 0.1–1.1%.

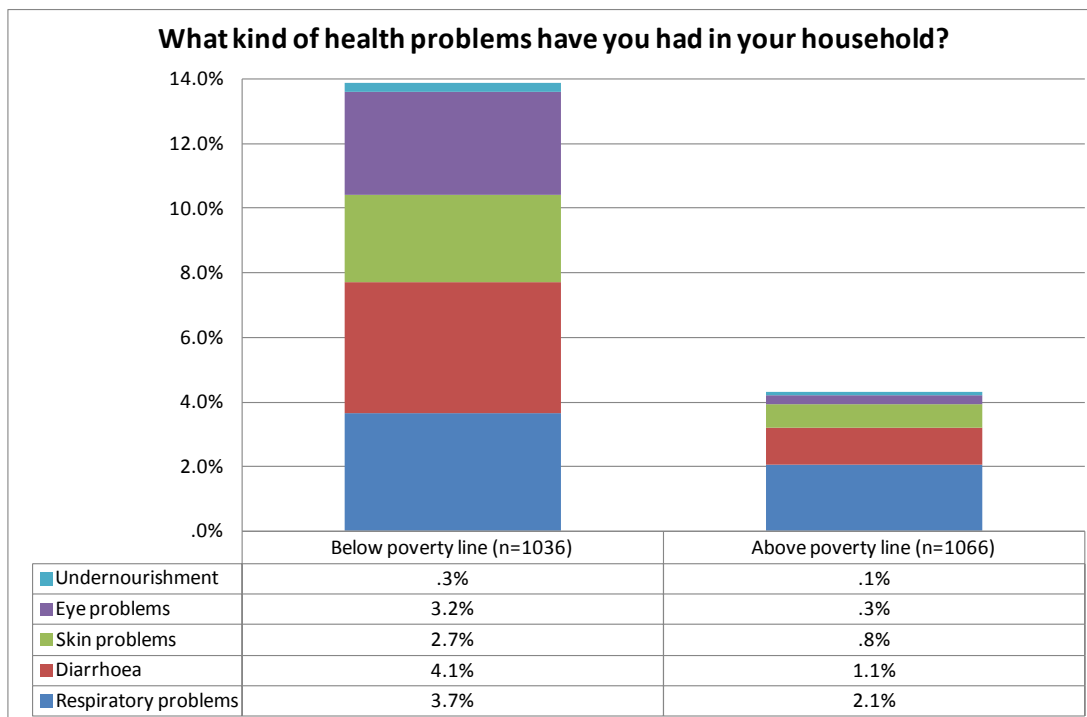


Figure 5.61. Experienced health problems by the poverty line.

## 5.12. Awareness of new technologies

There were major differences in the awareness of two surveyed energy saving technologies, energy saving light bulb and improved cooking stove. Most households in Vientiane (81–88%) had heard of both. In other urban areas, improved cooking stove was better known (88%) than energy saving light bulb (59%). Just over a half of rural on-grid households (52–56%) had heard of these new technologies, whereas in rural off-grid areas with road access, less than a third (29–32%) knew of them. The awareness was the lowest in rural off-grid households without road access, where 21% had heard of energy saving light bulbs and 15% of improved cooking stoves.

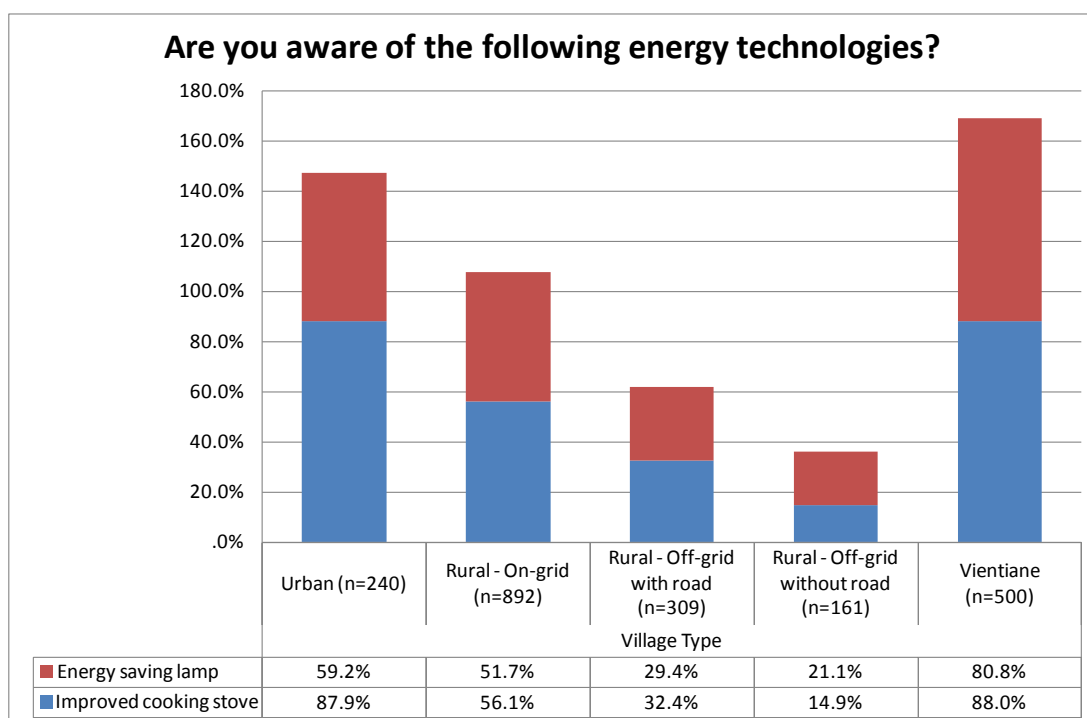


Figure 5.62. Awareness of energy saving technologies by village type.

The awareness of energy saving technologies was higher within the households above the poverty line than within those below the poverty line. Nearly three out of four (72–73%) households above the poverty line had heard of energy saving lamps and improved cooking stoves. Within households below the poverty line, 48% were aware of improved cooking stoves and 35% of energy saving light bulbs. We can conclude that there is still need for better awareness of modern cooking facilities.

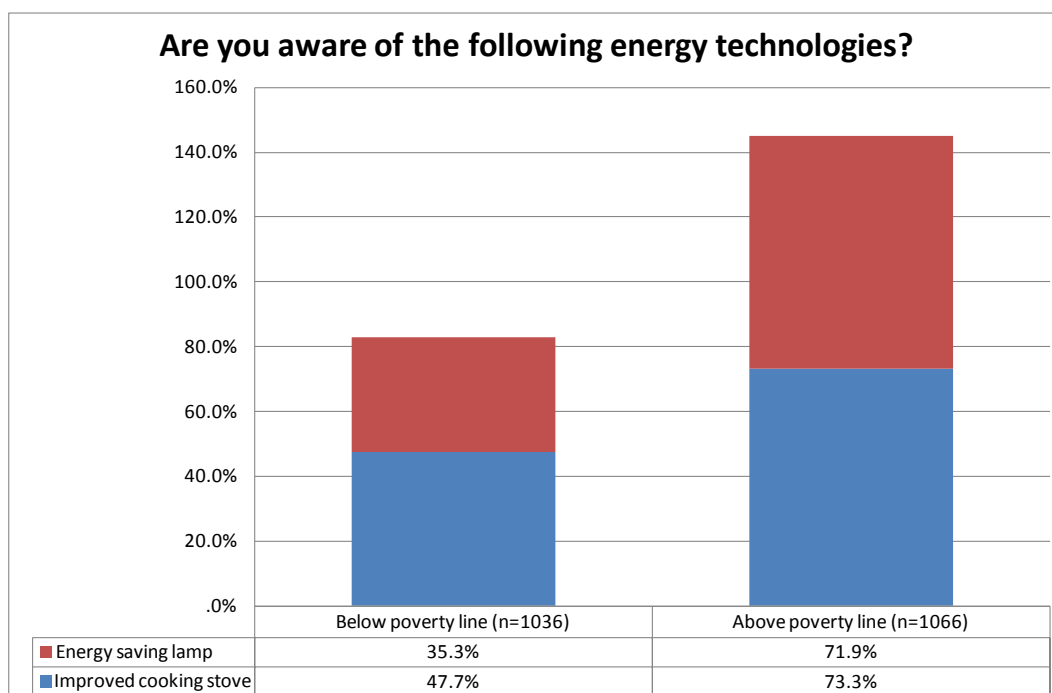


Figure 5.63. Awareness of energy saving technologies by the poverty line.

## 5.13. Ownership of electrical appliances now and in the future

The households were asked whether they own different kinds of electrical appliances, and which appliances they are planning to buy in the following five years. Most of the appliances in the questionnaire were owned by at least a small percentage of the households. Only wood processing tools were rarely owned. The survey conducted in Vientiane included more specified options than the nationwide survey: microwave ovens were owned by 15%, irons by 83%, water coolers by 41%, and shower heaters by 22% of the households in Vientiane. Some of these were mentioned also in the nationwide survey under other (specify) option, but the response rates were only marginal.

### 5.13.1. Radio

One in every ten households had a radio. There were no major differences between the village types in this regard (8.3–13%). In the next five years, the rural off-grid households were planning on buying radios more often (4.9–8.7%) than the households in Vientiane (0%), urban (2.5%) and rural on-grid areas (2.6%).

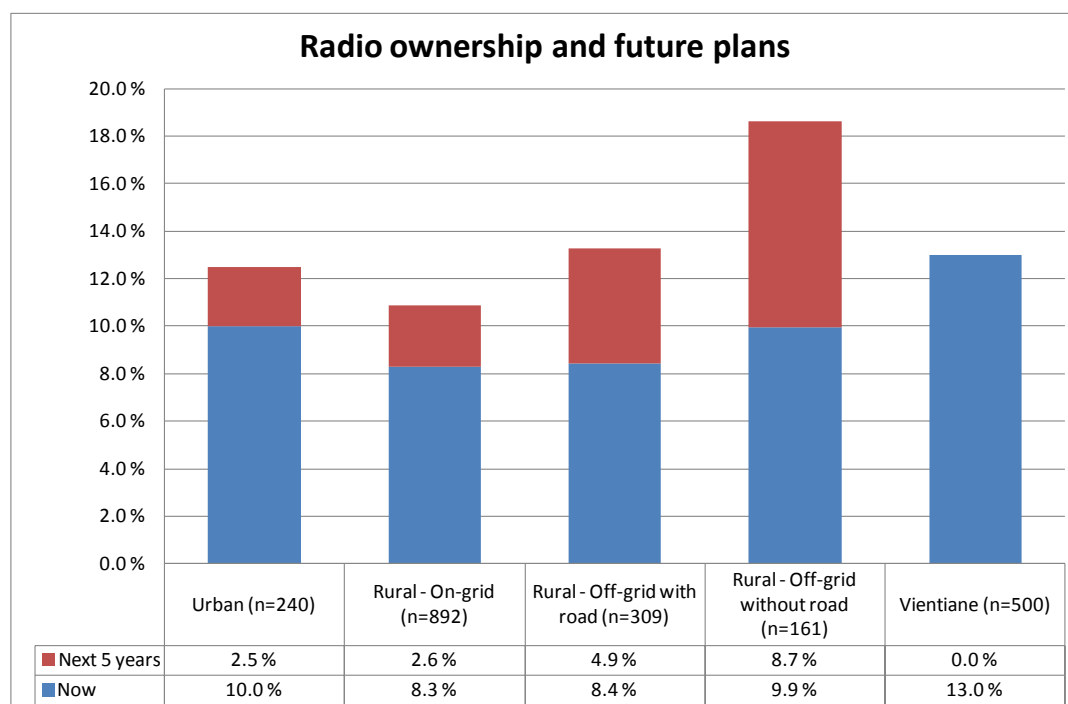


Figure 5.64. Ownership and future plans for buying a radio by village type.

9.4% of households below and 10% above the poverty line had a radio. In the next five years, households below the poverty line were planning on buying more radios (4.9%) than households above the poverty line (0.7%).



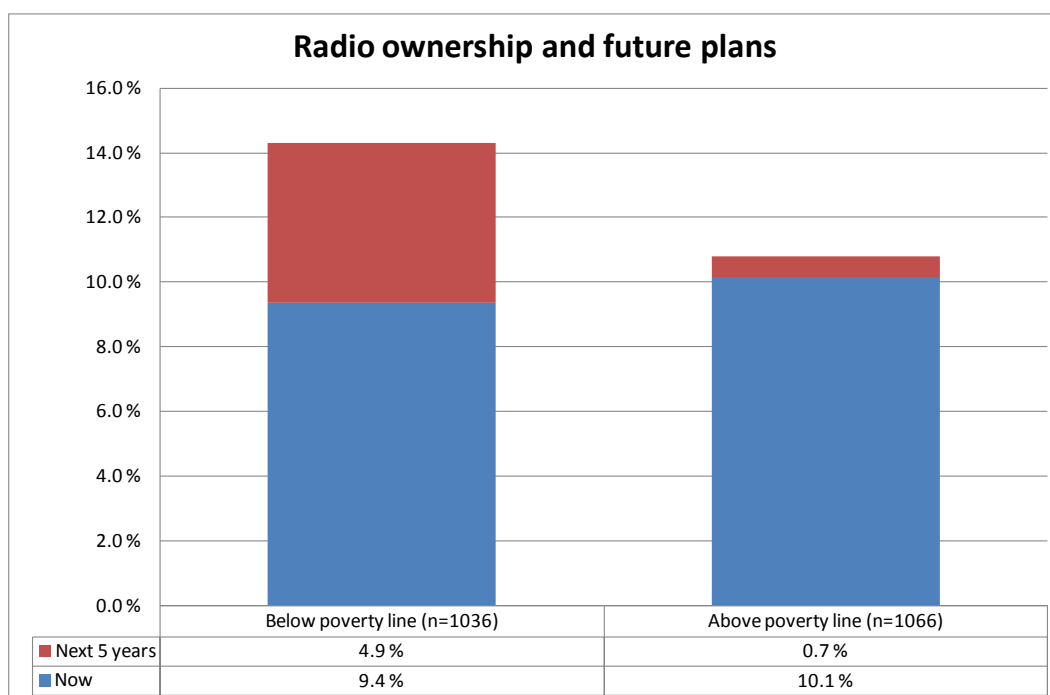


Figure 5.65. Ownership and future plans for buying a radio by the poverty line.

### 5.13.2. Colour television

The majority (84–99%) of households had color television in on-grid areas while the share in off-grid areas was considerably lower (9.9–13%). In the next five years, more than 50% of households in rural off-grid villages were planning to buy television.

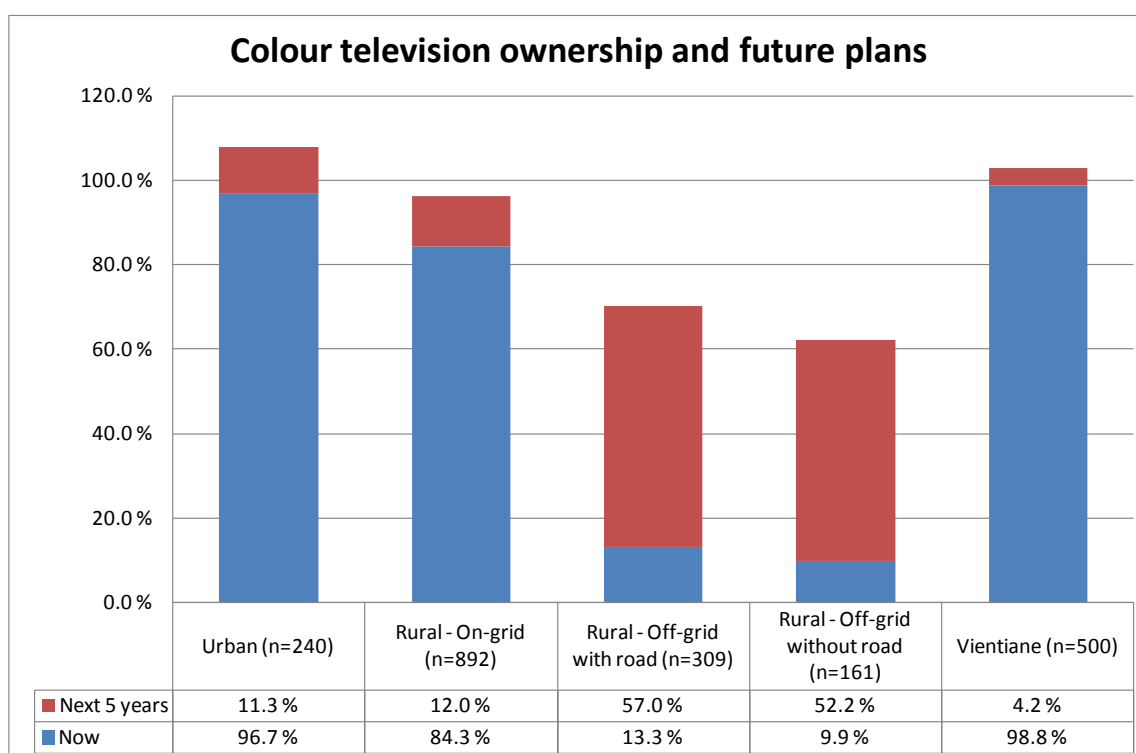


Figure 5.66. Ownership and future plans for buying a colour TV by village type.

Nearly 90% of households above the poverty line and 56% of households below the poverty line had a color television. In the next five years, the difference is predicted to decrease, with 30% of households below the poverty line and 10% above it planning to buy a new color television.

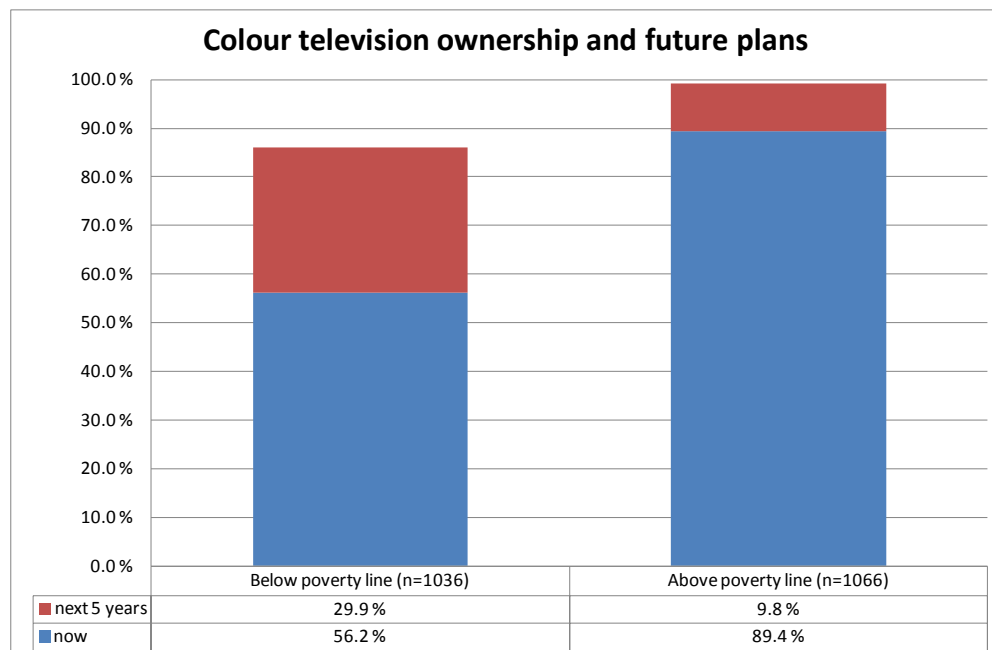


Figure 5.67. Ownership and future plans for buying a colour TV by the poverty line.

### 5.13.3. CD/DVD player

A majority of 78% of households in Vientiane had a CD or DVD player. Many urban and rural on-grid households had also CD or DVD players (62% and 51%, respectively). In rural off-grid villages the percentage was lower (11%). There are no major changes to be expected in the situation in the next five years.

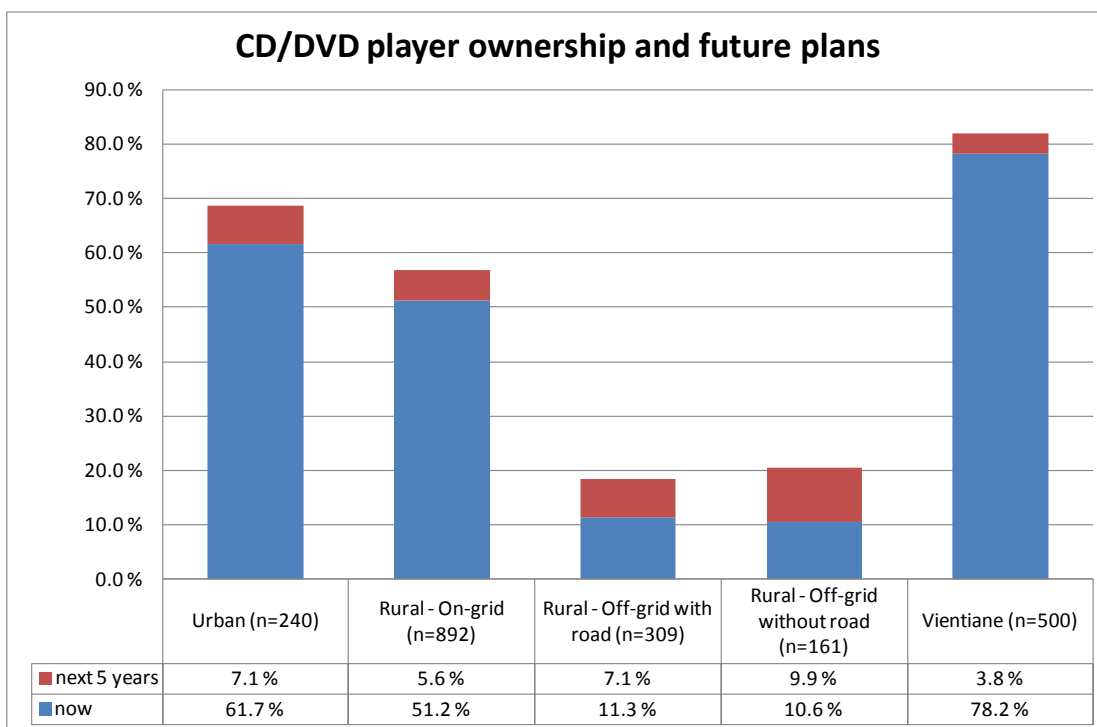


Figure 5.68. Ownership and future plans for buying a CD or DVD player by village type.

Households above the poverty line owned CD or DVD players almost twice more often (62%) than households below the poverty line (37%). In the next five years, the difference appears to decrease slightly with 7% of households below poverty the line and 5% of households above the poverty line planning to buy a CD or DVD player.

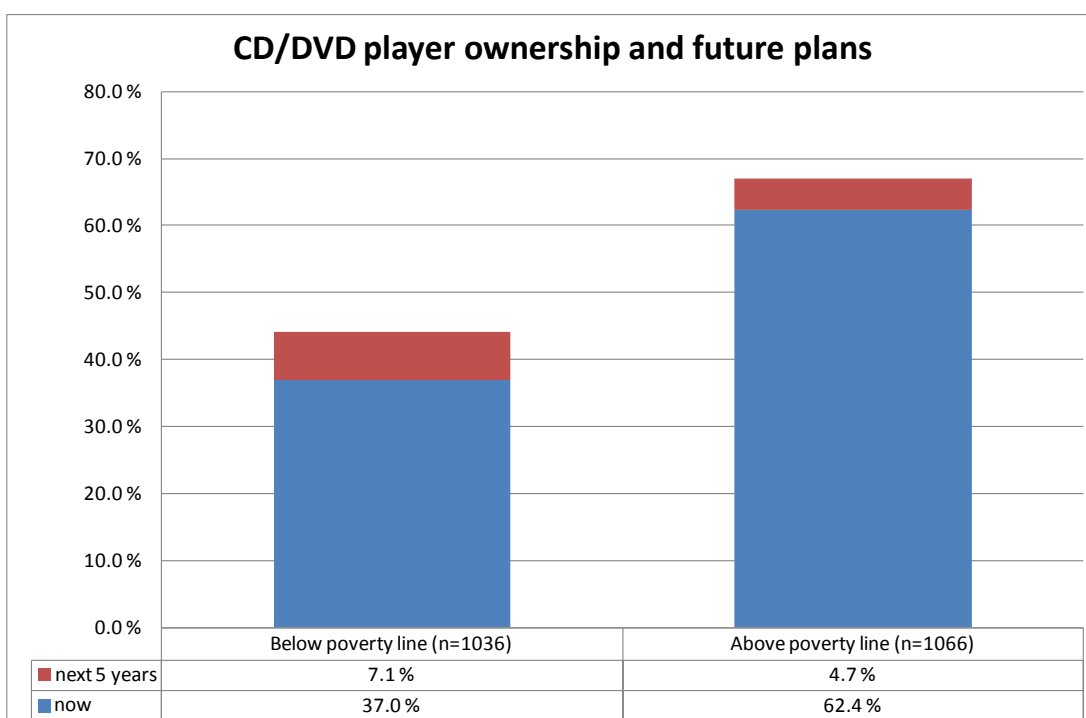


Figure 5.69. Ownership and future plans for buying a CD or DVD player by the poverty line.

### 5.13.4. Fan

Most of the households in Vientiane (99%), urban (89%) and rural on-grid (76%) areas had a fan, while almost no one had a fan in rural off-grid villages (in rural off-grid with road 1.9%, and in rural off-grid without road 5%). In the following five years, 49% of rural off-grid households with road and 35% without road were planning to buy a fan.

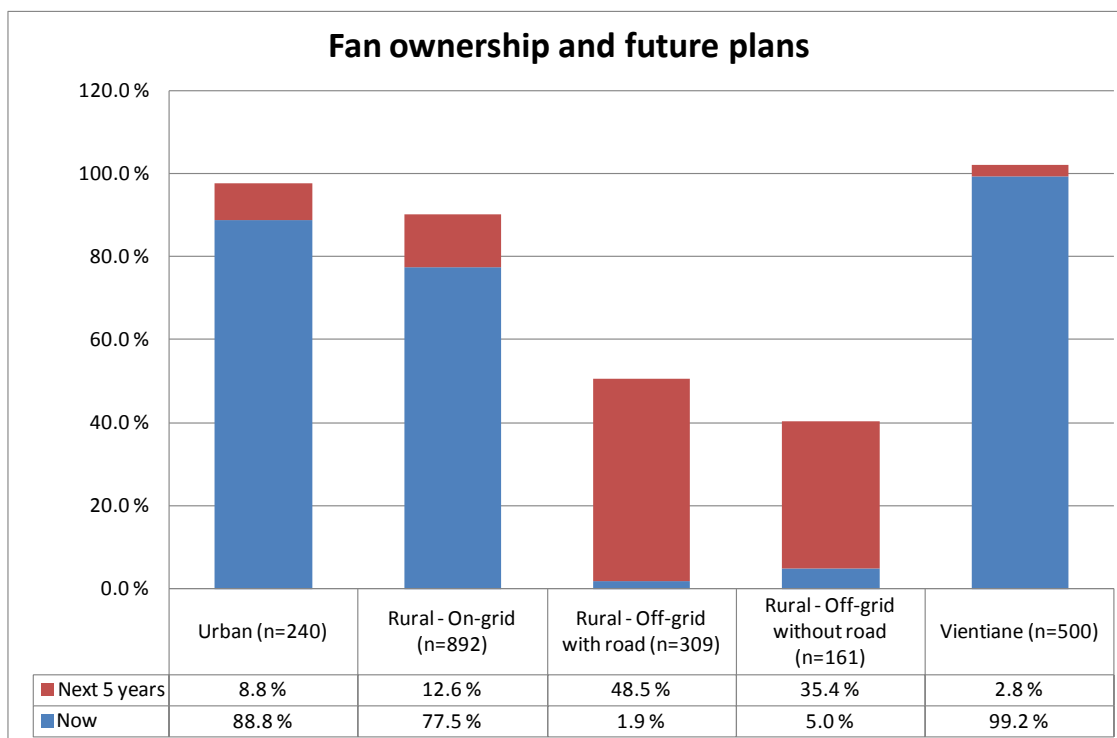


Figure 5.70. Ownership and future plans for buying a fan by village type.

86% of households above the poverty line and 48% of households below the poverty line had a fan. The rather large gap between these two groups is predicted to decrease in the next five years, as 26% of households below the poverty line and 8% of households above the poverty line were planning on buying a fan.

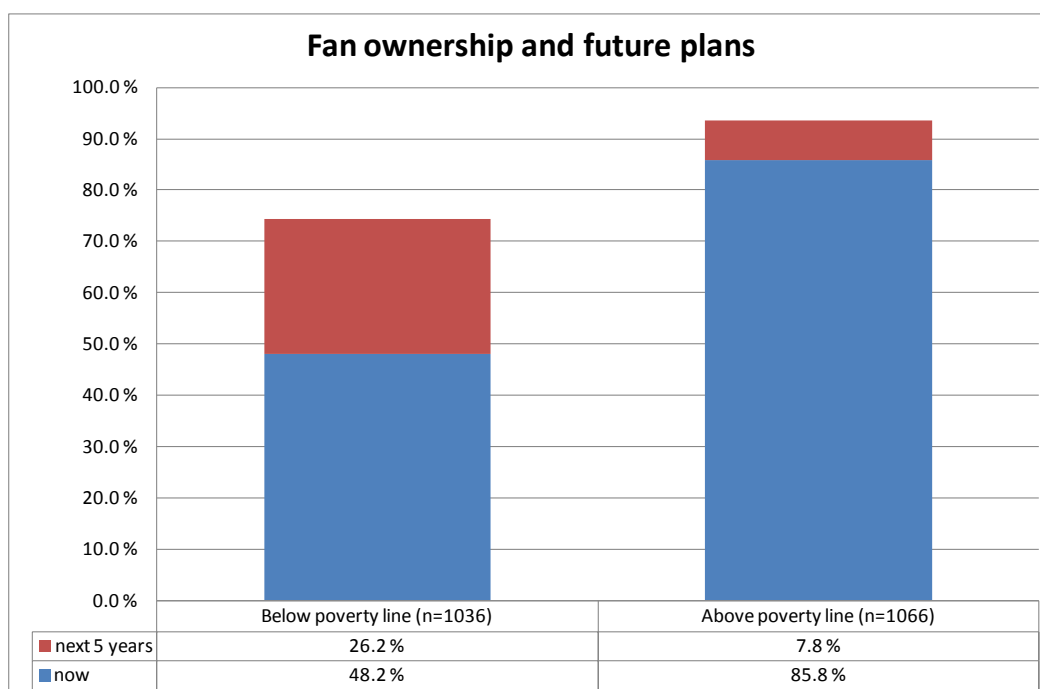


Figure 5.71. Ownership and future plans for buying a fan by the poverty line.

### 5.13.5. Washing machine

Depending on where the household was located, owning a washing machine was very rare or relatively common. In Vientiane, 57% of households had a washing machine and 19% were planning to buy one in the next five years. In urban villages, 31% of households had washing machine and as many as 35% were planning on buying one. Almost no one in rural areas had a washing machine but the shares of households planning to buy one were 25% in rural on-grid, 4.2% in rural off-grid with road and 1.2% in rural off-grid without road.

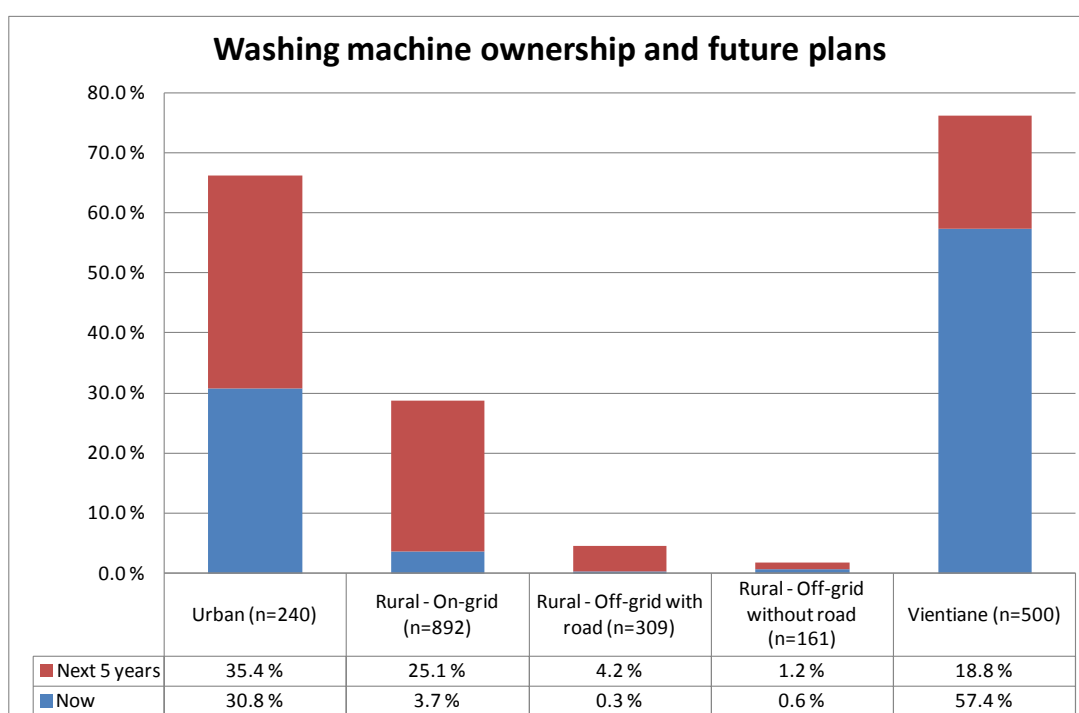


Figure 5.72. Ownership and future plans for buying a washing machine by village type.

There were major differences on the share of households that had a washing machine, depending on if the household was below or above the poverty line. A third (34%) of the households above the poverty line and 3% of the households below the poverty line had a washing machine. Almost equal shares of household in both groups (18% and 22%, respectively) were planning to buy a washing machine in the next five years.

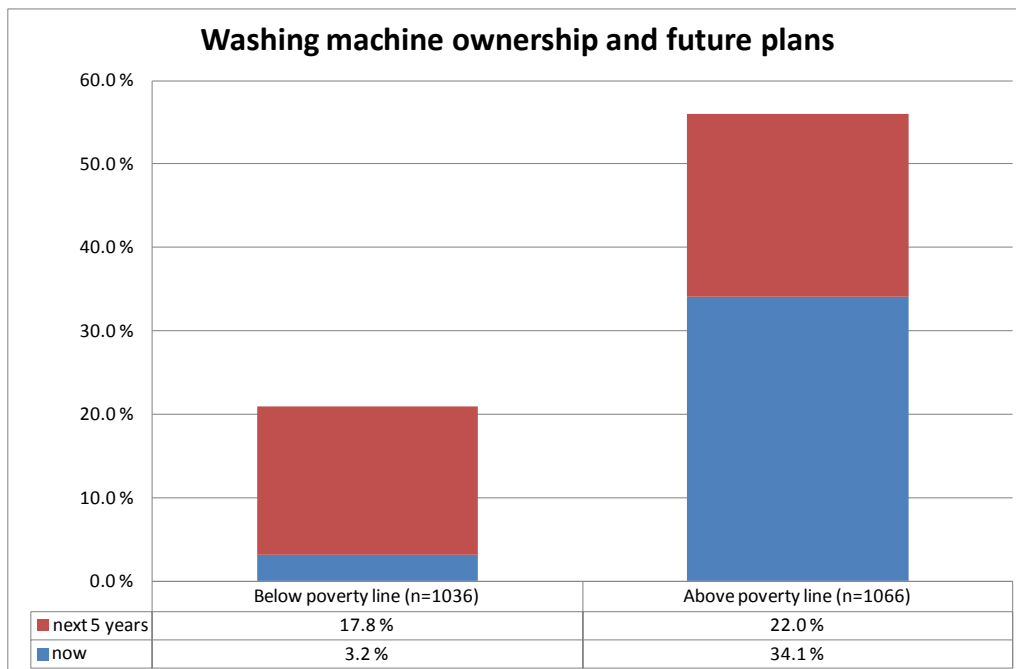


Figure 5.73. Ownership and future plans for buying a washing machine by the poverty line.

### 5.13.6. Air conditioner

Ownership of air conditioners was strongly related to urbanization: in Vientiane, 40%, and in other urban areas, 13%, of the households had an air conditioner, while the percentage was zero in rural villages. In the next five years, a fifth of the households in urban areas and a few percent in rural areas were planning on buying an air conditioner.

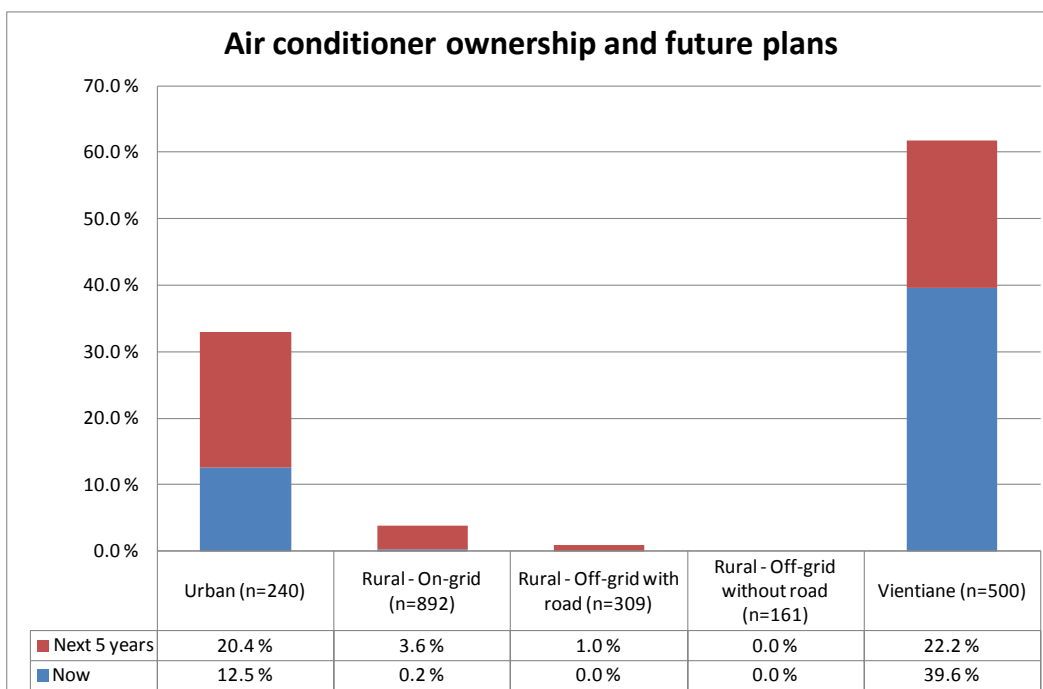


Figure 5.74. Ownership and future plans for buying an air conditioner by village type.

A fifth of the households above the poverty line had an air conditioner, whereas only 1.2% of the households below the poverty line had one. The difference is not expected to decrease in the next five years: 15% of households above the poverty line and 3% of households below the poverty line were planning to buy an air conditioner.

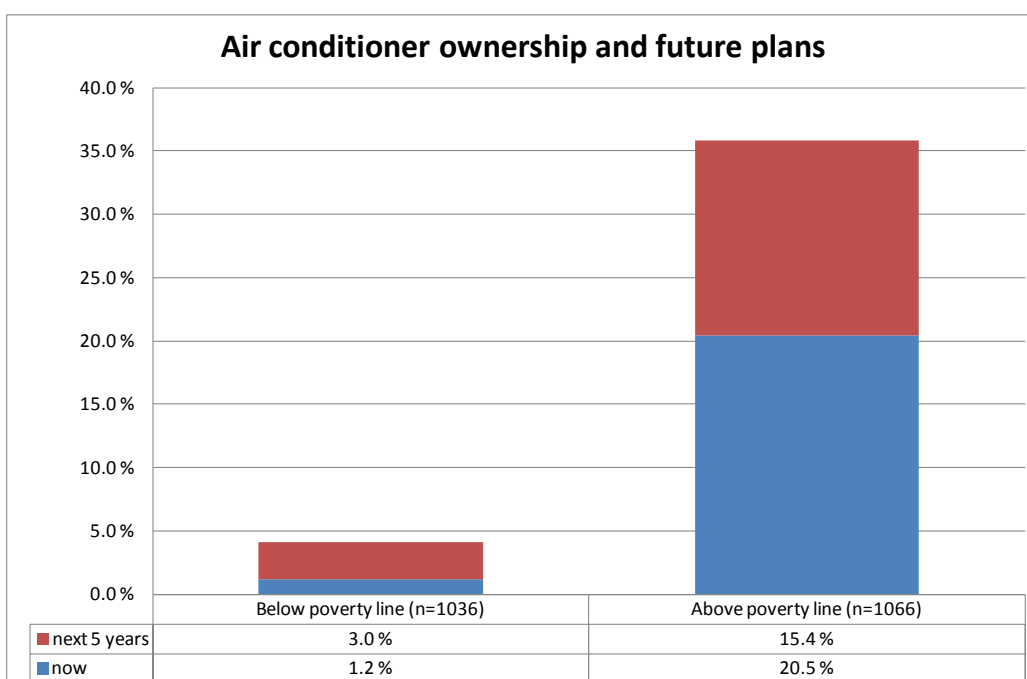


Figure 5.75. Ownership and future plans for buying an air conditioner by the poverty line.

### 5.13.7. Refrigerator

Almost every (95%) household in Vientiane had a refrigerator while almost no one in rural off-grid villages had one (0.3–0.6%). However, more than 30% of households in rural areas were planning to buy one in the following five years. Most urban households already had a fridge (86%), and the rest (16%) were going to buy one in the next five years.

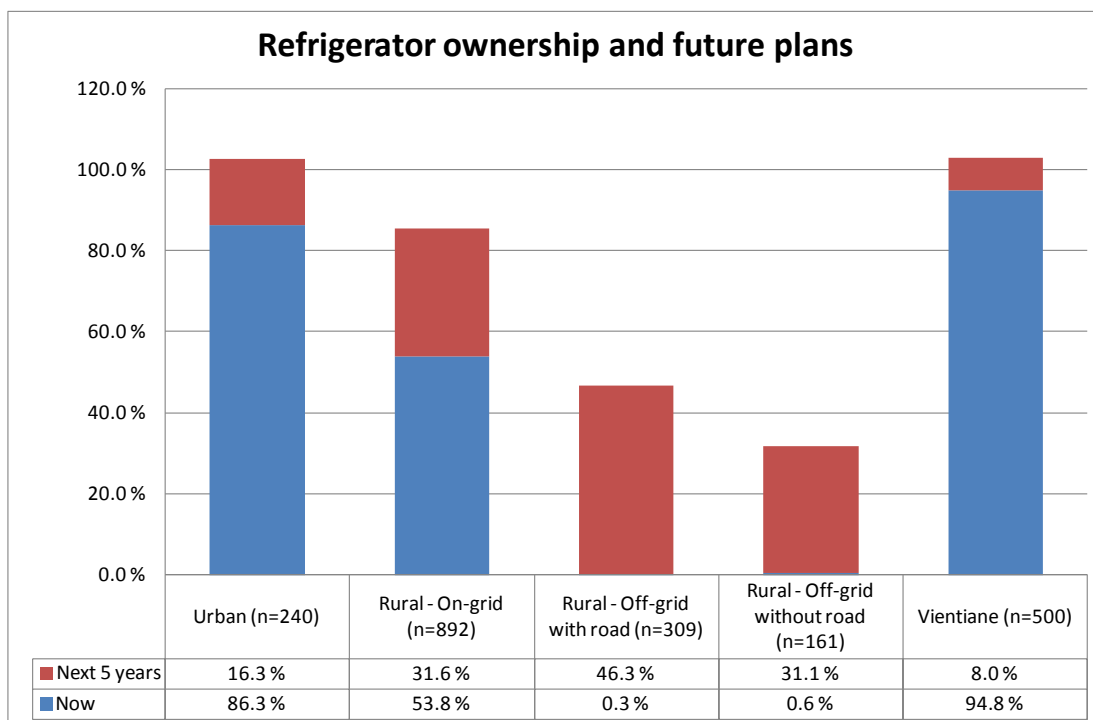


Figure 5.76. Ownership and future plans for buying a fridge by village type.

More than twice as many household above the poverty line (76%) had a refrigerator, compared to households below the poverty line (34%). The situation is expected to stabilize after five years. A third (35%) of the households below the poverty line and 18% above the poverty line were planning to buy a refrigerator in the following five years.



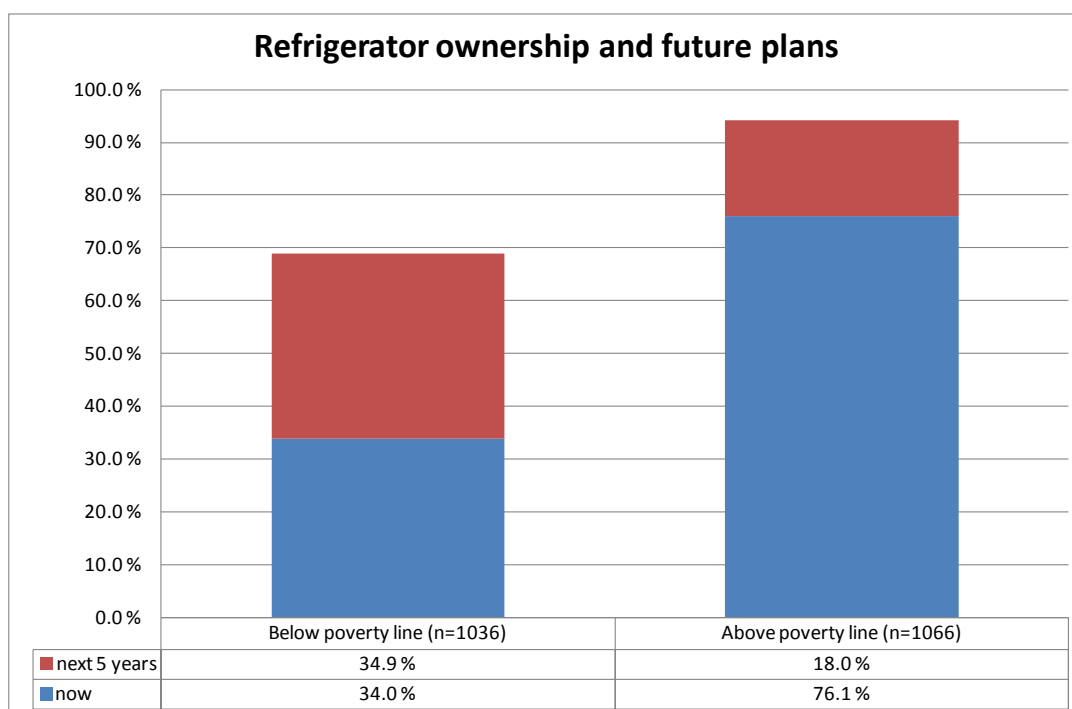


Figure 5.77. Ownership and future plans for buying a fridge by the poverty line.

### 5.13.8. Electrical cooker

There was a substantial difference between village types regarding how many households had an electrical cooker. In Vientiane, almost every (95%) household had an electrical cooker, while 74% of urban and 45% of rural on-grid households had one. The differences grow even greater when looking at rural off-grid villages, where almost no one (0.3–1.2%) had an electrical cooker. In the next five years, households were planning to buy electrical cookers at different rates in different village types: in Vientiane, 2.6% of households were going to buy an electrical cooker, while in urban areas the share was 12%, in rural on-grid villages 24%, in rural off-grid villages with road 13%, and in rural off-grid areas without road the share was 5.6%.

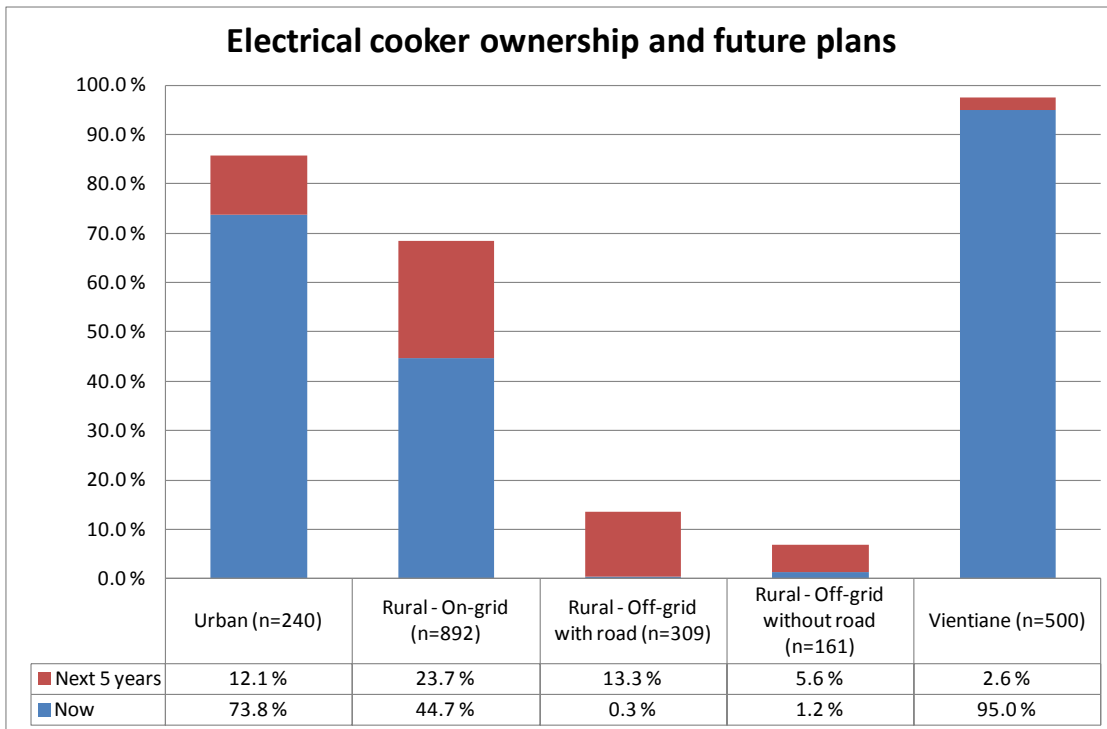


Figure 5.78. Ownership and future plans for buying an electrical cooker by village type

More than 70% of households above the poverty line and only 27% of households below the poverty line had an electrical cooker. After five years, the difference is still expected to remain rather large, although slightly more poor households (18%) than the ones earning more (11%) were going to buy an electrical cooker.

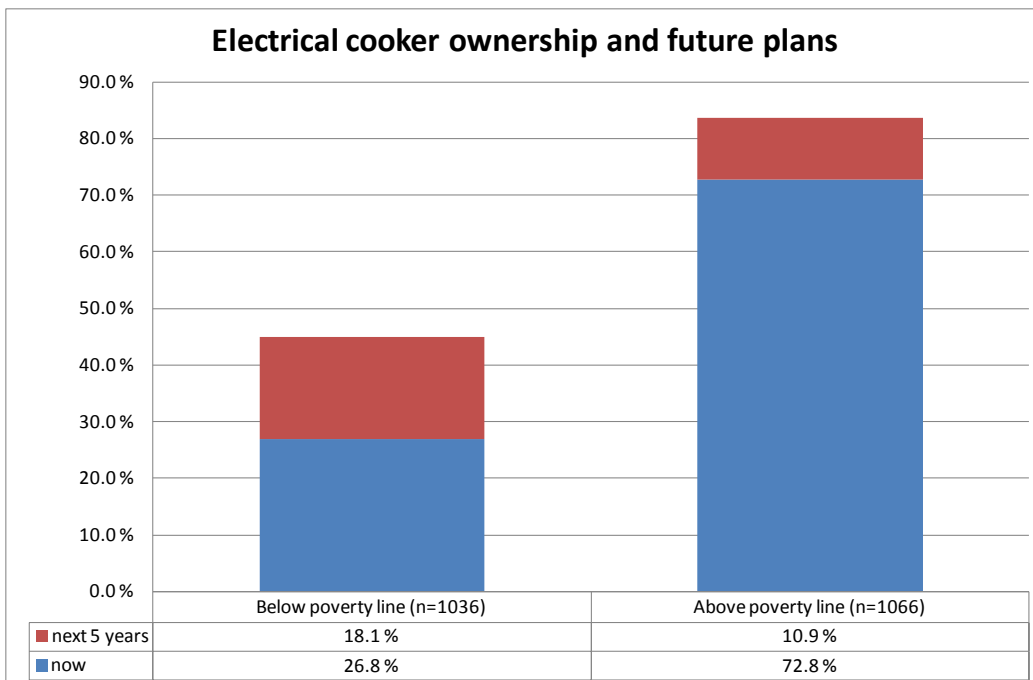


Figure 5.79. Ownership and future plans for buying an electrical cooker by the poverty line

### 5.13.9. Personal computer

Not many household had a personal computer. Most of the PCs were in the households of urban areas: in Vientiane, 20%, and in other urban, 16% of the households had a personal computer. Instead, almost no one in rural areas had a PC. In the next five years, the situation does not seem to change. More than 10% of the households in all urban and 3% in rural on-grid villages were planning to buy personal computer.

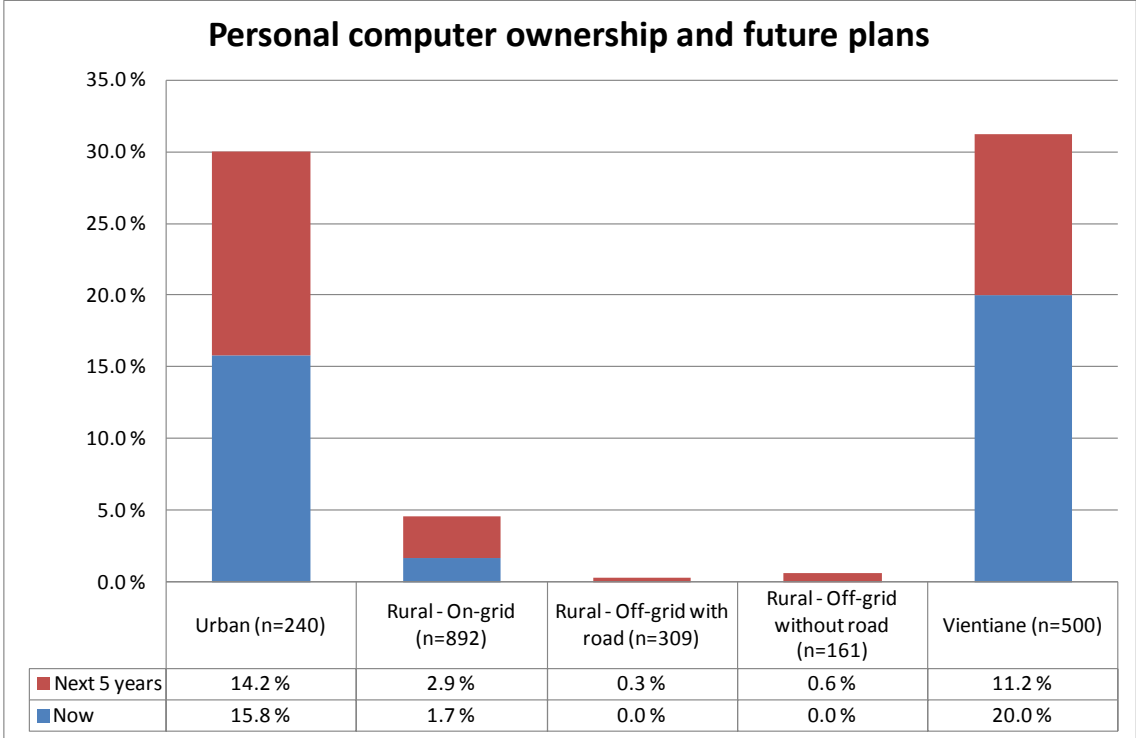


Figure 5.80. Ownership and future plans for buying a PC by village type.

Only a few households owned personal computers in general, and the differences between the income levels were substantial. 13% of the households above the poverty line and just over 1% of the households below the poverty line had a PC. In the next five years, the gap between the two seems to widen, as 8.4% of the households above the poverty line and less than 3% below the poverty line were planning to buy a personal computer.

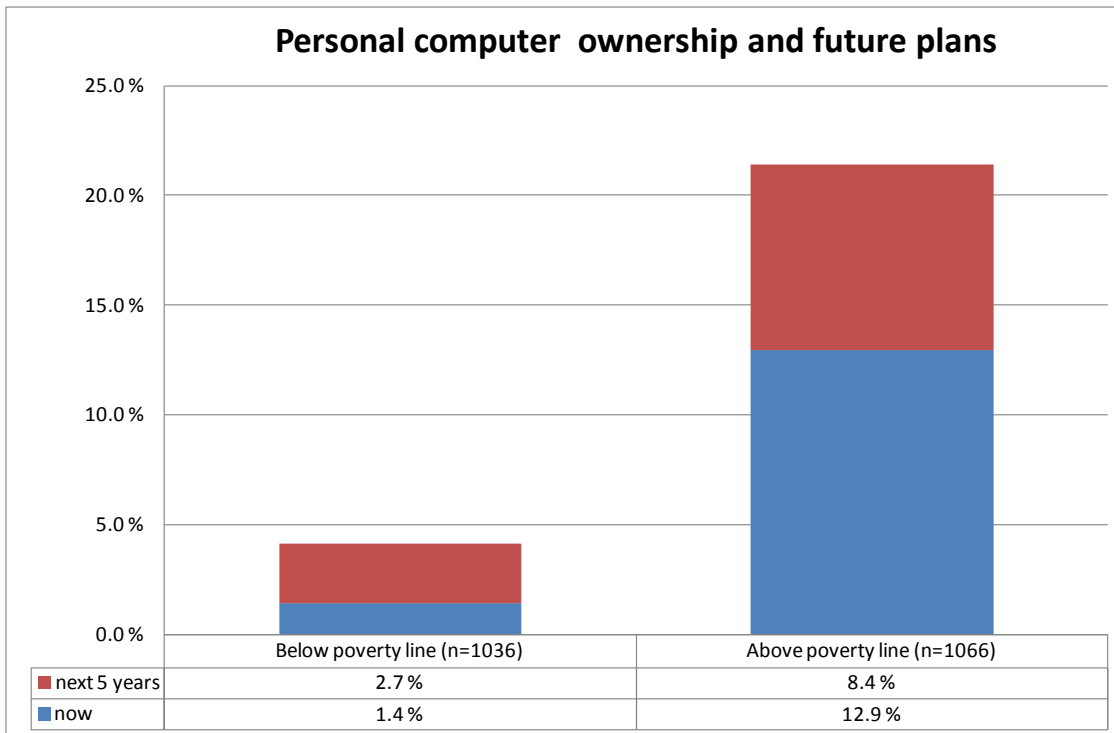


Figure 5.81. Ownership and future plans for buying a PC by the poverty line.

#### 5.13.10. Land line telephone

Less than a third of the households in urban areas had a landline telephone. In rural areas, the share was just below 10%, apart from off-grid villages without road, where almost no one had a landline phone. In the next five years, hardly anyone was planning to buy a land line phone.

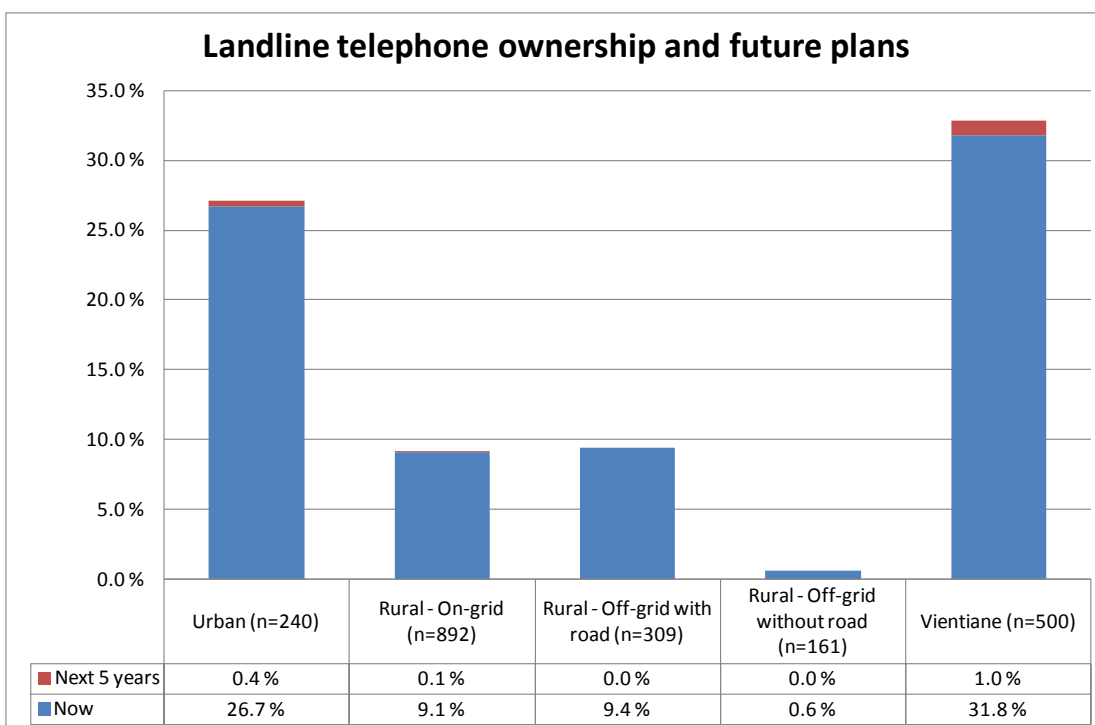


Figure 5.82. Ownership and future plans for buying a land line phone by village type.

Slightly less than a quarter (23%) of the households above the poverty line had a land line phone, while 8.3% of households below the poverty line had one.

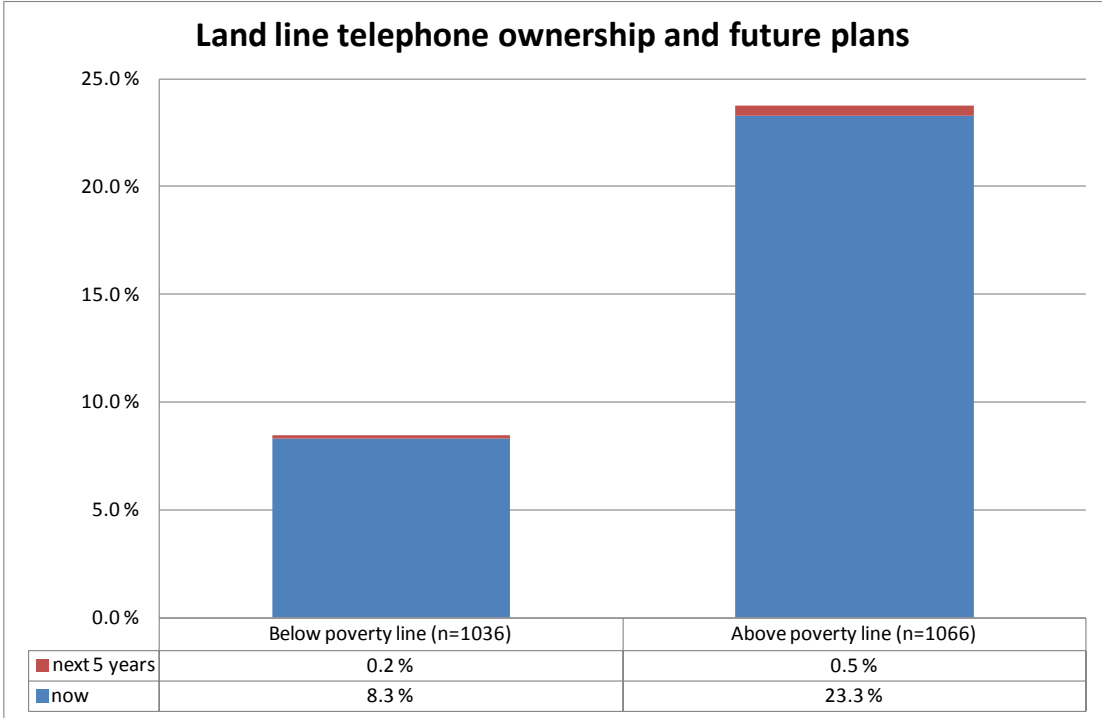


Figure 5.83. Ownership and future plans for buying a land line phone by the poverty line.

5.13.11. Mobile telephone

Almost every household (95–98%) in Vientiane and other urban areas had a mobile phone. Mobile phones were also fairly common in rural on-grid villages with 76% share. In rural off-grid villages with road, 46%, and in rural off-grid without road, 24% of the households had a mobile telephone. In the next five years, the situation does not seem to change a lot. Households in rural areas were planning on buying more mobile telephones than households in urban areas.

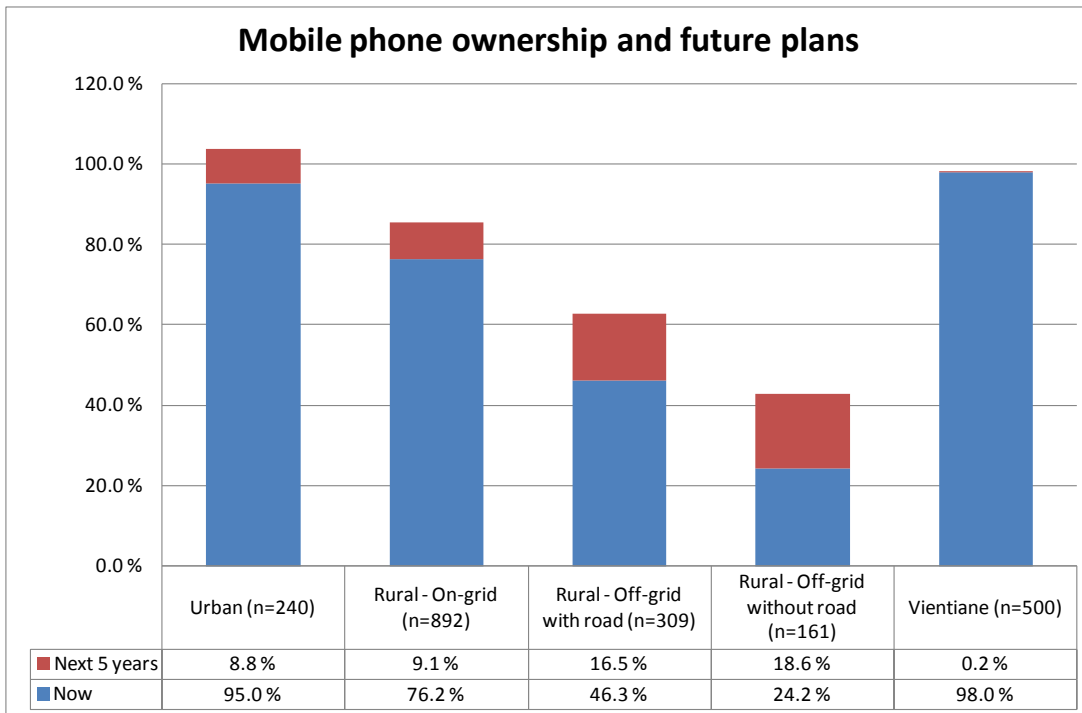


Figure 5.84. Ownership and future plans for buying a mobile phone by village type.

Almost 90% of household above the poverty line had a mobile telephone. The percentage in households below the poverty line was 61%. In the next five years, 4% of the households above the poverty line and 14% of the households below the poverty line were planning to buy a mobile phone. Thus, the difference between these two groups may become slightly more even in the future in this regard.

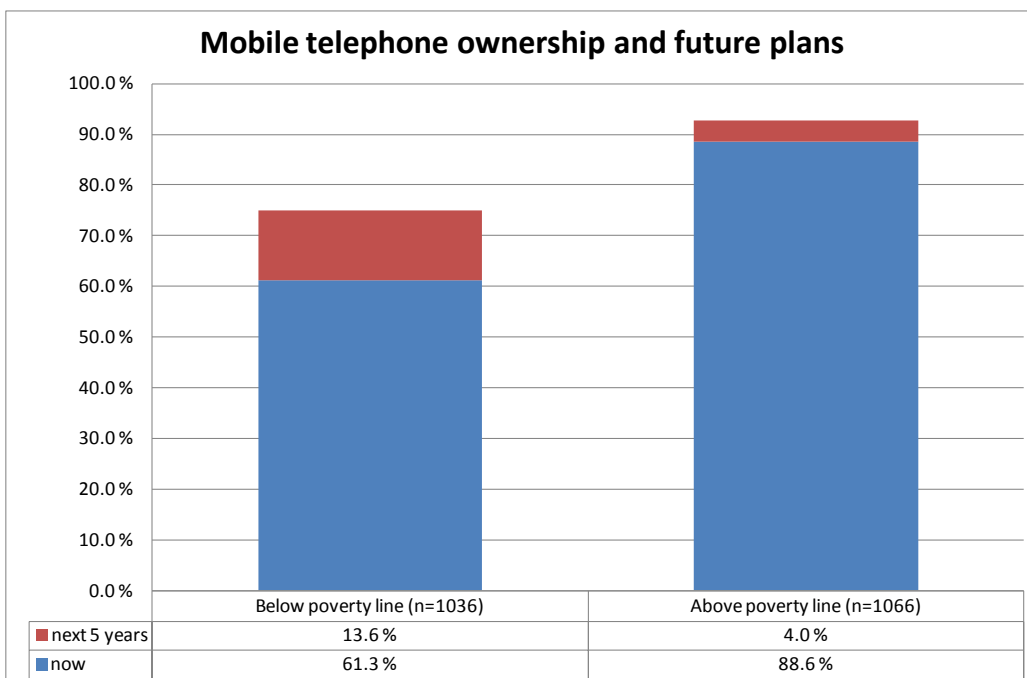


Figure 5.85. Ownership and future plans for buying a mobile phone by the poverty line.

### 5.13.12. Water pump

Water pumps were not very common in Laos. In Vientiane and in rural on-grid, 18–19% of the households had an electric water pump. Within urban households, the share was 5.8%, and within rural off-grid households, hardly any households (0.0–0.6%) had a water pump. In the next five years, only a few of the households was planning to buy a water pump.

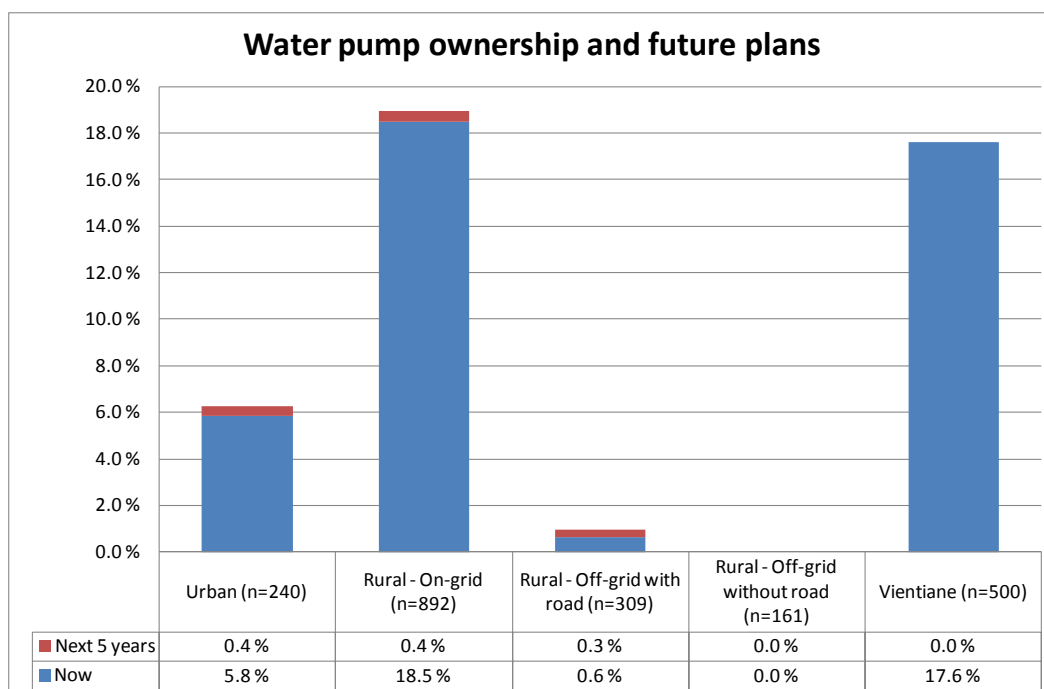


Figure 5.86. Ownership and future plans for buying a water pump by village type.

The wealthier households had more water pumps (17%) than the households below the poverty line (8.3%).

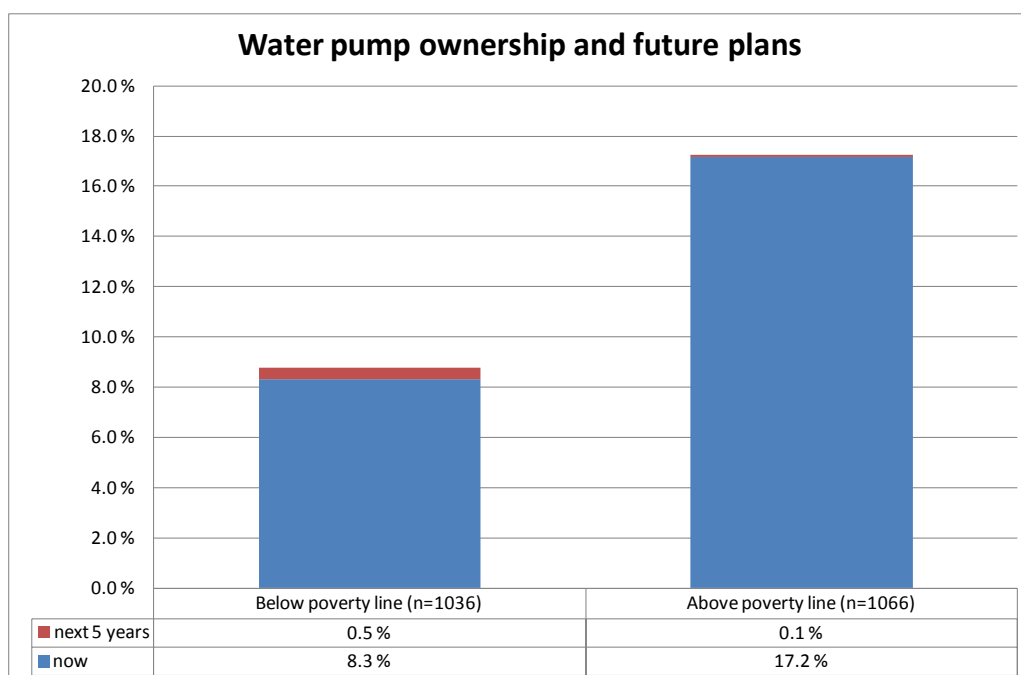


Figure 5.87. Ownership and future plans for buying a water pump by the poverty line.

## 6. ENVIRONMENTAL CHANGES

Laos is a country rich in natural resources, and it is one of the most biodiversity-rich countries in Southeast Asia. The Mekong River and its numerous tributaries provide large volumes of internal water resources, which are important for fishing and agriculture. The mountainous landscape together with water resources also provide a large hydro power potential. In addition, rich mineral resources have fueled the mining sector, which has expanded quickly during the past years. The current economic growth is based on extraction of natural resources, especially on mining industry and hydropower development, and also cash crop plantation. These natural resources are important for the economic growth, but they also have caused significant environmental damage. Rapid industrial growth combined with weak legislation and law enforcement, urbanization, and population growth has increased the pressure on the environment and has led to decreasing environmental quality.

The environmental impacts related to hydropower and mining development can be many. They can affect the access of the local people to water and land resources when the land is cleared and sometimes inundated. A major issue in Laos is also resettlement of villagers affected by the development projects. Resettlement of villages has an impact on the people and their livelihoods, but also further impact on the environment at the new location of the resettled village (World Bank 2010). The reservoirs and changes in water flow associated with hydropower dams affect negatively fish and other aquatic life and their dynamics. The dams affect water levels and seasonal changes of water levels and flows. The sediment flow is also expected to get distorted, which may increase the erosion of riverbanks at some places, as well as reduce the amount of fertile sediments that are important for agriculture and aquatic life in other locations downstream (Lazarus et al. 2006). In addition, water quality issues due to acidic liquid waste, and dissolved heavy metals from mining sites, pollute rivers and other water sources (World Bank 2010). This may have an effect on aquatic life, agriculture, as well as drinking water quality.

The incidence of financial poverty is still high in Laos, and a large portion of the population makes their living out of natural resources. In addition to subsistence agriculture, non-timber forest products (NTFPs) and wild food from forest and rivers play an important role, especially in rural peoples' lives (Hanssen 2007). However, during the past years, access to land has become increasingly limited for many Lao people due to 'land grabbing', a term which explains the rapid, abrupt and unjust nature of the land ownership deals (GRAIN 2008). Laos is one of the countries in Southeast Asia that has conceded significant amounts of land to foreign investors in conjunction with the rise of global land acquisitions. Concessions have led to an uncompensated loss of assets at both village and state level (Kenney-Lazar 2012). When mining sites are included, 21% of the total land area is estimated to be under concession agreements and contracts. Roughly 13% of all villages in Laos have at least one concession within their village boundaries. The average poverty rate of these affected villages is slightly above the national average (Wellman 2012). Considering that 80% of the Lao population live in rural setting and is highly dependent on subsistence agriculture and the access to NTFPs for their living, the increasingly limited access to land poses a threat to the livelihoods of the rural population.



Laos is a mountainous country with over 70% of the land area having a slope of more than 20 degrees. The steep slopes in combination with erosion prone soils, high rainfall, and shortened fallow periods in agriculture have resulted in erosion, decreased productivity, and a demand of more land. While pioneer 'slash and burn' is considered more harmful, some forms of shifting agriculture, such as long rotational swidden, are not considered harmful to the land (World Bank 2005). Shifting cultivation is still widely practiced, especially in Northern uplands, despite the government's efforts to 'eliminate' it. Although the forest cover has decreased during the past decades, not only due to shifting cultivation, but also because of commercial logging and commercial plantations, in comparison to other Southeast Asian countries, the forest cover in Laos is relatively high, around 40% (Robichaud et al. 2009).

In the Lao PDR, only about half of the population has access to safe sanitation. This is below the regional average of 67% for Southeast Asian countries. In rural Laos, the percentage of people with access to safe sanitation is only about 40%. Poor sanitation leads to illnesses and deaths, but also loss of money as drinking water must be treated or brought in bottles (Hutton et al. 2009).

The rapid urbanization has caused pressure on the urban environment. As the cities continue expanding, sewage systems, solid waste collection, recycling, and disposal are challenges to be addressed. Also access to safe water and sanitation pose a challenge. Lack of human resources, financing, and uneven enforcement of environmental laws exacerbate these problems in Laos (World Bank 2005). Urbanization and economic growth also affect the traffic. The number of vehicles on the roads of Laos is increasing quickly. This has had a negative effect on the air quality, and has also caused noise and carbon monoxide pollution, especially in Vientiane (Vientiane Times 27.08.2012).

Traditionally, indoor air quality has also been poor since wood fuels and other solid fuels are used for cooking and heating. It has been estimated that in 2003 over 95% of the population used solid fuels for cooking and heating. Solid fuels are often burnt indoors in open fires, or in poorly functioning stoves. The inefficient burning of solid fuels creates carbon monoxide and small particles harmful to the respiratory system (WHO 2006). In consequence, especially women, who typically are responsible for cooking, as well as their young children, are heavily exposed to air pollution. The indoor air pollution has been found to increase the risk of several diseases, among others acute respiratory infections, which are one of the major causes of death among children in developing countries (Emmelin 2007). In addition, the energy efficiency of this kind of combustion is usually low and adds pressure on forest resources.

In our survey, related to recent environmental problems, we asked the households to evaluate whether a number of changes had occurred in the past five wet and dry seasons. In the questionnaire of the survey in Vientiane, wet and dry seasons were not separated. Therefore, the results from Vientiane are investigated here separately, by the poverty line division.

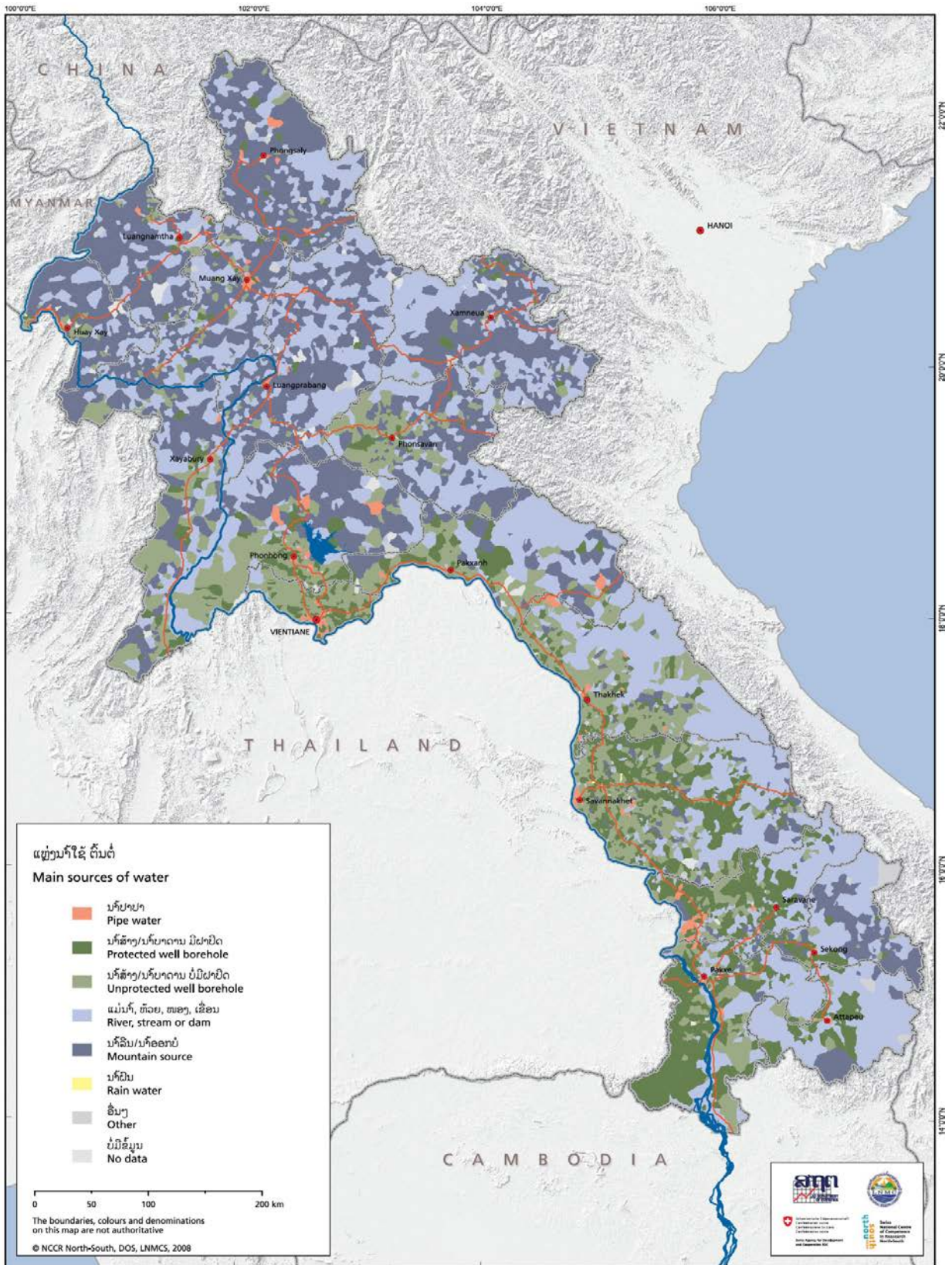


Figure 6.1. The map of main sources of water in Laos (Messerli et al. 2008).

## 6.1. Quality of water

Households in off-grid villages with road access had experienced most often decreases in water quality in the past five wet and dry seasons (34%-35%). In other village types, the quality of water had deteriorated for approximately a fifth of the households in the wet seasons and for a quarter in the dry seasons.

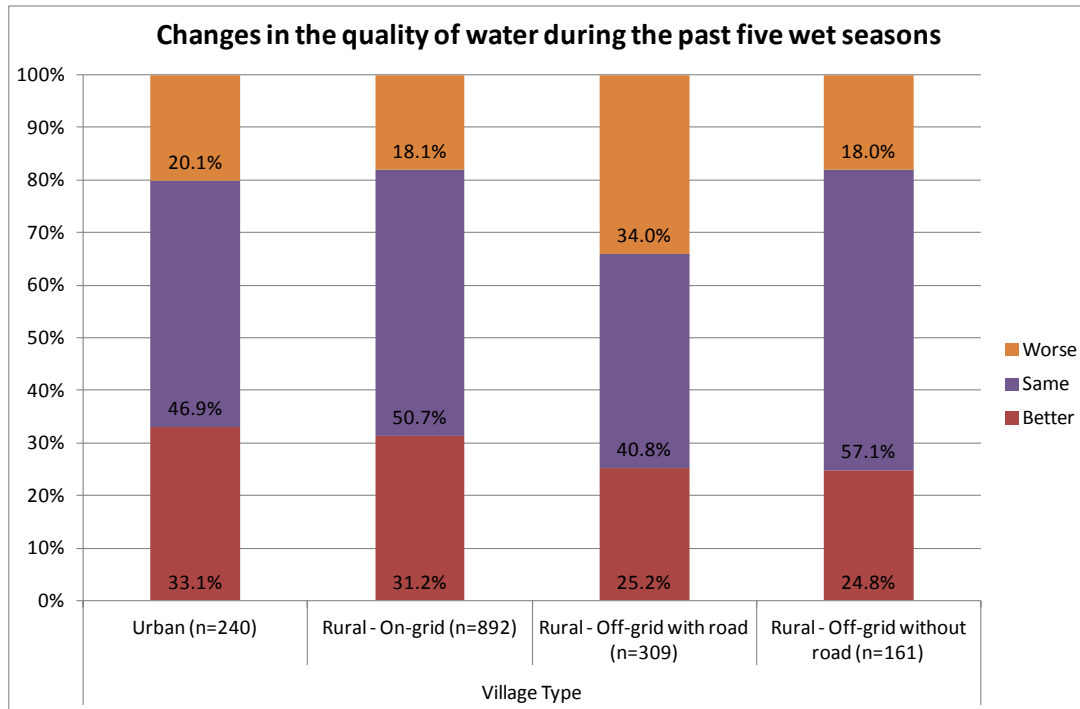


Figure 6.2. Experiencing changes in the quality of water in the past five wet seasons by village type ( $\chi^2=40.54$ ,  $df=6$ ,  $p<0.001$ ).

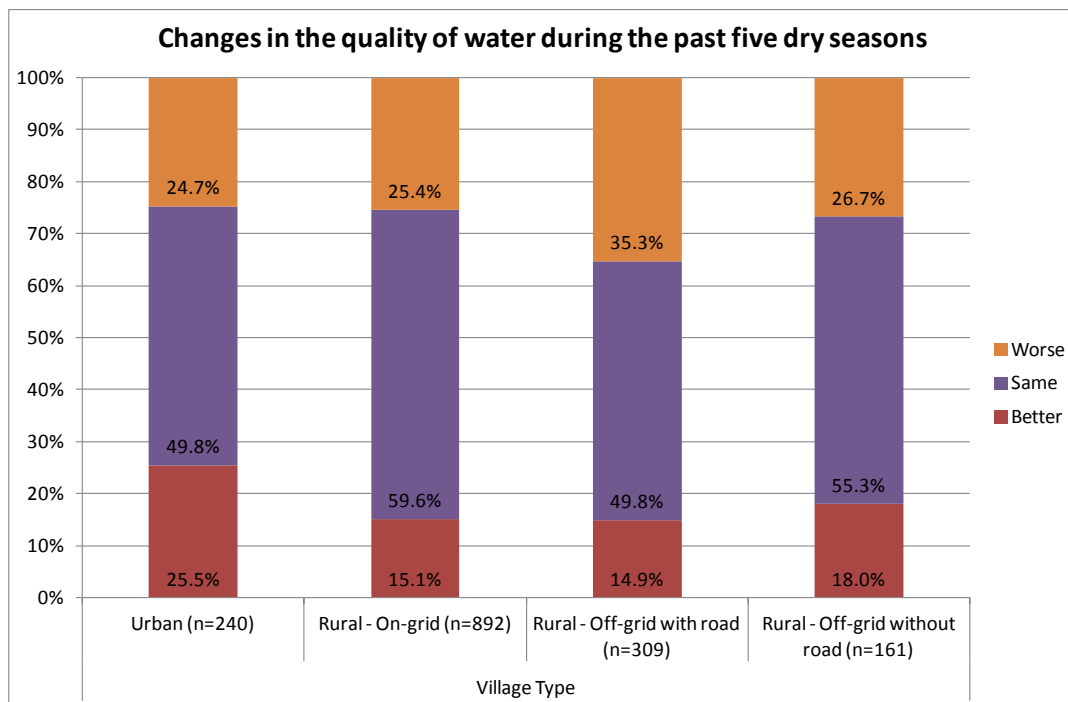


Figure 6.3. Experiencing changes in the quality of water in the past five dry seasons by village type ( $\chi^2=27.94$ ,  $df=6$ ,  $p<0.001$ ).

About 20% of the households below and above the poverty line had experienced a change to the worse in water quality in the wet season. Respondents above the poverty line said more often that there had been no changes in the quality of water, 61%, compared to 42% within households below the poverty line. It was more common among households below the poverty line to have experienced an improvement of the water quality, 35%, compared to 20% in the households above the poverty line.

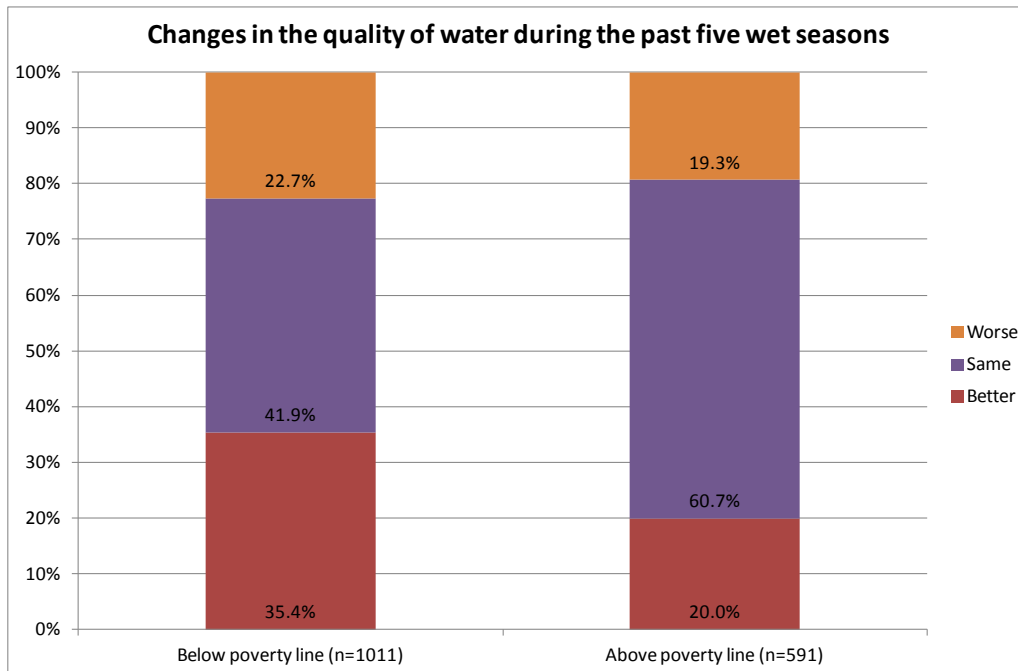


Figure 6.4. Experiencing changes in quality of water in the past five wet seasons by the poverty line ( $\chi^2=52.4$ ,  $df=2$ ,  $p<0.001$ ).

It was more common among the households below the poverty line to have experienced a deterioration of the quality of water in the past five dry seasons (32%, compared to 20% above the poverty line). A majority of the households above the poverty line (64%) and half of the households below the poverty line (51%) had not experienced any changes. Compared to the wet seasons, there had been less positive changes in the past dry seasons regarding the quality of water.

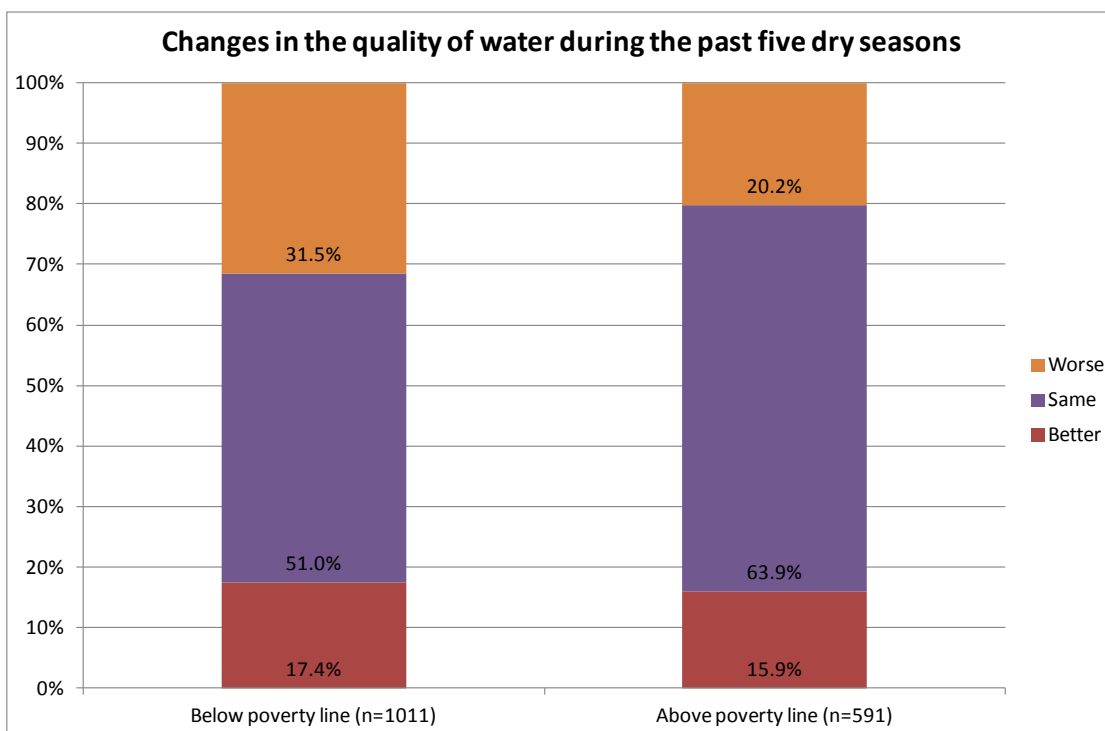


Figure 6.5. Experiencing changes in quality of water in the past five dry seasons by the poverty line ( $\chi^2=29.1$ ,  $df=2$ ,  $p<0.001$ ).

In Vientiane, the share of households with decreased water quality was slightly bigger for the households above the poverty line, 19%, compared to 12% within the households below the poverty line.

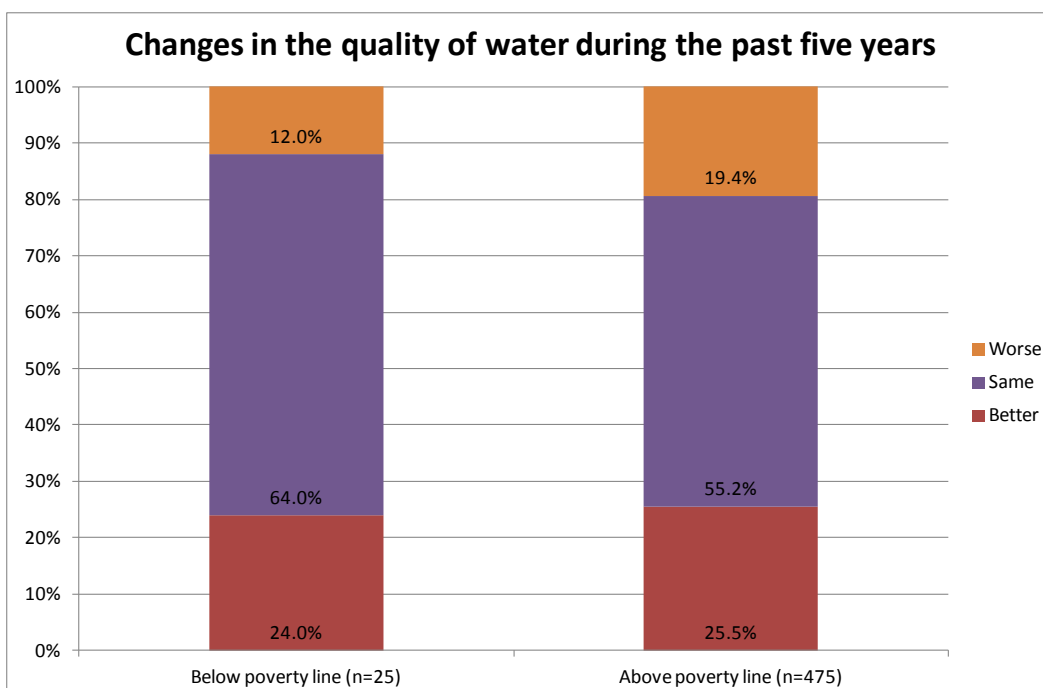


Figure 6.6. Experiencing changes in quality of water in the past five years by the poverty line (Vientiane only,  $\chi^2=1.0$ ,  $df=2$ ,  $p=0.60$ ).

## 6.2. Access to rivers, lakes or ponds

Access to natural water sources had not changed during the last five wet seasons for the majority. Off-grid households with road access had experienced most changes, both positive (17 % in the wet and 24% in the dry seasons) and negative (37 % in the wet and 24% in the dry seasons).

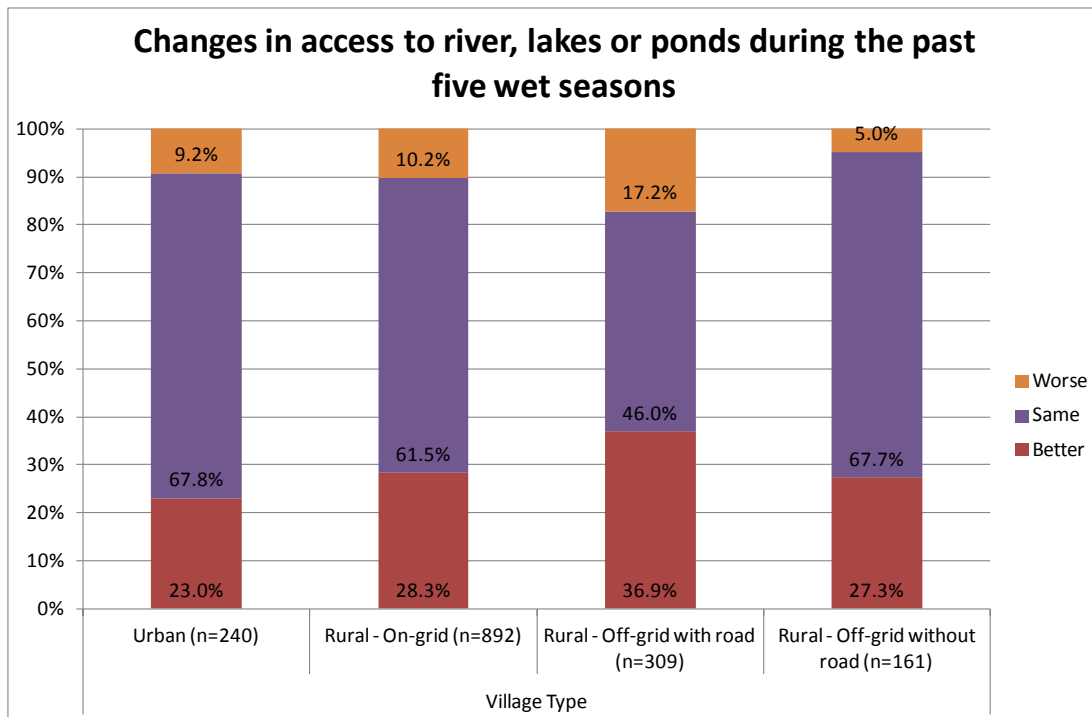


Figure 6.7. Experiencing changes in access to river, lakes or ponds in the past five wet seasons by village type ( $\chi^2=41.64$ ,  $df=6$ ,  $p<0.001$ , not asked in the Vientiane survey).

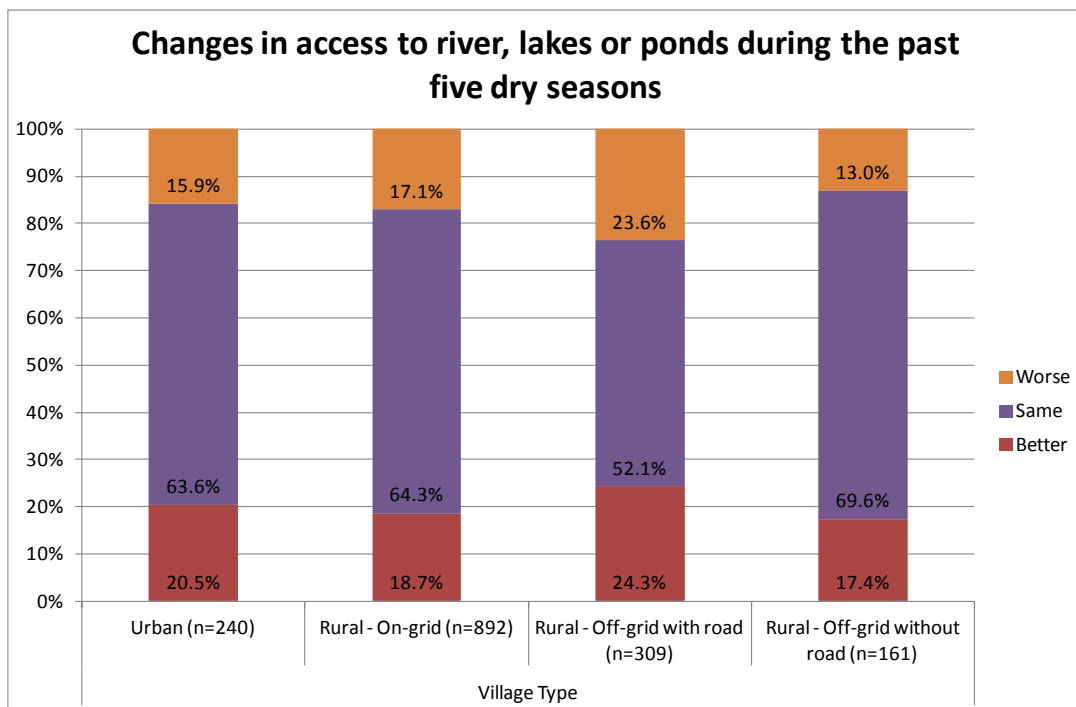


Figure 6.8. Experiencing changes in access river, lakes or ponds in the past five dry seasons by village type ( $\chi^2=20.05$ ,  $df=6$ ,  $p=0.003$ , not asked in the Vientiane survey).

For the households below the poverty line, it had been slightly more common to have experienced both a worsening of access to water sources in the wet seasons (35%, and 19% above the poverty line) as well as an improvement of the situation (13% and 7.5%). Half of the households below the poverty line replied that there had been no change, whereas a majority of the households above the poverty line (74%) had not experienced a change.

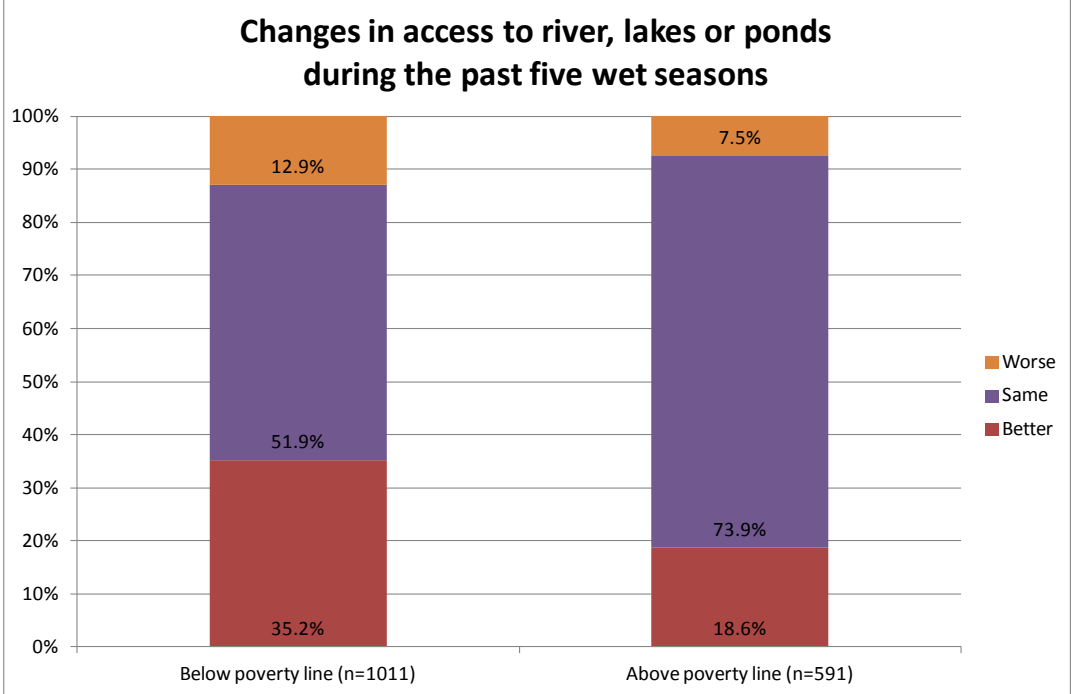


Figure 6.9. Experiencing changes in access to river, lakes or ponds in the past five wet seasons by the poverty line ( $\chi^2=75.0$ ,  $df=2$ ,  $p<0.001$ , not asked in the Vientiane survey).

Access to rivers, lakes or ponds, in the past five dry seasons resembled the situation in the wet seasons, described above. It had been more common within households below the poverty line to have experienced both a worsening of the situation (22%, compared to 11%) as well as an improvement of the situation (22% and 16%). Roughly a half of the households below the poverty line (56%) did not mention a change in the access to natural water, whereas considerably more of the households above the poverty line (73%) said there had not been a change.

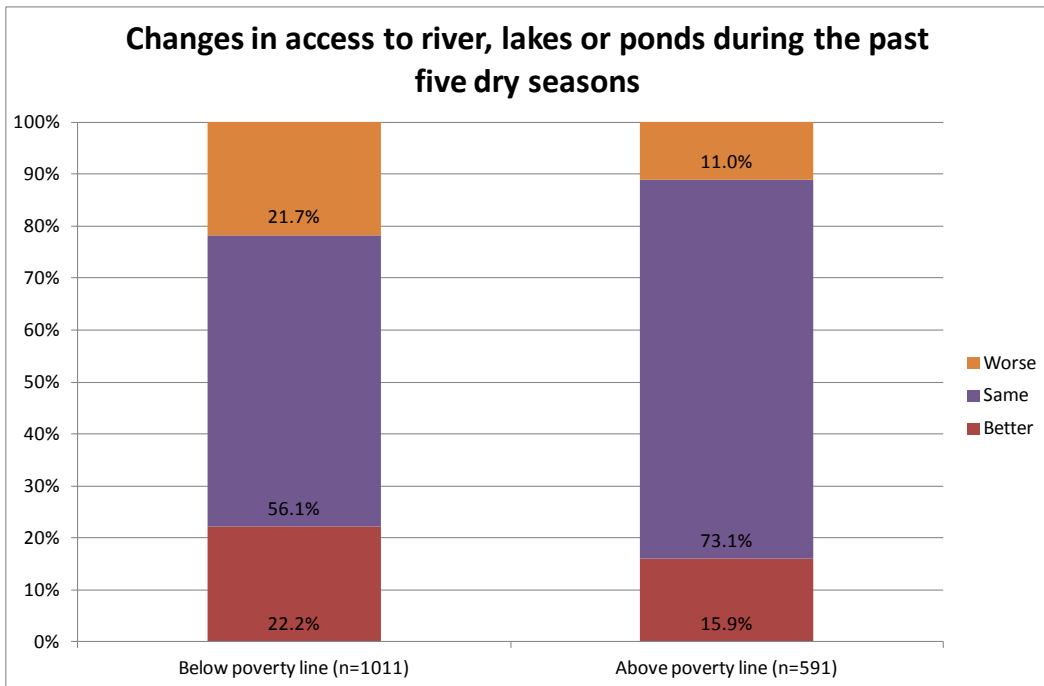


Figure 6.10. Experiencing changes in access to river, lakes or ponds in the past five dry seasons by the poverty line ( $\chi^2=48.5$ ,  $df=2$ ,  $p<0.001$ , not asked in the Vientiane survey).

### 6.3. Access to latrine sanitation

More than half of the urban villages and rural-on grid villages stated that their access to latrine sanitation had improved. For around one third of all rural-off-grid villages, access to latrine sanitation had worsened.

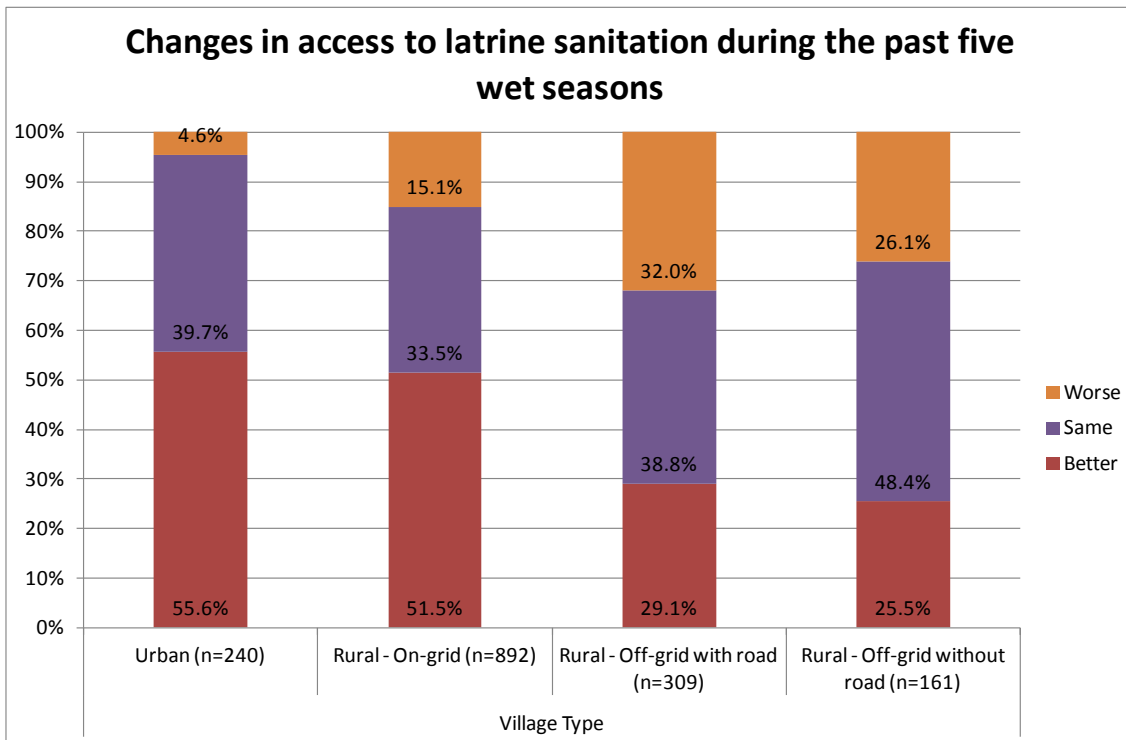


Figure 6.11. Experiencing changes in access to latrine sanitation in the past five wet seasons by village type ( $\chi^2=122.75$ ,  $df=6$ ,  $p<0.001$ ).



In all villages, latrine sanitation had become better more commonly in dry seasons compared with the wet seasons. Similarly, it had been less common that the sanitation conditions had deteriorated in the dry seasons.

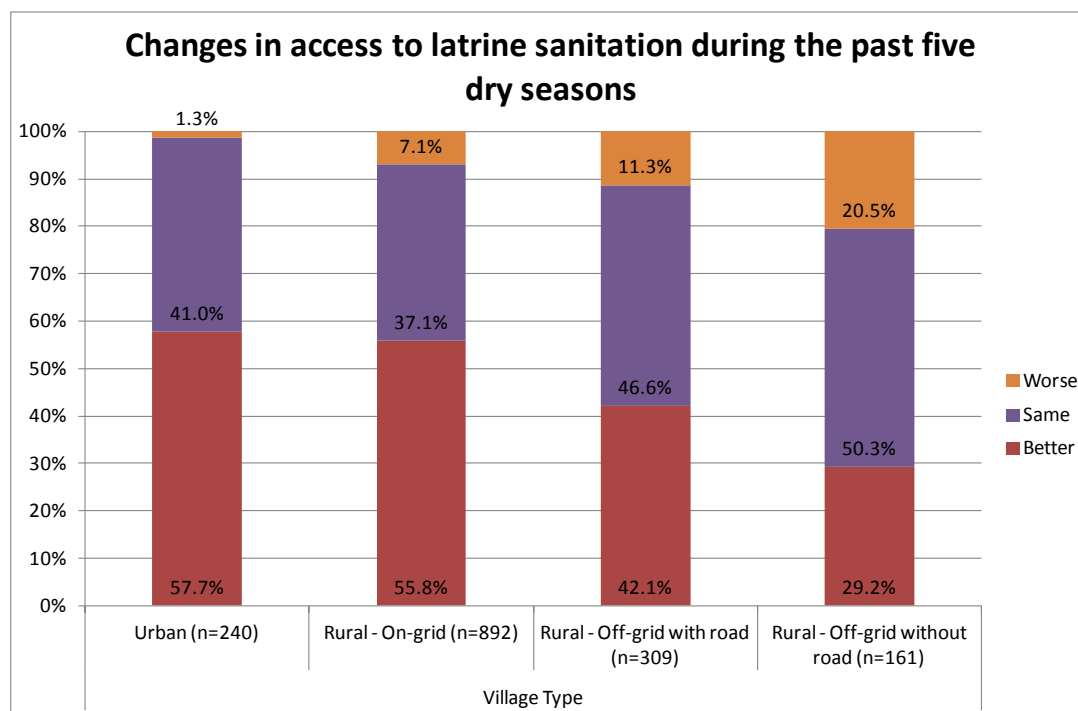


Figure 6.12. Experiencing changes in access to latrine sanitation in the past five dry seasons by village type ( $\chi^2=82.98$ ,  $df=6$ ,  $p<0.001$ ).

There was a significant difference between the households below and above the poverty line with regards to changes in access to latrine sanitation in the past five wet seasons. The households above the poverty line were almost twice more likely (61%) to have had better access to sanitation than the households below the poverty line (36%). Likewise, worsened access to latrine sanitation was significantly more common among the households below the poverty line (25%), than the households above the line (6.1%).

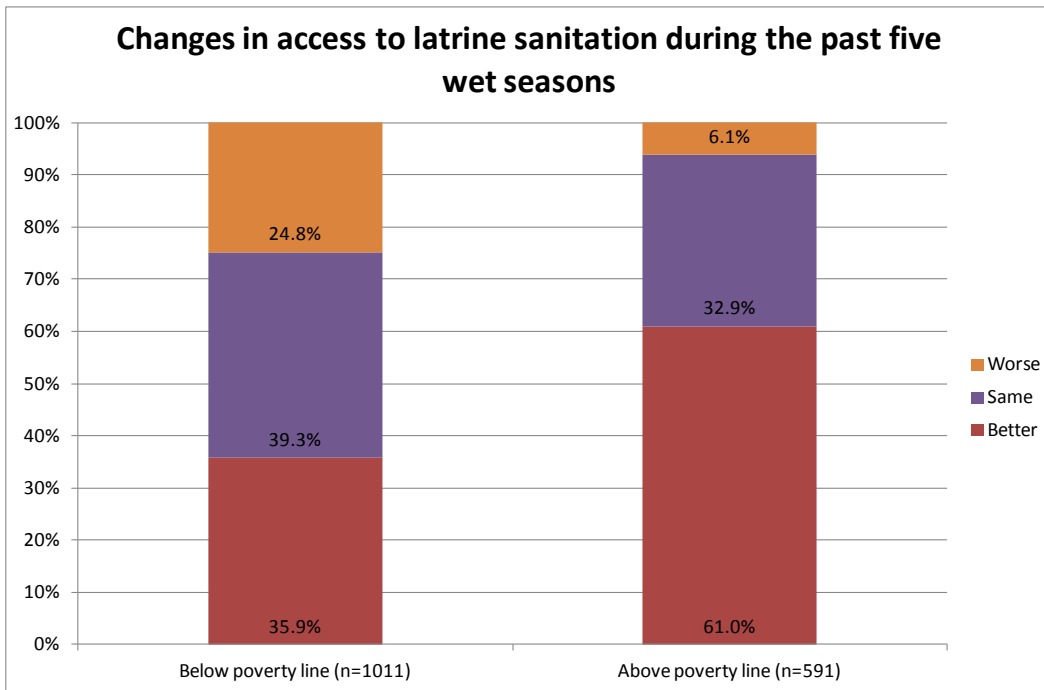


Figure 6.13. Experiencing changes in access to latrine sanitation in the past five wet seasons by the poverty line ( $\chi^2=128.9$ ,  $df=2$ ,  $p<0.001$ ).

Changes in access to latrine sanitation in the past five dry seasons were also significantly different for households with different income levels. Overall, the access in the dry seasons had improved more than in the wet seasons. The wealthier households had experienced more positive changes (64%) and less negative changes (1.5%) than the households below the poverty line (43% and 12%, respectively).

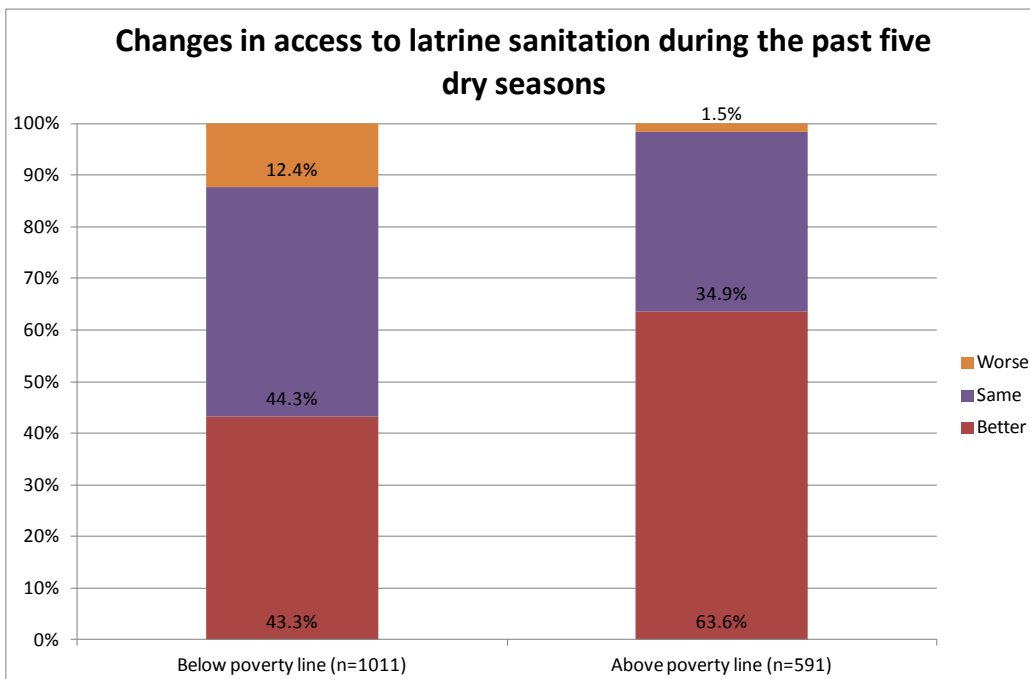


Figure 6.14. Experiencing changes in access to latrine sanitation in the past five dry seasons by the poverty line ( $\chi^2=90.5$ ,  $df=2$ ,  $p<0.001$ ).

As for the households in the capital of Laos, access to latrine sanitation had improved considerably more in the past five years than in the rest of the country. Otherwise, the trend is similar: the households above the poverty line had experienced more positive changes (75%) than the households below the poverty line (56%). The shares of households that had experienced a worsened access to latrine sanitation were only marginal.

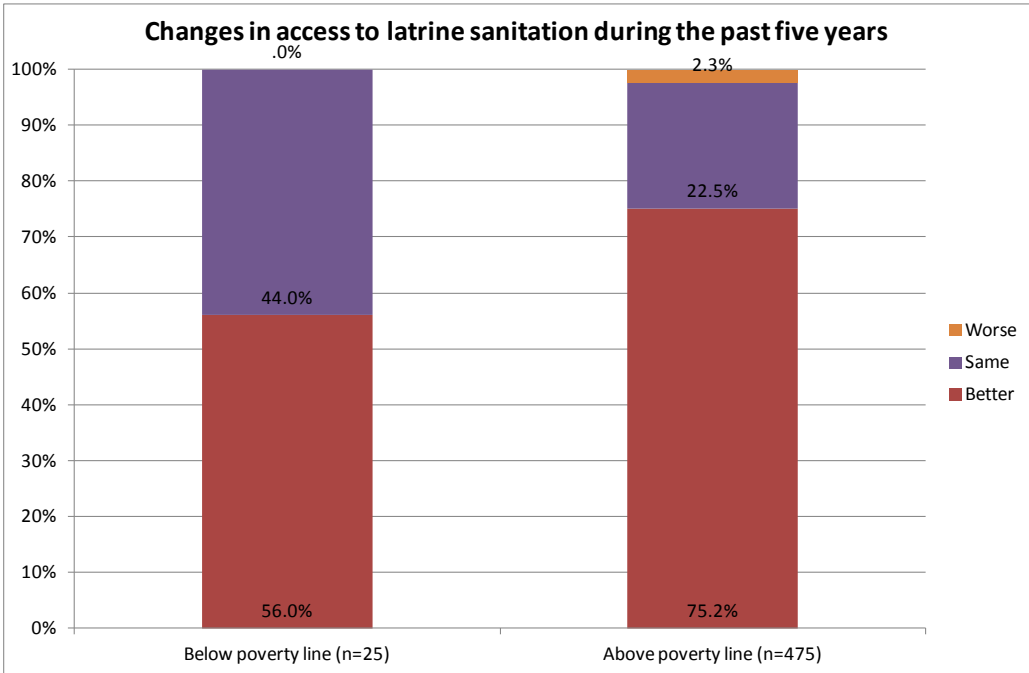


Figure 6.15. Experiencing changes in access to latrine sanitation in the past five years by the poverty line (Vientiane only,  $\chi^2=6.4$ ,  $df=2$ ,  $p=0.041$ ).

### 6.4. Access to community land or forest

Majority of the households had not experienced any change in access to community lands or forests during the last five wet seasons.

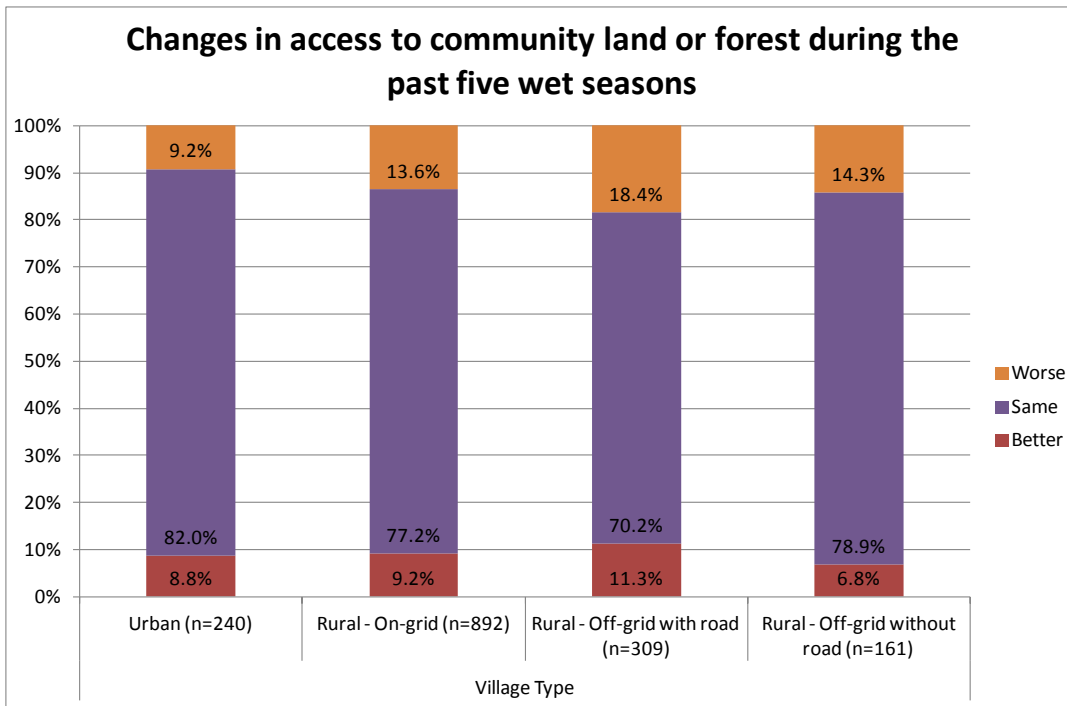


Figure 6.16. Experiencing changes in access to community land or forest in the past five wet seasons by village type ( $\chi^2=13.61$ ,  $df=6$ ,  $p=0.034$ , not asked in the Vientiane survey).

In all village types, the number of households who had had better access to community land or forest had been higher in past dry seasons than in wet seasons.

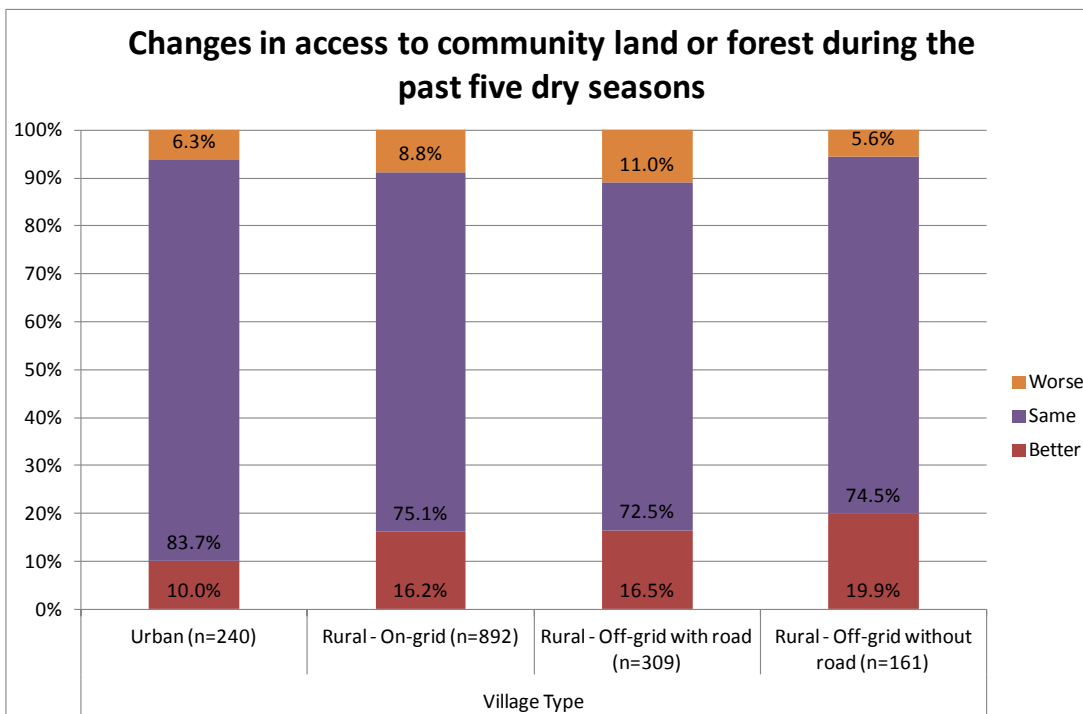


Figure 6.17. Experiencing changes in access to community land or forest in the past five dry seasons by village type ( $\chi^2=14.77$ ,  $df=6$ ,  $p=0.022$ , not asked in the Vientiane survey).

The access to community land or forest in the past five wet seasons had become somewhat worse for the households below the poverty line, with 18% saying there had been a negative change and 10% stating a

positive change. All in all, the majority had not experienced any changes, although the share was larger within the households above the poverty line (84%, compared to 72% below the poverty line).

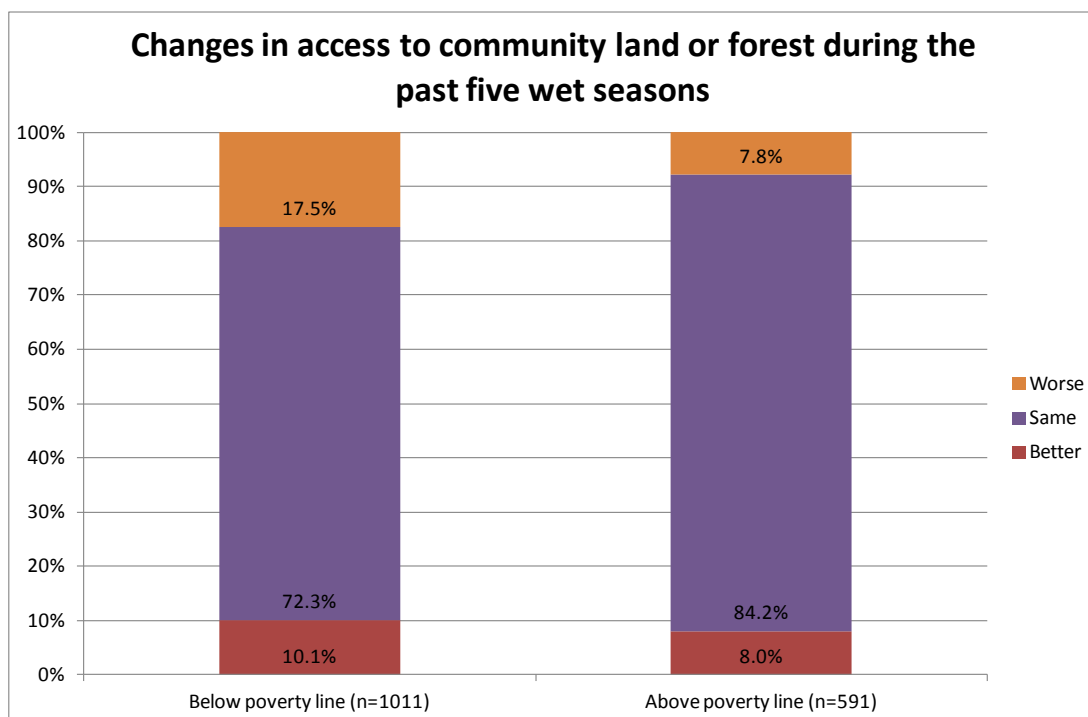


Figure 6.18. Experiencing changes in access to community land or forest in the past five wet seasons by the poverty line ( $\chi^2=34.0$ ,  $df=2$ ,  $p<0.001$ , not asked in the Vientiane survey).

The households below the poverty line had encountered more improvements in their access to community land or forest in the past five dry seasons, compared to the past wet seasons. A fifth said the access had improved and 9.8% that it had become worse. As for the households above the poverty line, the changes had been similar on both seasons.

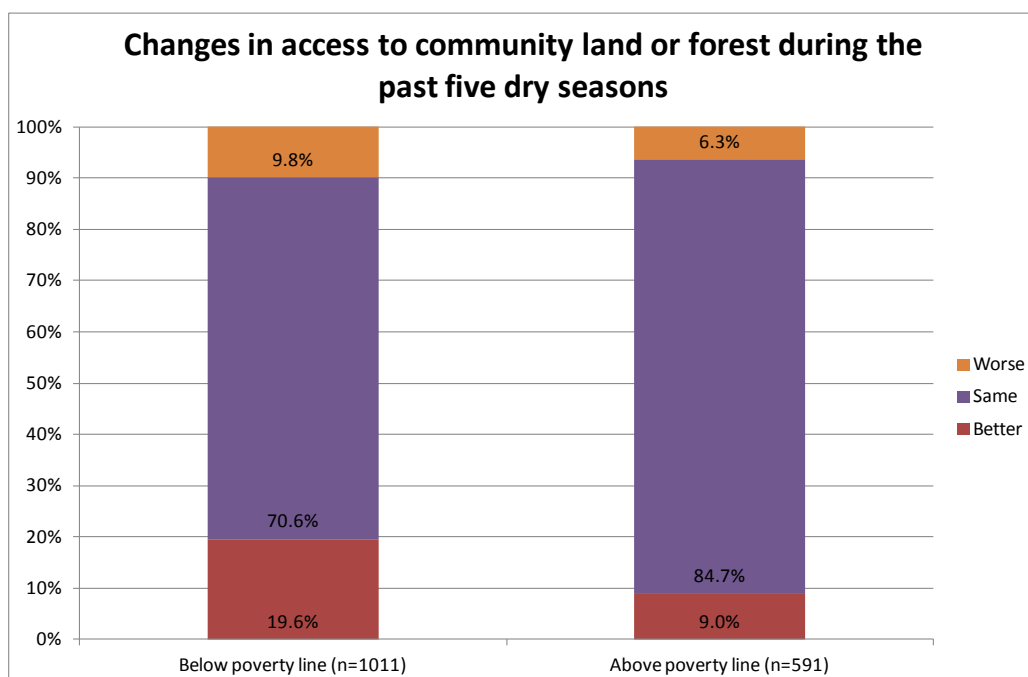


Figure 6.19. Experiencing changes in access to community land or forest in the past five dry seasons by the poverty line ( $\chi^2=42.2$ ,  $df=2$ ,  $p<0.001$ , not asked in the Vientiane survey).

## 6.5. Land or soil quality

Land or soil quality had not changed during the last five wet seasons for the majority of households (70%-80%). However, land or soil quality had deteriorated more commonly in rural-off-grid villages, where the livelihoods are mainly based on agriculture.

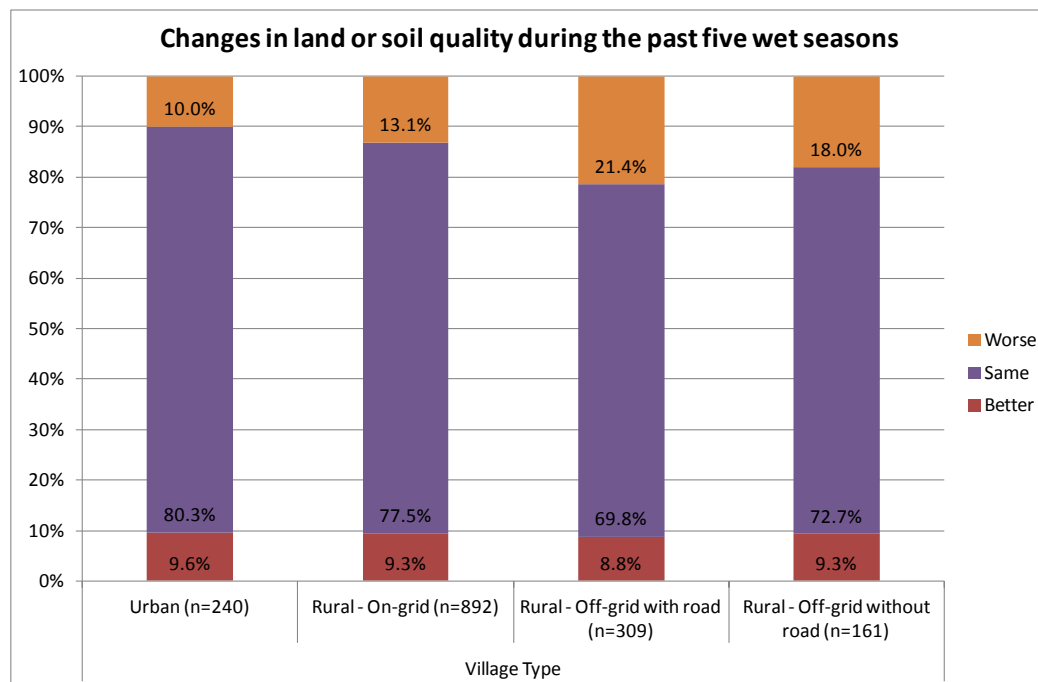


Figure 6.20. Experiencing changes in land or soil quality in the past five wet seasons by village type ( $\chi^2=18.37$ ,  $df=6$ ,  $p=0.005$ , not asked in the Vientiane survey).

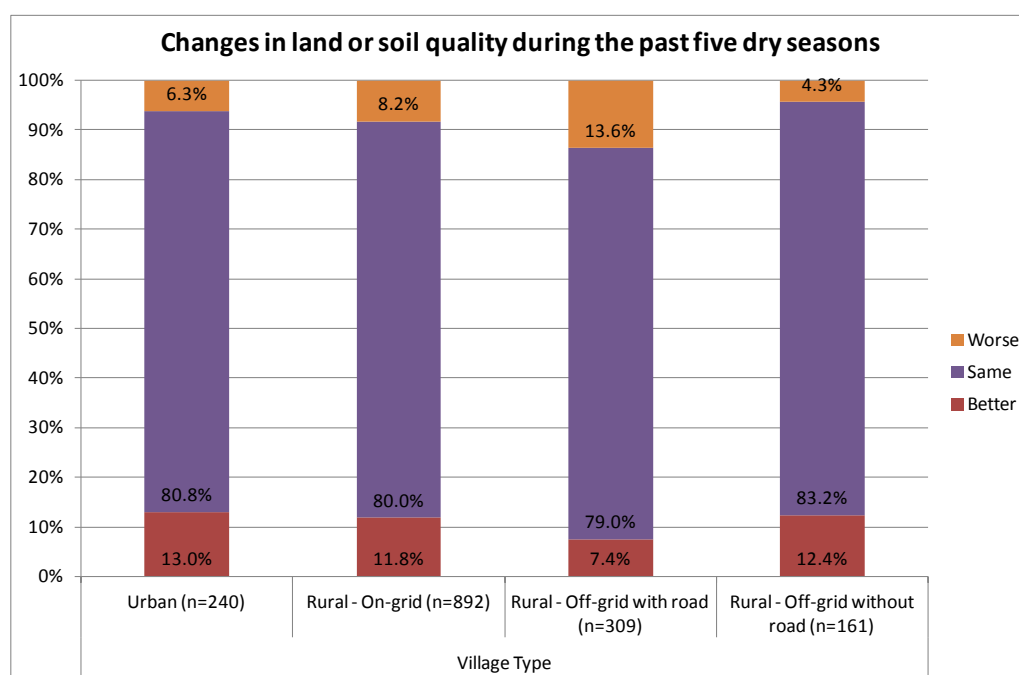


Figure 6.21. Experiencing changes in land or soil quality in the past five dry seasons by village type ( $\chi^2=19.37$ ,  $df=6$ ,  $p=0.004$ , not asked in the Vientiane survey).

In the past five dry seasons, it had also been more common for households below the poverty line to have experienced a decreased land or soil quality (11% versus 4.4% for the households above the poverty line), although there had been overall less negative changes compared to the wet seasons.

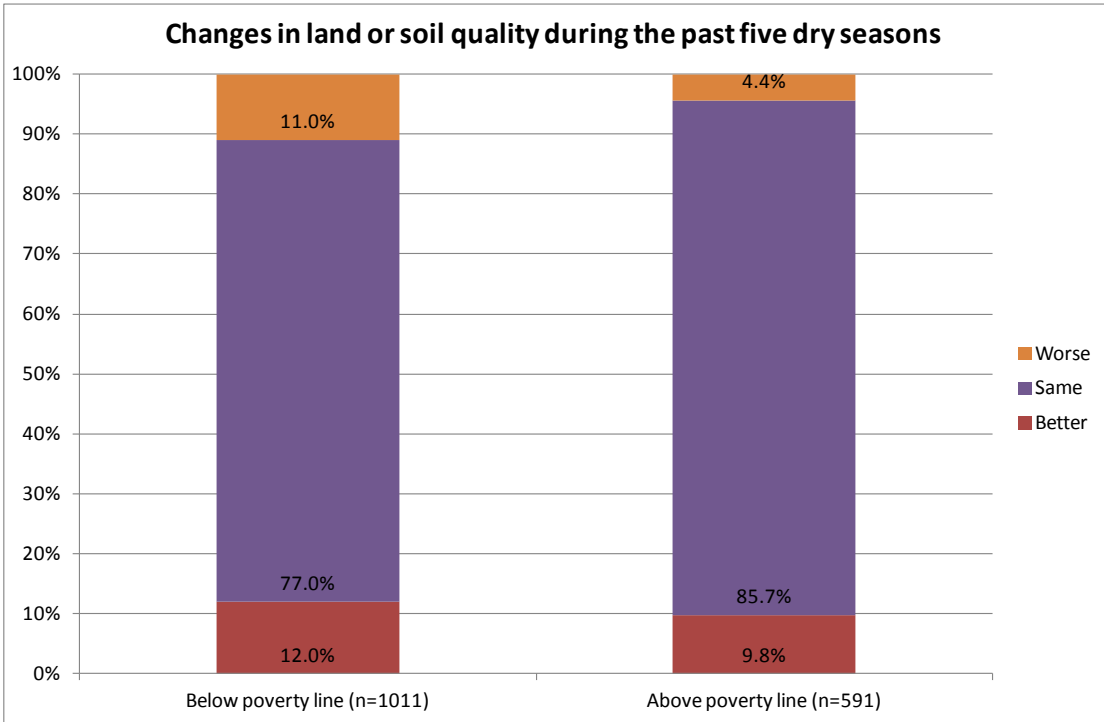


Figure 6.22. Experiencing changes in land or soil quality in the past five dry seasons by the poverty line ( $\chi^2=23.9$ ,  $df=2$ ,  $p<0.001$ , not asked in the Vientiane survey).

### 6.6. Outdoor air quality

Around one third of the households in urban and rural-on grid villages had experienced better air quality during the last five wet seasons. On the contrary, in rural-off-grid villages with road, more than one third of the households evaluated the air quality to be worse than five years ago.

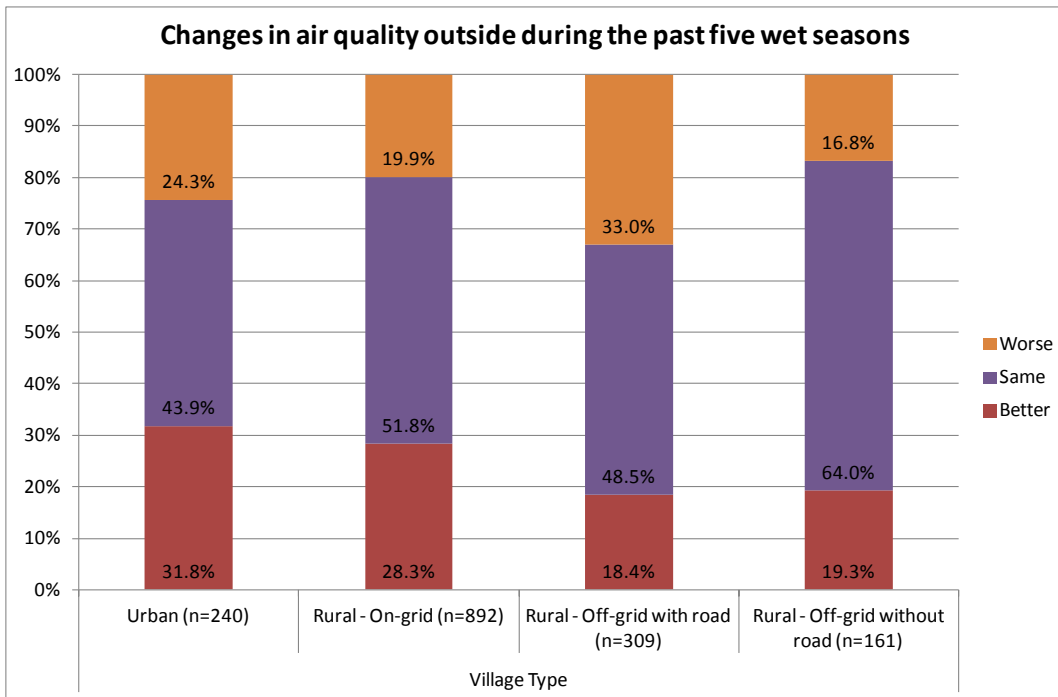


Figure 6.23. Experiencing changes in outdoor air quality in the past five wet seasons by village type ( $\chi^2=42.86$ ,  $df=6$ ,  $p<0.001$ ).

In the past five dry seasons, outdoor air quality had become worse for around one third of households regardless of the type of village. Air quality had deteriorated more in the dry than in the wet seasons.

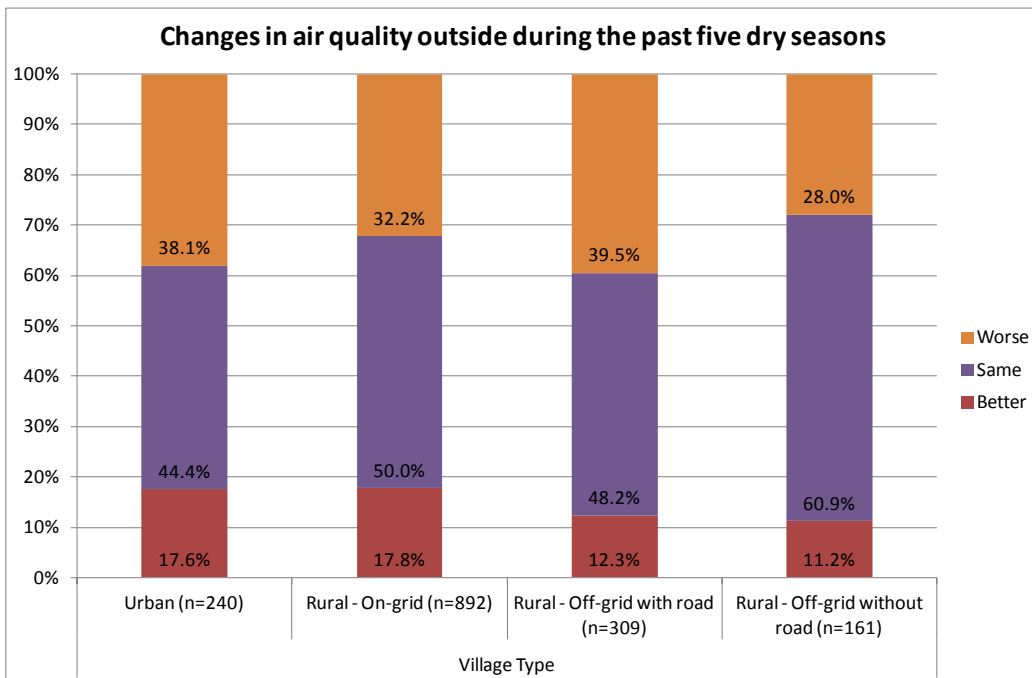


Figure 6.24. Experiencing changes in outdoor air quality in the past five dry seasons by village type ( $\chi^2=19.01$ ,  $df=6$ ,  $p=0.004$ ).

In the past five wet seasons, the Laotian households below and above the poverty line had experienced changes in outdoor air quality equally often: air quality had decreased for 20–24%, increased for 25–27%, and remained the same for 49–55%.



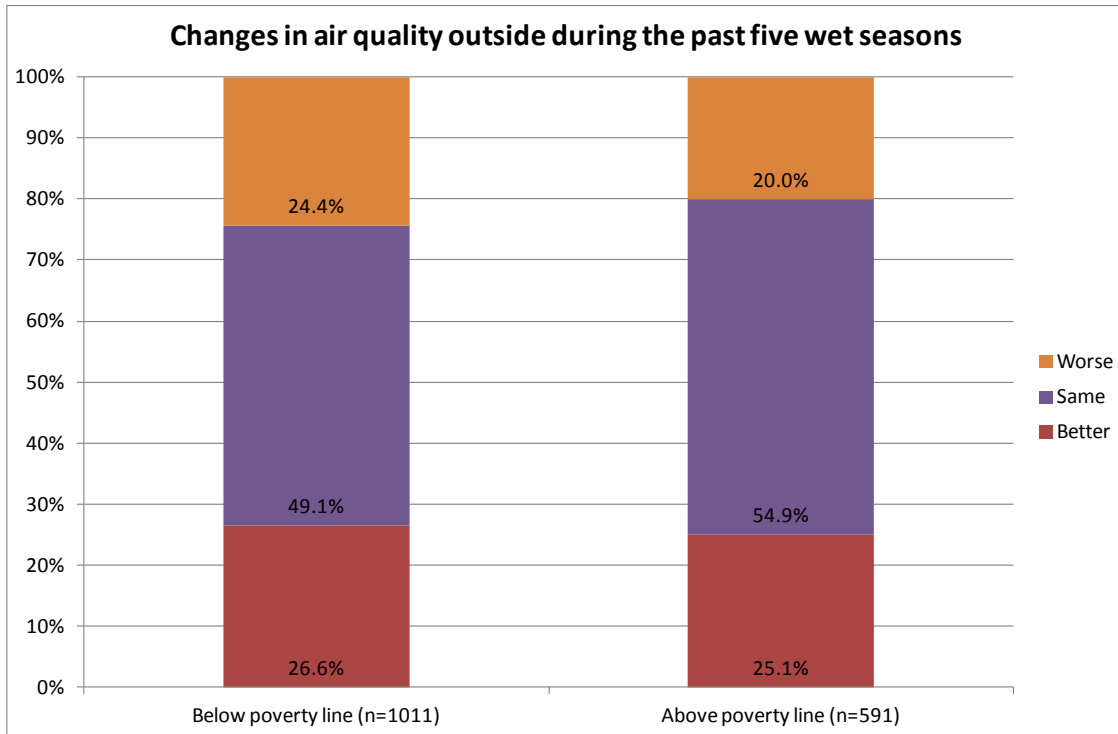


Figure 6.25. Experiencing changes in air quality outside in the past five wet seasons by the poverty line ( $\chi^2=5.9$ ,  $df=2$ ,  $p=0.051$ )

There were no differences between households below and households above the poverty line in terms of changes in outdoor air quality in the past five dry seasons. Half of the respondents replied that there had been no changes, roughly a third had experienced a worsening of the air quality, and about 16% an improvement.

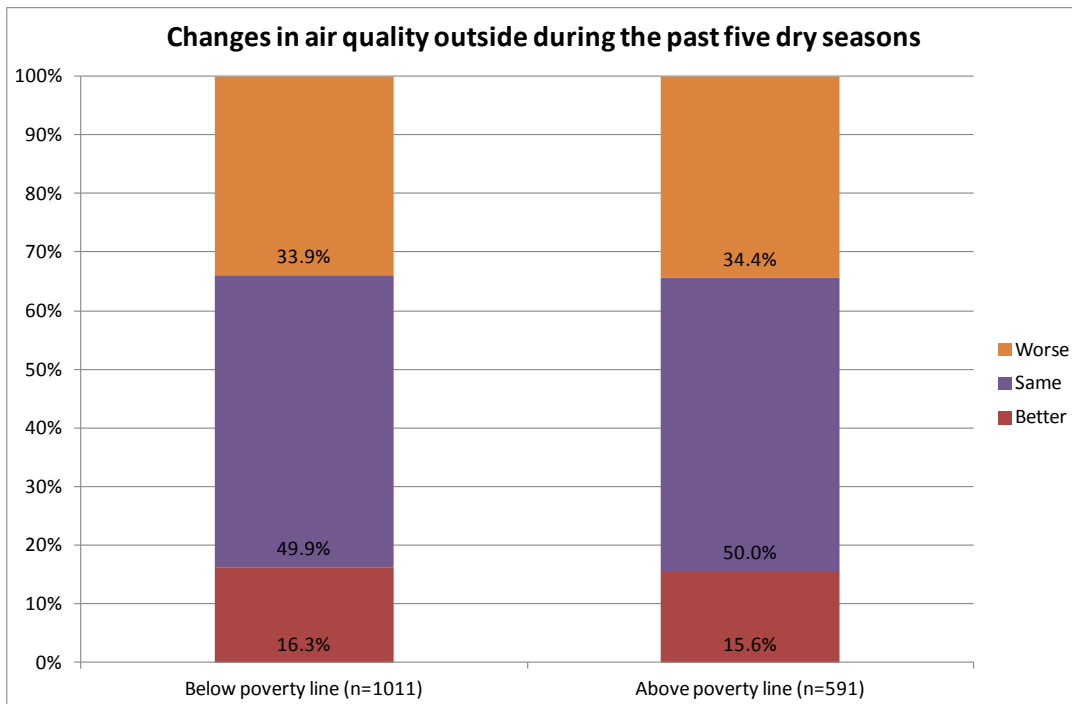


Figure 6.26. Experiencing changes in air quality outside in the past five dry seasons by the poverty line ( $\chi^2=0.1$ ,  $df=2$ ,  $p=0.94$ ).

In Vientiane, it was more common for the wealthier households to have experienced negative changes and less common to have experienced positive changes in air quality outside, compared to the households below the poverty line. Almost half of the households below the poverty line (48%) had replied that the air quality had become better, whereas almost half of the households above the poverty line (44%) had replied that it had become worse.

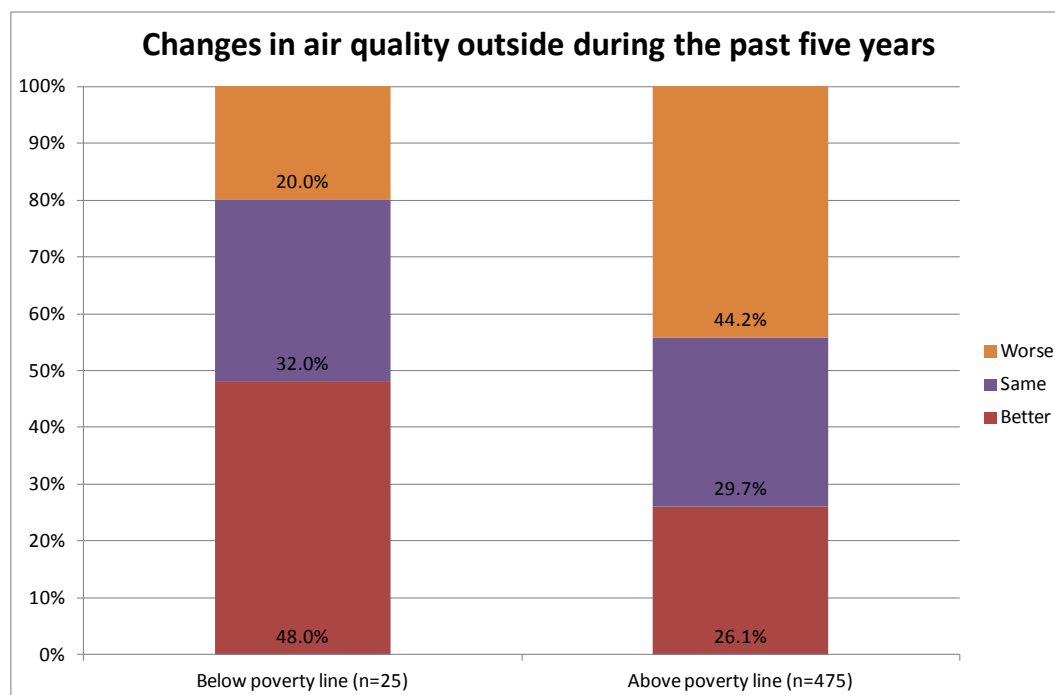


Figure 6.27. Experiencing changes in air quality outside in the past five years by the poverty line (Vientiane only,  $\chi^2=7.5$ ,  $df=2$ ,  $p=0.024$ ).

## 6.7. Indoor air quality

More than half of the households had not experienced changes in their indoor air quality during last five years. Indoor air quality had improved more often in urban and rural-on-grid areas. Rural off-grid households with road reported most commonly negative changes related to air quality in their homes: 20%-28% reported a negative change and 15%-23% reported a positive change, depending on the season.

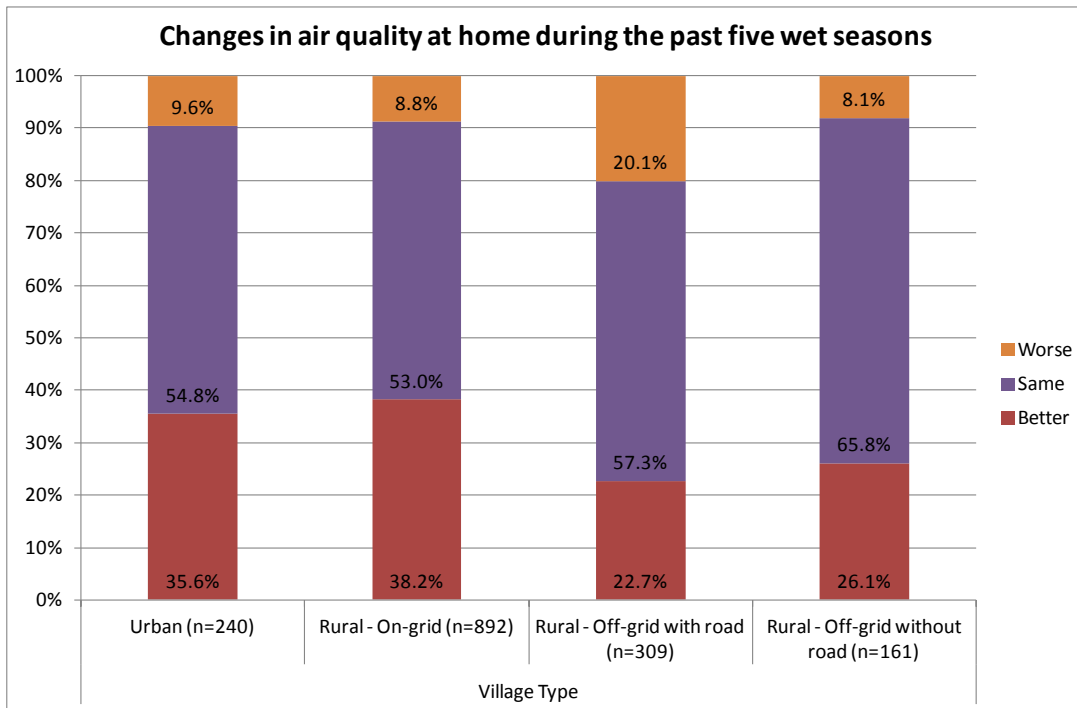


Figure 6.28. Experiencing changes in indoor air quality in the past five wet seasons by village type ( $\chi^2=52.67$ ,  $df=6$ ,  $p<0.001$ ).

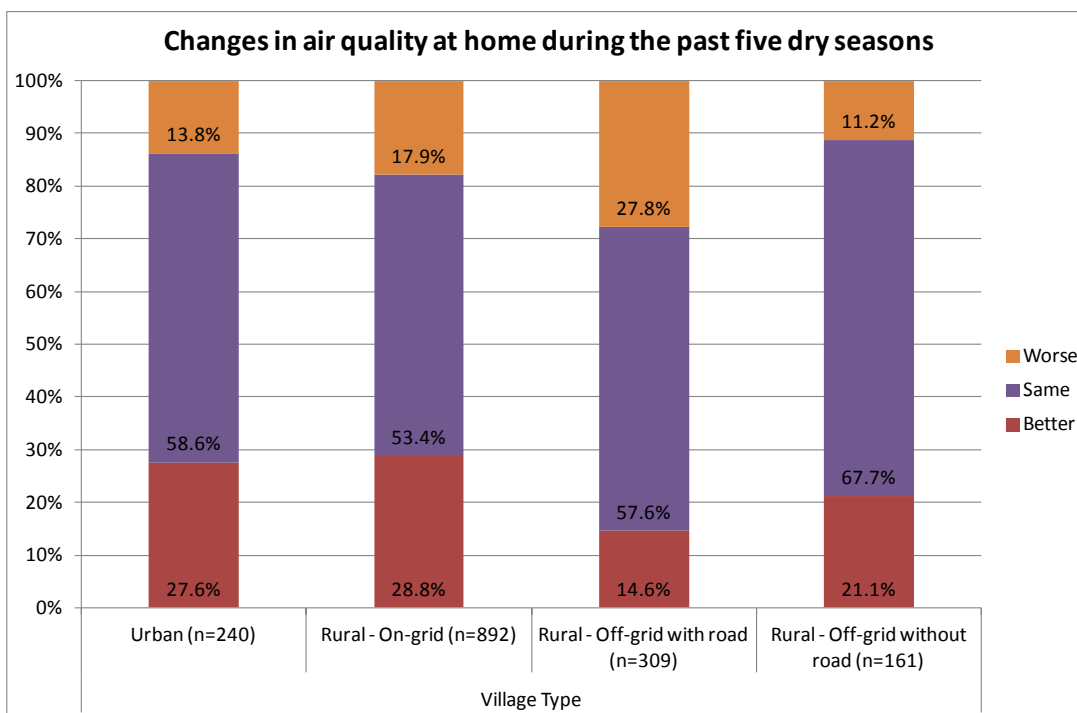


Figure 6.29. Experiencing changes in indoor air quality in the past five dry seasons by village type ( $\chi^2=47.67$ ,  $df=6$ ,  $p<0.001$ ).

There was a significant difference between the households below and the households above the poverty line in terms of indoor air quality in the past five wet seasons. For households above the poverty line, it had been more common to have experienced an improvement of the inside air quality (44%) than in the group below the poverty line (28%), whereas within households below the poverty line it had been more common to have experienced a worsening of the inside air quality (23%) than in households above the poverty line (6.9%).

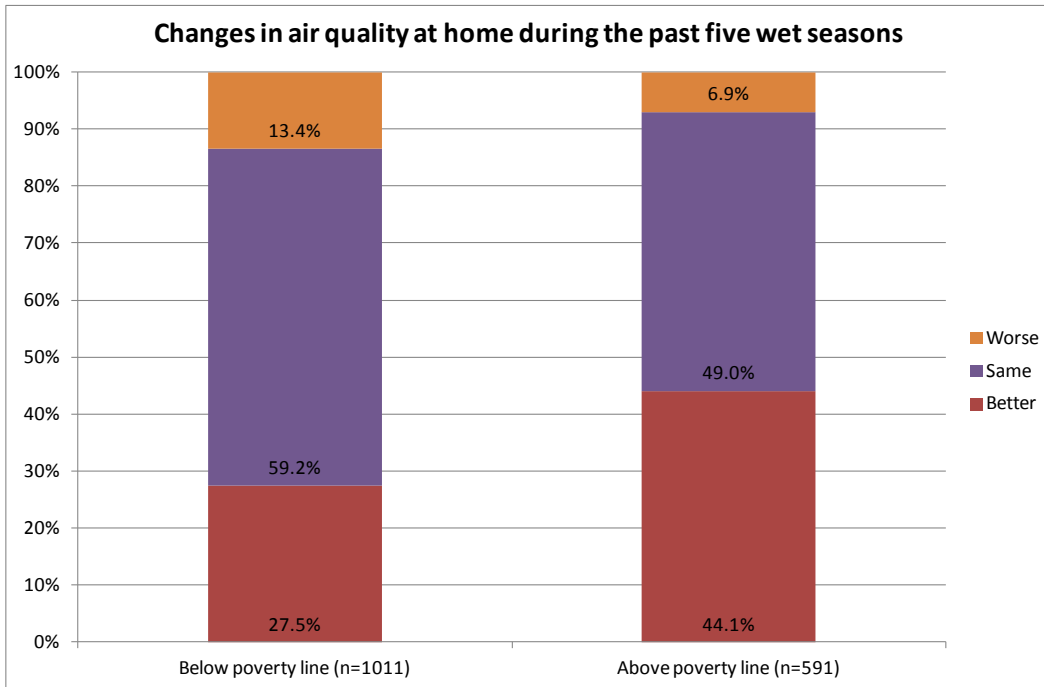


Figure 6.30. Experiencing changes in air quality inside in the past five wet seasons by the poverty line ( $\chi^2=51.6$ ,  $df=2$ ,  $p<0.001$ ).

For households above the poverty line, it had been more common to have experienced an improvement of the indoor air quality (33%) in the past five dry seasons than for the group below the poverty line (20%). Similarly, for households below the poverty line it had been more common to have experienced a worsening of indoor air quality (21%) than for households above the poverty line (14%). In comparison to past five wet seasons, the air quality had decreased more and improved less often in the dry seasons.

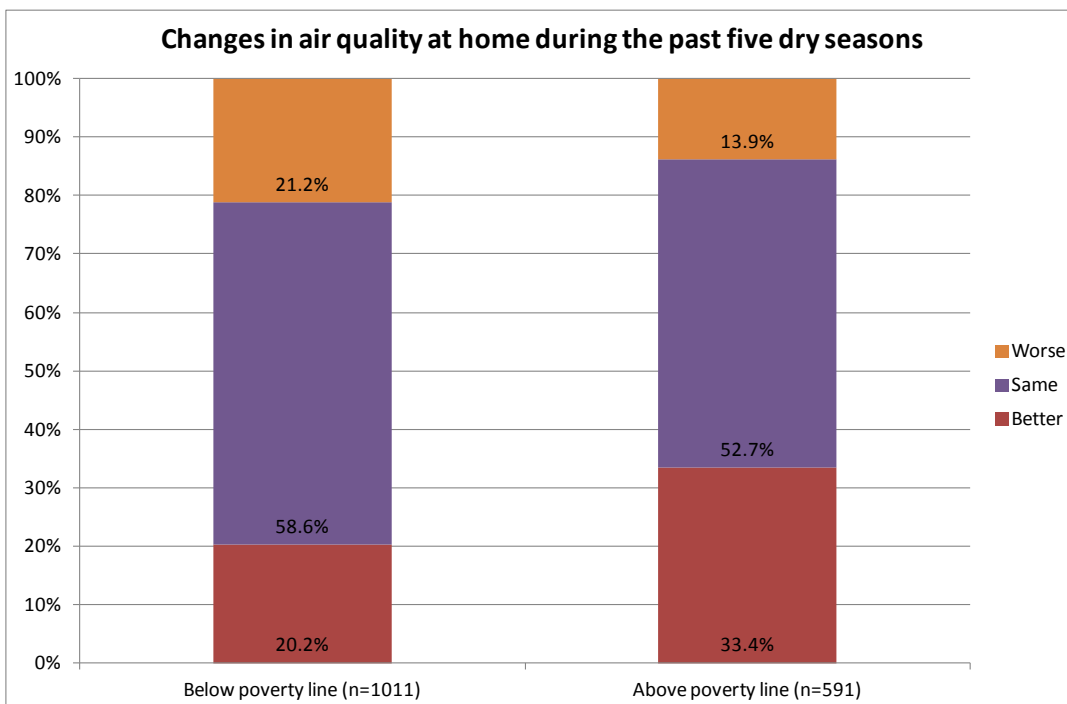


Figure 6.31. Experiencing changes in in air quality inside in the past five dry seasons by the poverty line ( $\chi^2=38.8$ ,  $df=2$ ,  $p<0.001$ ).

In Vientiane, contrary to the other parts of the country, there were no significant differences between households above and below the poverty line with regards to changes in indoor air quality. Households above the poverty line had more often experienced an improvement of indoor air quality (30%) than households below the poverty line (16%). Negative changes had been equally common, 23%-24%.

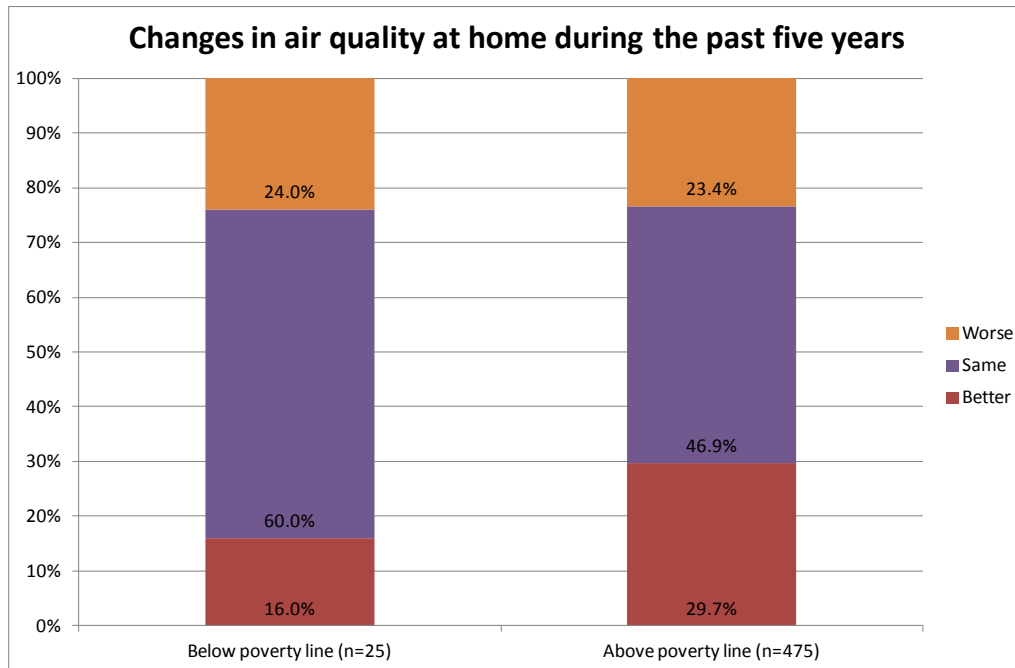


Figure 6.32. Experiencing changes in in air quality inside in the past five years by the poverty line (Vientiane only),  $\chi^2=2.4$ ,  $df=2$ ,  $p=0.30$ ).

## 6.8. Distance to collect firewood

The change in distance to collect firewood and plants had become worse to around one third of the households in rural areas in the past five wet seasons (and for a quarter in the dry seasons). Nevertheless, nearly two thirds stated that the distance had not been changed during the last five years.

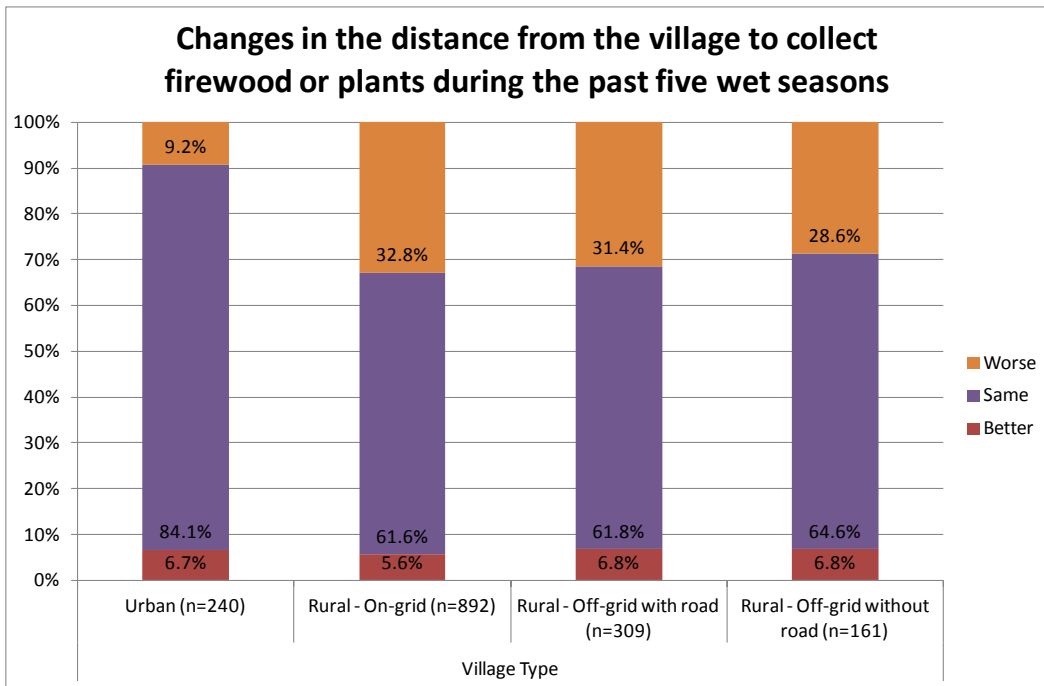


Figure 6.33. Experiencing changes in distance from to collect firewood in the past five dry seasons by village type ( $\chi^2=57.09$ ,  $df=6$ ,  $p<0.001$ , not asked in the Vientiane survey).

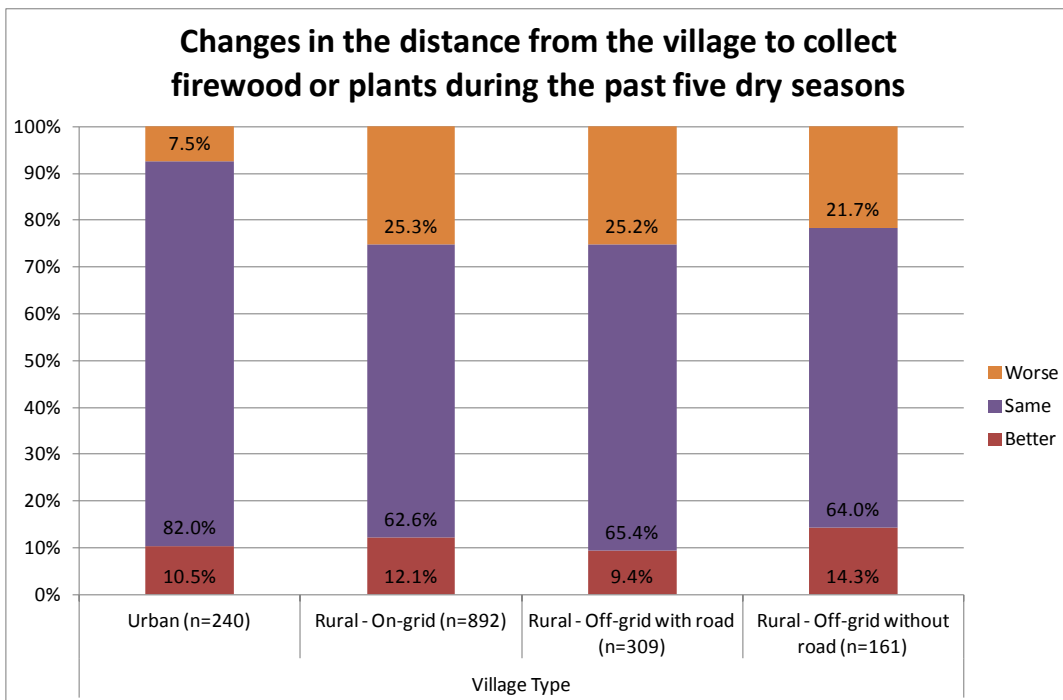


Figure 6.34. Experiencing changes in distance from to collect firewood in the past five dry seasons by village type ( $\chi^2=41.93$ ,  $df=6$ ,  $p<0.001$ , not asked in the Vientiane survey).

It was slightly more common for households below the poverty line to have to walk further to collect fire wood or plants (31%) than for households above the poverty line (24%) in the past five wet seasons. More than half of the respondents in both groups (63–69%) had not experienced a change and 6–7% in both groups had experienced an improvement of the situation.

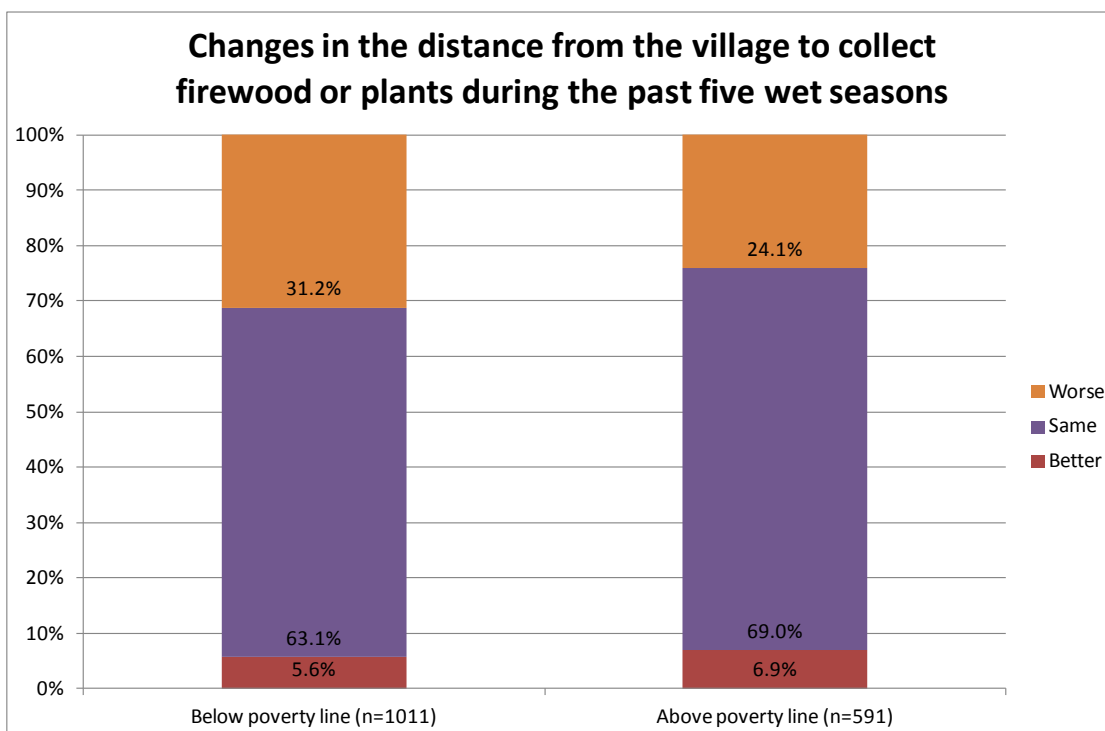


Figure 6.35. Experiencing changes in the distance from to collect firewood in the past five wet seasons by the poverty line ( $\chi^2=9.6$ ,  $df=2$ ,  $p=0.008$ , not asked in the Vientiane survey).

It had been slightly more common among households below the poverty line to have experienced an improvement of the distance to collect firewood in the past dry season. Apart from that, there were no significant differences between the income groups. In both groups, a majority (64–71%) had not experienced a change in the distance and more than fifth (21–23%) replied they had had to go further to collect wood.

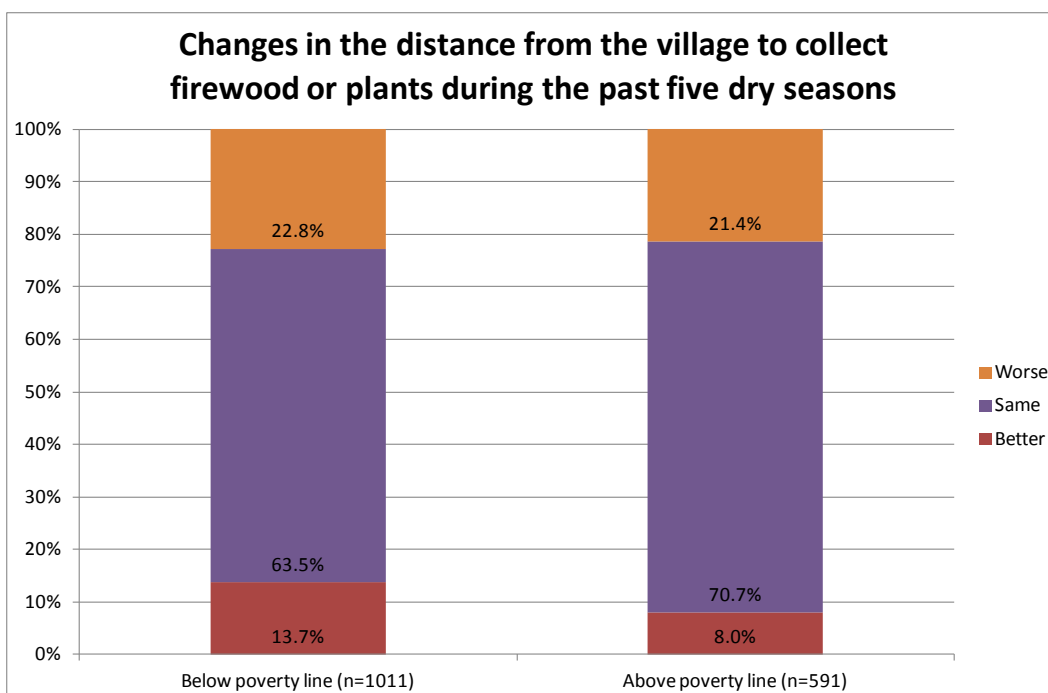


Figure 6.36. Experiencing changes in the distance from to collect firewood in the past five dry seasons by the poverty line ( $\chi^2=13.7$ ,  $df=2$ ,  $p=0.001$ , not asked in the Vientiane survey).

## 6.9. Level of noise

In Vientiane, the level of noise had increased for a third of the households above the poverty line and for a fifth of the households below the poverty line. For a fifth, the level of noise had improved in the past five years.

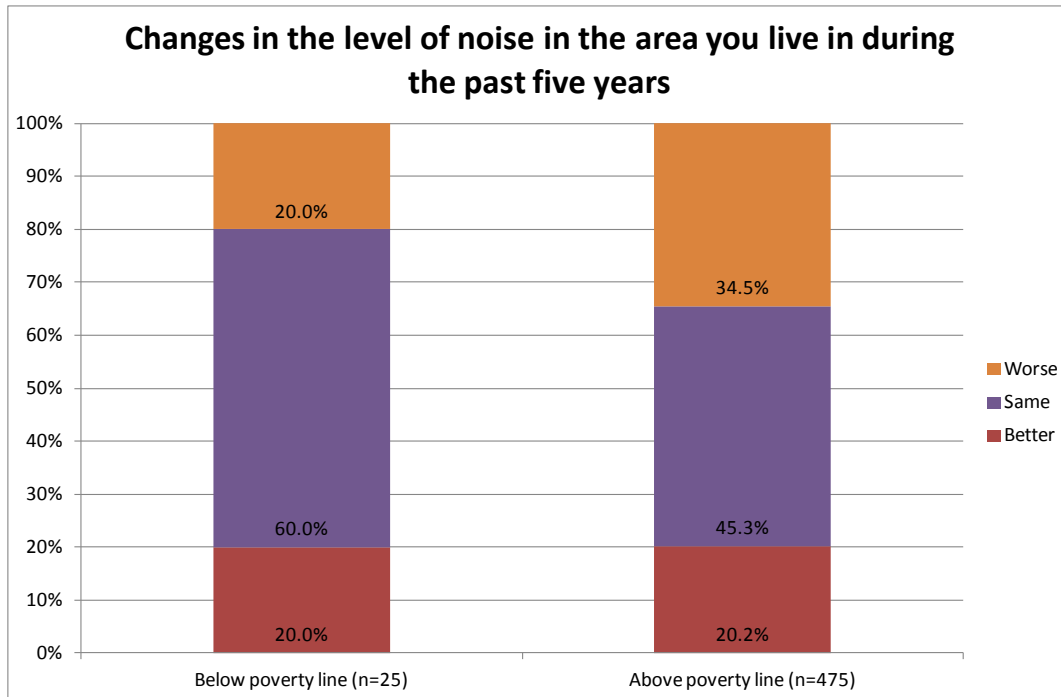


Figure 6.37. Experiencing changes in noise in the past five years by the poverty line (Vientiane only,  $\chi^2=2.6$ ,  $df=2$ ,  $p=0.27$ ).



## 7. SUMMARY AND CONCLUSIONS

Development in Laos has been relatively rapid in the past years. Actual yearly GDP growth rate in 2006-2010 was 7.9% on average (Lao People's Democratic Republic Peace Independence Democracy Unity Prosperity 2011). This has been driven by hydropower development and energy exports to neighboring countries which has provided the country with a steady stream of revenue.

The Lao PDR has taken promising steps in poverty eradication, but a large proportion of its population remains poor. Poverty is common in rural and remote areas in the north and south as the survey results also indicate. The progress in poverty eradication has been satisfactory. Poverty has decreased in provincial, regional and national levels. In 1993, poverty rate was 46%, but in 2010 it was 26%. The poverty rate in the priority areas of the government (the poorest districts) has decreased more than in other areas. (Lao People's Democratic Republic Peace Independence Democracy Unity Prosperity 2011, 44-45)

To plan the supply of energy utilities and infrastructures requires information about geographic and socio-economic data of household conditions. This publication and its findings provide new information and knowledge about the real-life situation of rural and urban households in Laos.

Laos faces a number of capacity and infrastructure related barriers in the development. Yet, some experts have noted that the story of rural electrification in Laos has been a success story among LDCs. Still, there remain needs to invest in capacity building of domestic institutions so that the Lao PDR can implement its ambitious plans of electrification and develop energy trade market in the long run.

According to these survey results it seems that urban households as well as wealthier households are more resistant to the changes that climate change is expected to cause. In other words, the poorest rural households are the most prone to climate change induced changes in livelihoods, and they have fewer options for adaptation. The vulnerability aspects of energy supply system should be given a special attention in the case of Laos.

In this survey, there were only a few questions where the village type categorization or the poverty line division did not show significant differences between the households. One of the few was cooking indoors, which was equally common in all village types. Indoor cooking with wood or other so called dirty cooking fuels may cause respiratory problems. Therefore, the fuel and the technology in cooking should be considered not only from the natural resource point of view but also from the perspectives of public health.

Most often the rural households and the ones below the poverty line were in a more vulnerable position. One of the few exceptions was outdoor air quality, which had deteriorated more for the wealthier households. The reason for this is this is that the wealthier households are more often situated in city centers where the outdoor air pollution can be a problem.

The differences between villages with different levels of infrastructure requires attention. The gap between urban and regional households should be taken into consideration, Our survey also suggests that urbanization and income in Laos are closely linked: in most cases, rural and urban differences are comparable to those between poor and richer households.

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