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Asia Pro Eco Project 'Diagnostic Study on Renewable Energy Potential and Feasibility in Southeast Asia'

POTENTIAL AND ACCEPTANCE OF ENERGY FARMING AND ORGANIC FERTILIZER IN VIENTIANE MUNICIPALITY

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1 INTRODUCTION

The potential for renewable energy is growing throughout Southeast Asia with interest in a range of technologies including PV Solar and bioenergy. The bioenergy sector in particular has shown considerable potential over the 1990s and early 2000s with investment by both state and large private entrepreneurs (Oosterveer et al. 2006). To meet the growing needs of small holder farmers in Southeast Asia biomass digestion, or energy farming holds energetic potential based on existing agricultural production. However, little is known about how willing or able farmers are to accept what could amount to considerable changes in production and livelihood practices. In addition, more information is needed on the status and role of organic fertilizer to determine the potential of waste re-use from the anaerobic digestion involved in energy conversion.

To contribute to an empirically focused discussion on the potential of energy farming in Lao PDR this paper reports on the results of a study investigating the acceptance and viability of energy farming and organic fertiliser in urban and peri-urban communities of Vientiane Municipality. In doing so the survey assesses the potential of the renewable energy sector as part of wider study of Southeast Asia. The following results are based on two surveys: the first targeting farmers and the second fertilizer consumers and dealers. The three guiding questions for the surveys were: 1. What is the general acceptance of energy as a renewable energy strategy?; 2. What is the current use and future potential for organic fertilizer use?; and 3 What potential exists for collective forms of renewable development in urban and peri-urban

Vientiane Municipality was selected for the survey as a starting point to understanding the potential of energy farming in the rest of the country. Given that energy farming is a new technology for farmers its acceptance in Vientiane Municipality acts as a 'pilot study' for its potential in the rest of the country.

The report is divided into 4 sections. The following section provides an overview of existing knowledge on the organic fertilizer in Lao PDR and some basic statistics on agricultural production in Vientiane Municipality. This is followed by an outline of the methodology used for the two surveys in section 3. Section 4 focuses specifically on the results of the farmers survey, outlining the potential of crops, livestock and fertilizer use in Vientiane Municipality; Section 5 then focuses specifically on the perceptions of organic fertilizer before the potential and acceptance of renewable energy and, more specifically, energy farming are outlined in section 6. The final section then provides comments and recommendations on the outlook for energy farming in Vientiane and more widely in Lao PDR.

2 EXISTING INFORMATION

2.1 Agriculture in Vientiane Municipality

Vientiane Municipality is the most industrialised area of the country, with a total population of around half a million people and an annual per capita GDP of US$2848 (€3200), some US$1400 (€1573) more than the national GDP (UNDP 2001).[1] The Municipality is also the most urbanised area of the country, however still maintains 30% of its area as agricultural land. The crop production of Vientiane makes up around 39% of total national production (Table 1). Likewise 39% of total livestock production also occurs in the city and its surrounds (Table 2). Despite the large proportion of livestock production the number of head per household is significantly lower than the national average, indicating that production is more industrial in nature. For more comparison between Vientiane and the rest of the country see CDEA (2006).

Although not representative of many other parts of the country Vientiane Municipality does highlight the character a wealthy agricultural urban and per-urban community with strong links to agriculture. If biomass farming was to be successfully adopted in any part of the country we assume that it would be in these communities. As such it is the focus of our exploratory survey.

Table 1: Crop production in Vientiane Municipality (Source: NSC, 2005)

Crops	Vientiane (tons/yr)	National (tons/yr)	% of National
Rice	295380	2529000	12
Sugar cane	630	7030	9
Maize	1346	67500	2
Vegetables	15356	107150	14
Peanuts	31	14605	0
Mung beans	10	2415	0
Soy beans	74	5620	1

Table 2: Livestock production in Vientiane Municipality (Source: NSC, 2005)

Livestock	Vientiane		National		% of
	Head	Head/HH	Head	Head/HH	National
Cattle	64000	0,54	1307000	2,09	5
Buffalo	25000	0,21	113000	1,38	22
Pigs	37000	0,31	1416000	1,79	3
Poultry	1899000	15,96	19480000	24,25	10

[1] Based on 2001 figures and conversion rates

2.2 Organic Fertilizer

Overall, there is little existing information of organic fertilizer use or trade in Lao PDR with the majority of farmers using readily available imported chemical fertilizers from Thailand. One survey on organic fertilizer use was conducted by the Canadian funded "Waste Econ project" in 2004, where three volunteers interviewed the members of a sample group comprised of eight farmers, two producers, and ten retail shops (Canada Project Survey 2004). The survey focused specifically on the market potential for fertilizers including with manure/night soil, chemical fertilizer, organic fertilizer (called bio-fertilizer), and organic wastes (raw and processed), asking what kinds were used or sold; how much they used or sold; the price they bought or sold it for; and which times of year it is in demand. Their findings were used together with the information collected from the organic fertilizer study within the Canadian project to provide a preliminary study of the feasibility of organic fertilizer use, demand and pricing.

From their study it was found that the amount of organic fertilizer sold in a year is based directly on demand from seasonal farming. The study also shows there are two main periods of the year that farmers purchase these fertilizers; May to July and December to February. The majority of the organic fertilizer customers are nursery shop, gardeners with uncertain amount ordered, farmers, and landscapers. There are two organic fertilizer plants which sell their produce to Vientiane, one located in Ban Dongxiengdy in Vientiane Municipality and the other, named 'Maliny', located in Numchang village in Vientiane province.

One of the fertilizer plants produces only based on pre ordered, and so rarely produce any surplus. The other sold the majority of their product by credit. However, this credit system failed because no one paid them right away and they had no money to produce anything for the following year. Both factories offered a delivery service to the farmers, which is a necessity because most farmers do not own large trucks to come and pick up the large amounts of bio-fertilizer (Canada Project Survey,2004). As a result, the farmers have to often wait up to 10 days to receive a bag of organic fertilizer from Dongxiengdee factory e.g.. With the small amount order they have to wait 10 -15 days, therefore chemical fertilizer is their first choice.

As also shown in Figure 1, the demand for organic fertilizer for farming has generally increased over time despite the rising price. The producers of the organic fertilizer have forwarded costs of production onto consumers, thereby enabling them to remain profitable. As competition has remained limited the two producers have been able to set and control the market price of fertilizer.

The Canadian study concluded that educating users and traders alike is the most important aspect for properly marketing and selling compost as a product. The results of this survey found that the factory price for organic fertilizer currently stands between 620-1000LAK/kg

(€0.05-0,07) with a volume discount available. The organic fertilizer is basically organic matter (black soil, tobacco leftovers, bat dung etc) with extras like manure, and hormones added. They concluded that the need for compost is potentially large; the only problem is the challenge of keeping the production costs low enough so that the compost can be sold at a competitive price. Our questions compliment this earlier study by contributing to an empirical understanding the organic fertilizer market including the acceptance by farmers and its financial viability.

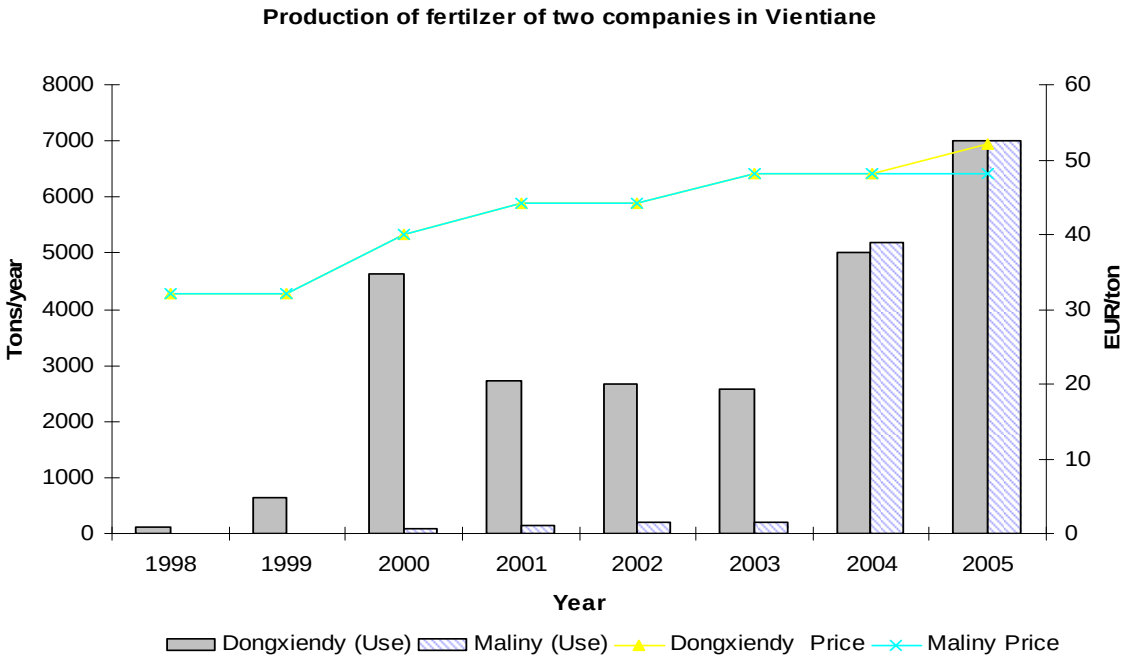

Figure 1: Organic factory amount produced and amount sold

Source Canada Project Survey 2004 and survey interviews.

3 SURVEY METHODOLOGY

3.1 Farmer survey

A total of 72 farmers were interviewed in the peri-urban districts of Saysetha and Hadsayfong and a further 25 in the urban districts of Sikhot and Chanthabouly (Figure 2). The questionnaire comprised five sections: 1. general information on the size and seasonality of farming; 2. potential of energy farming; 3. fertilizer use; 4. perceptions of energy farming; and 5. community organization and farmers involvement in village level development activities. Care was taken to ensure that all questions, including technical terminology, were clearly explained to respondents with technical and new concepts translated by the survey team.

3.2 Organic fertilizer survey consumers and dealers

The second questionnaire based on the Canadian project survey in 2004 was conducted through three volunteers from the Lao-American College, interviewing consumers and retail shops. In total sixteen shops selling organic fertilizer: 4 are located half-way to the airport, 8 are along Phousinaun road, 2 on the road to the Friendship Bridge and the final 2 on the Phoukang road, 13 km to the South.[2]

Selected districts to survey

Figure 2: Map of Vientiane Municipality showing survey locations

4 AGRICULTURAL POTENTIAL

4.1 Farmer characteristics

The average age of the heads of households is 45, with the youngest 31 and the oldest 70. Around one third of the households in both peri-urban and urban areas are headed by females, who have a lower average income compared to male headed households for whom wage labour is more available (Table 3 and Table 4).

The average size of families is similar between the two areas (see Table 5) and, as expected, smaller than the rural dominated national average of six people per household (National Statistic 2004). The available household workforce is divided between household members and hired labour. Household production appears to rely on wage labour with an average number of seven employees. There is no indication as to when this labour is avail-

[2] Previously 23 nurseries operated but now there are only 16. This decline is predominantly caused by road construction with the shops forced to move their location

able, but is likely to be during periods of rice and harvest times as is generally the case throughout Southeast Asia.

Families in both peri-urban and urban areas have a number of sources of income, being involved in various forms of small trade or wage labour (Table 6). The close proximity to the large labour and commodity markets of Vientiane means that sources of cash income are relatively accessible.

The average annual income differs considerably between households, with urban average income four times higher than in peri-urban areas (Table 6). As access to alternative sources of income appears equal between the two areas, it appears that either urban markets provide higher prices. The average income of households headed by females is slightly higher than male households in peri-urban areas while slightly lower in urban areas. Likewise, female headed households have slightly higher expenses than male households.

Table 3: Gender of respondents

	Peri Urban		Urban		All Areas	
	n	%	n	%	n	%
Female	20	28	8	32	28	29
Male	52	72	17	68	69	71
Total	72	100	25	100	97	100

Table 4: Annual income and expenses

	Peri Urban		Urban		All Areas	
	Income.yr (€)	Expenses.yr (€)	Income.yr (€)	Expenses.yr (€)	Income.yr (€)	Expenses.yr ()
Average	585	430	2.413	2.023	1.033	820
Maximum	1.222	993	6.112	5.196	6.112	5.196
Minimum	76	76	76	76	76	76
Female	644	517	2.158	2.025	1.076	947
Male	563	396	2.549	2.022	1.014	766

* exchange rate of February 2006: 13088 LAK/EU

Table 5: Available labour

		Peri Urban	Urban	All Areas
		n	n	n
Employees	Average	7.5	4.3	7.2
	Maximum	30.0	8.0	30.0
	Minimum	2.0	1.0	2.0
Family size	Average	3.6	3.4	3.8
	Maximum	7.0	7.0	7.0
	Minimum	1.0	1.0	1.0

Table 6: Main source of income

	Peri Urban		Urban		All Areas	
	n	%	n	%	n	%
Farming is only source of income	9	12	3	8	12.0	13
Alternative sources of income	63	88	22	92	85	87
Small business	47	65	16	67	63	66
Rice Mill	6	8	2	8	8	8
Sell Manure	2	3	0	0	2	2
Other (including labouring and fish farming	13	18	4	17	17	18

4.2 Farming systems

The 97 farmers surveyed all use less than 5 ha each for cultivation; 82 % of them even less than 1 ha. The majority of the land is used for private farming in both peri-urban and urban areas (

Table 8). In urban areas one third of the farmers surveyed rent land from the state, while only 4% of farms were rented in peri-urban areas. One reason for this is that in peri-urban land values have historically been much higher and prohibitive for private investors to purchase.

The large proportion of irrigated land in Vientiane municipality means land is used in both dry and wet season. Figure 3 shows the two peaks of land use between January and May, and again between August and November corresponding to the dry and wet season rice cultivation. The higher use of land in the dry season also shows the seasonality of fruit and vegetable production in the dry season when adjacent areas to the Mekong are not inundated and seasonality of fruit species such as mango and tamarind.

Vientiane Capital covers 392.000 hectares, with an agricultural land area of 119.500 ha (NSC, 2000). In total, 418.719 tons of crops were harvested on 91.002 ha in Vientiane Capital in 2004 (NSC, 2005). The different production and the used cultivation area for the different crops are described in Table 7. Seasonal farming varies with the different types of crops grown. For rice there are two times of the year in which farming is undertaken. Irrigated rice starts during January to February with harvesting time in April. Furthermore, rain fed rice begins when the rainy season starts, growing in early or late June to allow harvesting in November and December.

Rice is the main crop for 92% of all respondents, including both irrigated rain-fed crops, with the rest of the land used for various kinds of vegetable and livestock production. In general farming in lowland areas of Laos are similar to those found in Vientiane Municipality. For example, in Champasak province where rice makes up 91% of the total area of harvested land. However, communities closer to large urban areas, such as Vientiane, have more

opportunities for off-farm employment. In peri-urban areas of Vientiane the average annual household income ranges from €80 to €1283, the majority of which comes from rice selling. For poorer farmers with rice fields agricultural production is firmly at a subsistence level. In comparison, high income households often have enough surplus income to invest in alterative activities. Household production and consumption is divided between rice, which remains important for basic subsistence and vegetables which are often supplied to the market, providing income for purchasing meat, salt, and other consumer items.

Table 7: Agricultural production in Vientiane Capital in 2004 (NSC, 2005)

Crop	Production (tons)	Area (ha)
Maize crop	4650	1346
Irrigated rice	103280	21266
Season rice	192100	51505
Starchy roots	459	459
Vegetable bean	94800	15356
Peanuts	28	31
Soy bean	67	74
Mung bean	10	10
Tobacco	325	325
Sugar cane	23000	630
Total	418.719	91002

Table 8: Land tenure

	Peri Urban		Urban		All Areas	
	n	%	n	%	n	%
State Farm	3	4.2	8	33.3	11	11.3
Private Farm	66	91.7	15	62.5	81	83.5
No Response	3	4.2	1	4.2	5	5.2

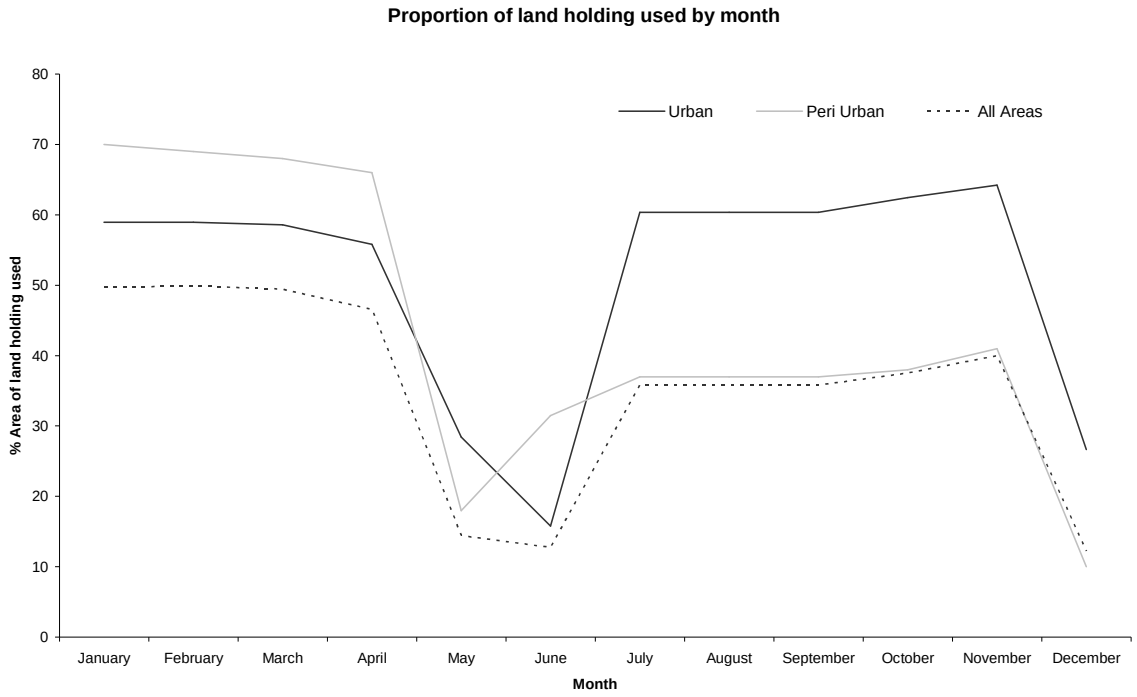

Figure 3: Proportion of land cultivated by season

The yield per hectare is slightly higher in peri-urban areas than in urban areas (Figure 4). Both dry and wet season crops are close to the national average, with the strange anomaly that dry season production is higher than wet season production. A key factor identified by farmers in increasing the yield of crops is their use of fertilizer: a belief held equally across the country (NAFRI 2003). To avoid food shortages from flooding in wet season, farmers offset their risk by planting vegetable crops such as mung beans, watermelon, maize and mustard seed in parallel to irrigated rice.

The cultivation time of fruit, vegetable and rice crops differs significantly (Figure 5). Vegetables have the shortest cultivation time with an average of 70 days. Urban areas are significantly shorter at 49 days, possibly because of the higher prevalence of chemical fertilizer use. The results for fruit are indicate the time from planting until tome of first harvest and further information is needed on the cultivation per time per season. Irrigated dry season rice has a shorter average cultivation time than rain fed wet season rice with little difference between urban and peri-urban areas.

The variety of species cultivated means that fruit it can be harvested year-round (Figure 6). Because of access to irrigated, vegetables can also be harvested year round, but in larger volumes from November to February. This is not the case in rural areas of the country where vegetable production is more common during the dry season. Irrigated rice is planted from January to February and harvested before the new monsoon in April and May. Wet season rice is planted soon after in June and July and harvested from October through to December.

The average price of most crops is higher in urban areas than in peri-urban areas (Figure 7). Of particular note is dry season rice, which is twice as valuable in urban areas as it is in peri-urban areas. As Laos is deficient the price of rice fluctuates in response to seasonal demand. The price of fruit is also considerably higher in urban areas. This may in part be explained by the lengthy supply chains from farmers through to retail traders and also the competition Vientiane retailers have with high value Thai markets for produce. Price fluctuations for fruit are also periodically affected by the pest infestations, as Lao farmers use less chemical pesticides (Dubbeldam 2006). Nevertheless, it is unclear if the significant difference in the price of fruit can be explained entirely by market forces and further investigation is needed.

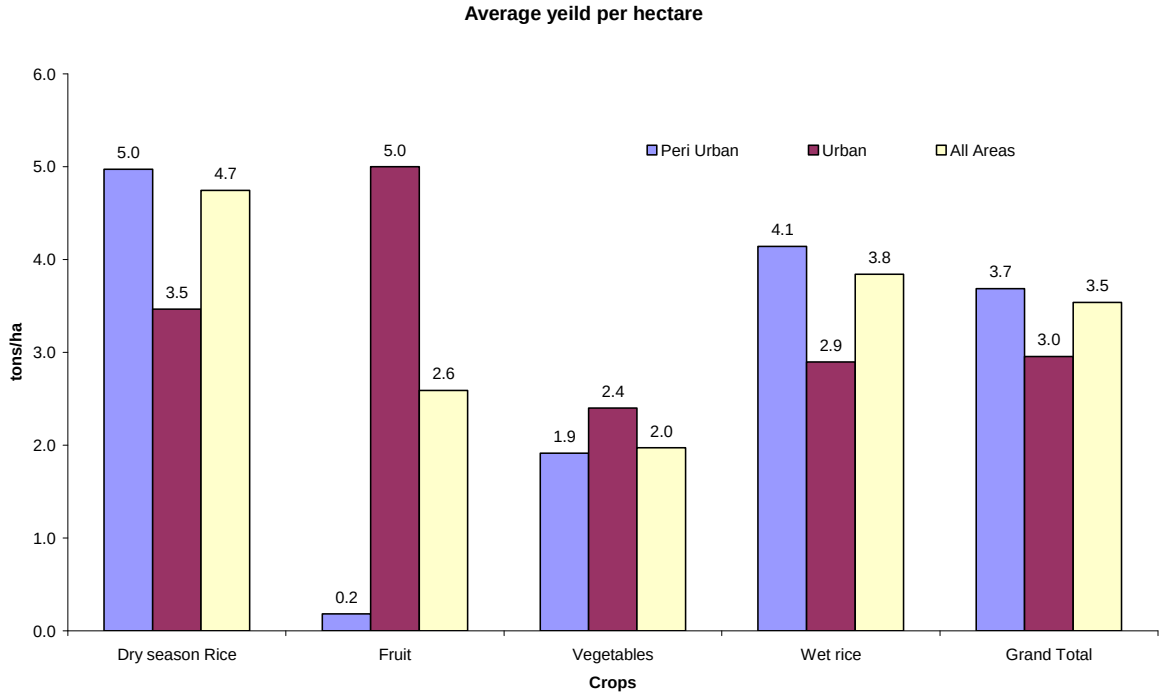

Figure 4: Average yield of main crops per hectare

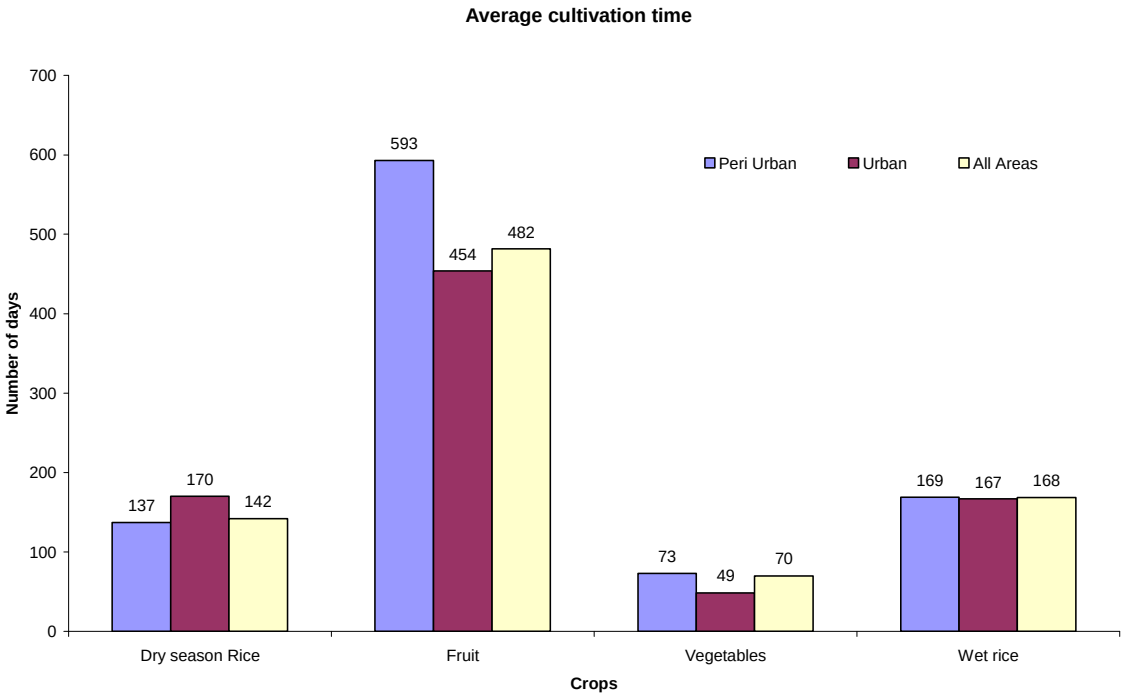

Figure 5: Average cultivation time

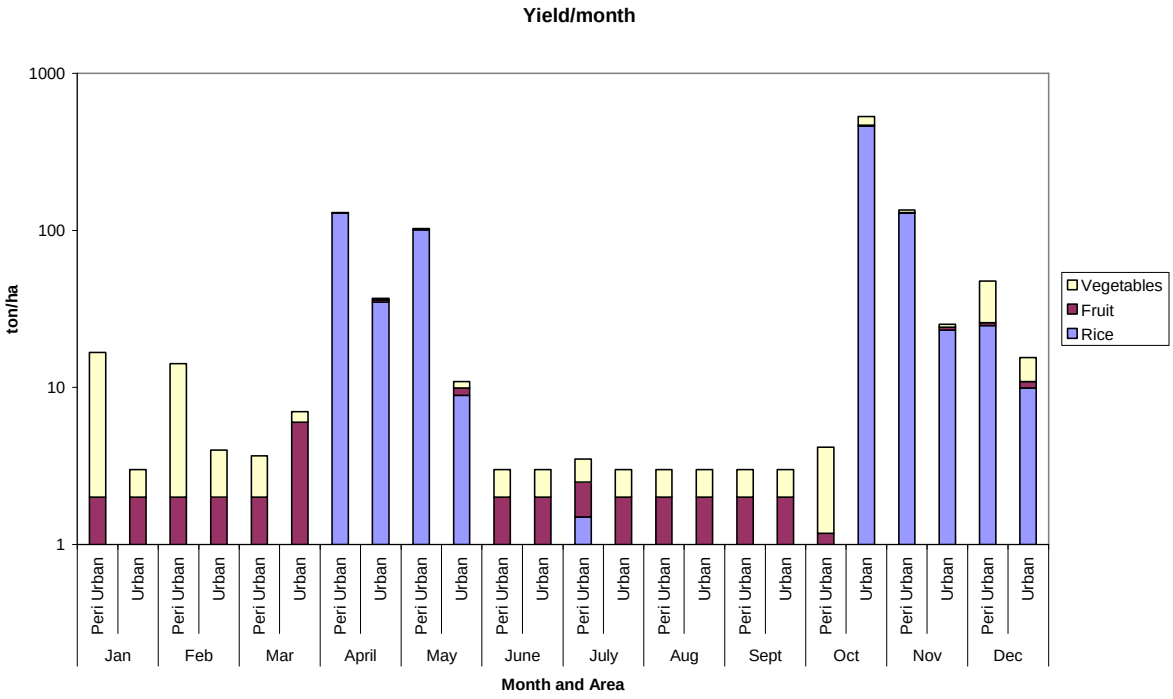

Figure 6: Comparison of crop yield per month in peri-urban and urban areas

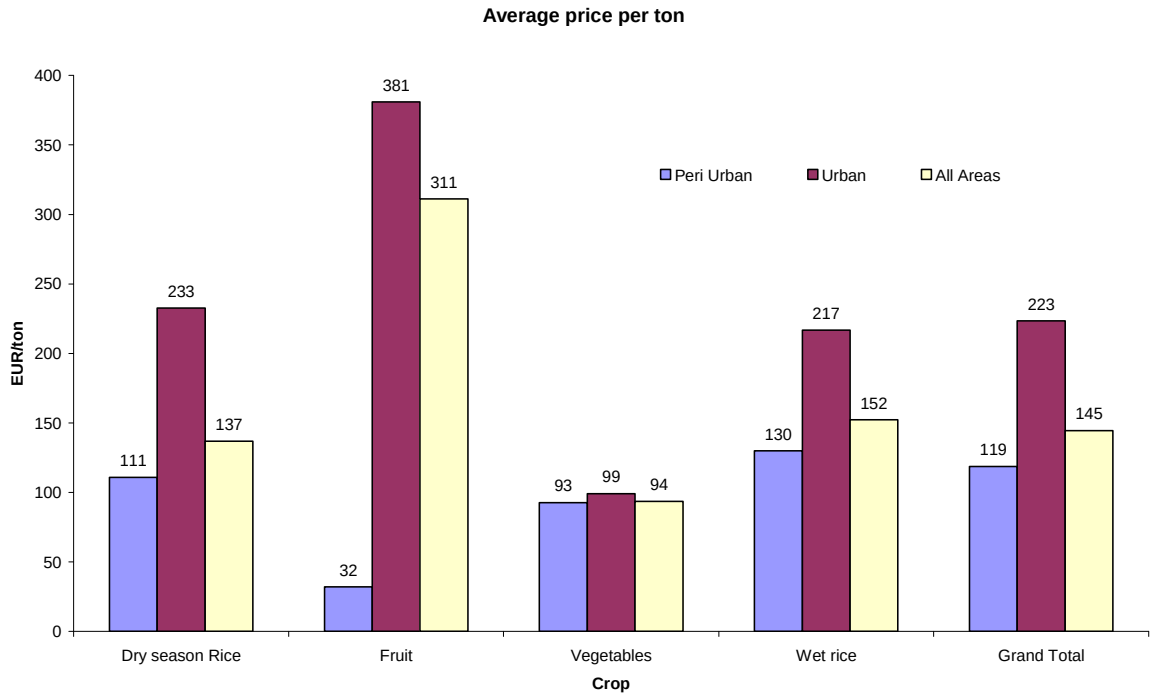

Figure 7: Average price of main crops per ton

4.3 Livestock and manure use

There are a comparable total number of livestock in both areas including cattle, pigs, poultry and water buffalo however urban areas do appear to have a larger average number of animals per household (Figure 8). This is an unexpected result, but may be explained by the high value of these livestock and the capacity for investment of wealthier urban households. In comparison livestock in the peri-urban areas may be used primarily for household consumption. Further research needs to be conducted to establish the ownership patterns of livestock in these areas.

Farmers noted it was difficult to provide an estimate of the amount of manure produced per animal (Figure 9 and Figure 10). Nevertheless, it was noted that livestock practices also affect the effectiveness and efficiency of manure collection. When livestock is allowed to roam, rather enclosed in pens to maximise the amount of land available for farming and gardening, it becomes difficult for farmers to collect manure. In comparison those households that keep livestock secure in pens at night provide more chance for an adequate quantity of dung to be collected.

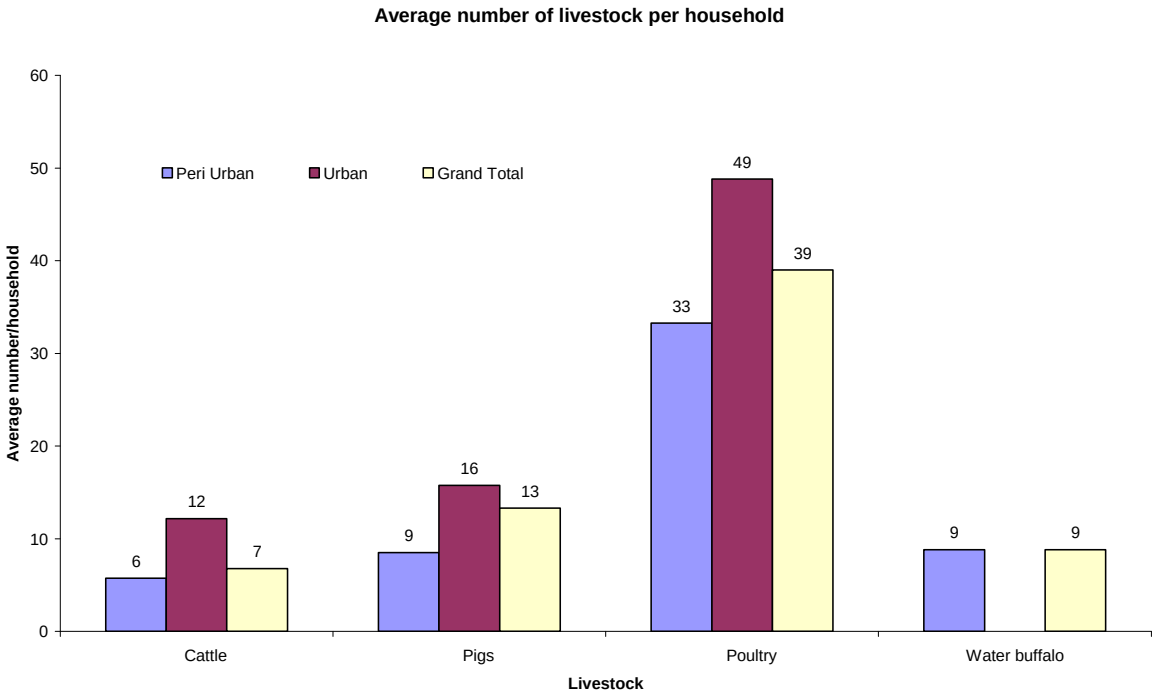

Figure 8: Average number of livestock per household

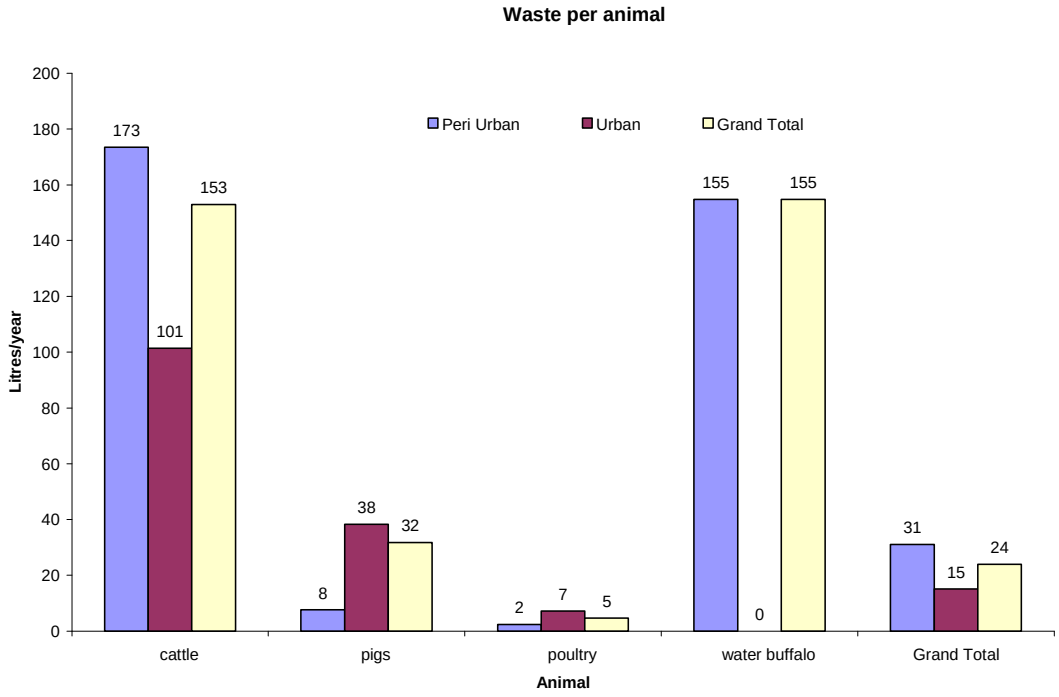

Figure 9: Production of manure per animal per year

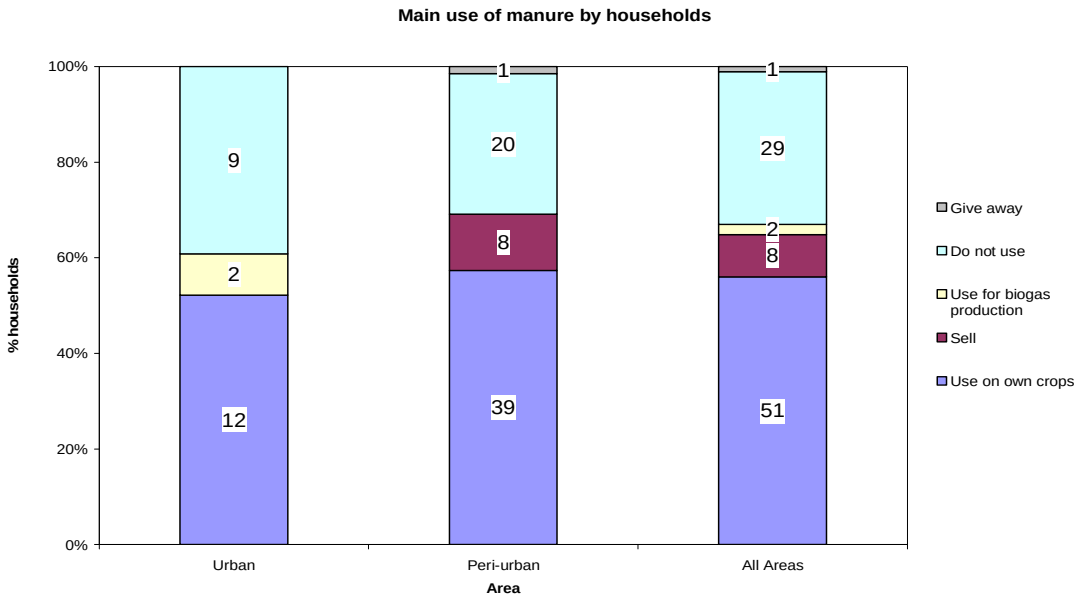

Figure 10 Uses of manure

5 Fertilizer

5.1 Fertilizer use patterns

The interviewed farmers were asked how much and which kind of fertilizer they use. Chemical fertilizer is the most used fertilizer in all evaluated districts, the peri-urban districts Saysetha and Hadsayfong and the urban districts Sikhot and Chanthabuli. The farmers in the peri-urban districts use additionally purchased or own manure, whereby the main fertilizer in use in the urban districts is chemical fertilizer (see Figure 9). Only 2 farmers use organic fertilizer, one manure and one bio fertilizer. Further research is needed to explain this pattern, taking especially into account the higher potential of manure (more animals per households) in the surveyed urban areas as reported above (see Figure 8).

Table 9: Used fertilizers

Districts	**Urban**		**Peri Urban**	
Total Farmers	25		72	
Fertilizer in use	Amount of farmers	Percentage of farmers	Amount of farmers	Percentage of farmers
Chemical fertiliser	24	96 %	60	83 %
Manure from livestock	0	-	30	42 %
Purchased manure	1	4 %	4*	6 %
Bio fertiliser	0	-	1	1 %
No Fertiliser	1	4 %	1	1 %
Only chemical fertilizer			38	53 %
Chemical fertilizer and			22	31 %
only manure			11	15 %

* One framer is using own and purchased manure

It is remarkable that 15 % of the interviewed farmers in the peri-urban districts only use organic fertilizer, the bio fertilizer or the manure, and that 31 % combine the manure with the chemical fertilizers. The farmers use 15 different fertilizers from 5 different brands. In total they apply 15 t of chemical fertilizer to their fields and spend about 5 % of their annual income, €4.956, for chemical fertilizer purchase. Additionally they apply about 43 t of manure, mainly from their own animals.

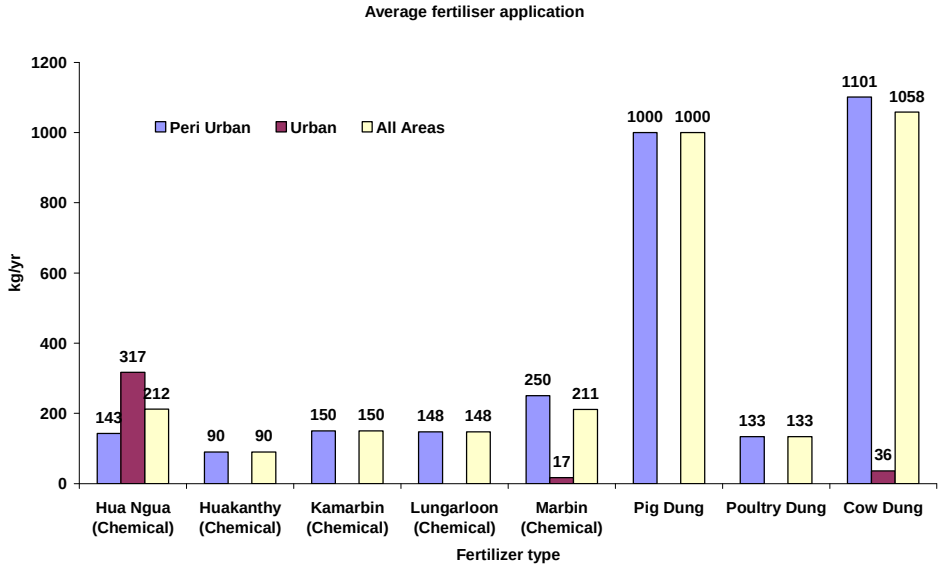

Figure 11: Average fertiliser application

Table 10: Used chemical fertilisers and their application in Kg per year

	Fertilizer	Number of Farmers using the respective fertilisers	Amount of used fertiliser (kg/year)
1	Huangur	8	820
2	Huangur 15-15-0	10	1830
3	Huangur 15-15-15	2	250
4	Huangur 16-20-0	18	6470
5	Huangur 16-0-0	3	450
6	Huangur 40-0-0	1	250
7	Huangur 46-0-0	14	1658
8	Huakanthy	5	360
9	Kamarbin	3	450
10	Lungarloon	11	1655
11	Marbin	2	650
12	Marbin 5-10-3	1	100
13	Marbin 15-15-0	2	500
14	Marbin 16-0-0	1	17
15	Marbin 16-10-3	1	100
		82	**15560**

The average fertiliser application in kg per year is shown in Figure 11. Table 10 shows the different used chemical fertilisers and their consumption per year.

Table 11 gives details on the chemical fertilizer and manure application, the price structure of the fertiliser use, and the share of income spent for fertiliser. Overall it was found that farmers spent in average 8,5 % of their income for chemical fertiliser, paying on average €0,34 EUR per kg chemical fertiliser and €0,03 per kg manure.

Table 11: Fertiliser application and prices

	Min	Max	Average	Total
Farmers income				
€/year	76	6.112	1.038	98.593
LAK/year	1.000.000	80.000.000	13.583.061	1.290.390.828
Chemical fertiliser	**Source: 82 farmers using chemical fertiliser**			
Application (kg/year)	15	1.500	100	15.560
Price (€/kg)*	0,23	0,38	0,34	
Price (LAK/kg)	3.000	5.000	4.500	
Total Expenses (€)	3,90	458,44	34,38	4.956,10
Total Expenses (LAK)	51.000	6.000.000	450.000	64.865.500
Share of income (%)	0,1	40,0	8,5	5,0
Manure	**Source: 8 farmers buying manure and 31 farmers using ma-**			
Application (kg/year)	36	8.000	1.382	42.856
Price (€/kg)*	0,02	0,04	0,03	
Price (LAK/kg)	300	500	456	
Total Expenses (€)	11,46	51,57	33,52	268,18
Total Expenses (LAK)	150.000	675.000	438.750	3.510.000
Share of income (%)	3,0	6,8	4,3	0,3

* exchange rate of February 2006: 13088 LAK/EUR

5.2 Perceptions of organic fertilizer

One of the surveyed farmers uses only bio fertilizer, while 11 use only manure, and 22 use manure in combination with chemical fertilizer in the peri-urban districts (see Table 9). Thus, almost 50 % of the surveyed farmers use organic matter to improve their soils. This shows that minimum half of them are already aware about the benefits of organic matter for their soil. This assumption is proved by evaluating their opinion on the potential of organic fertilizer (see Figure 12).

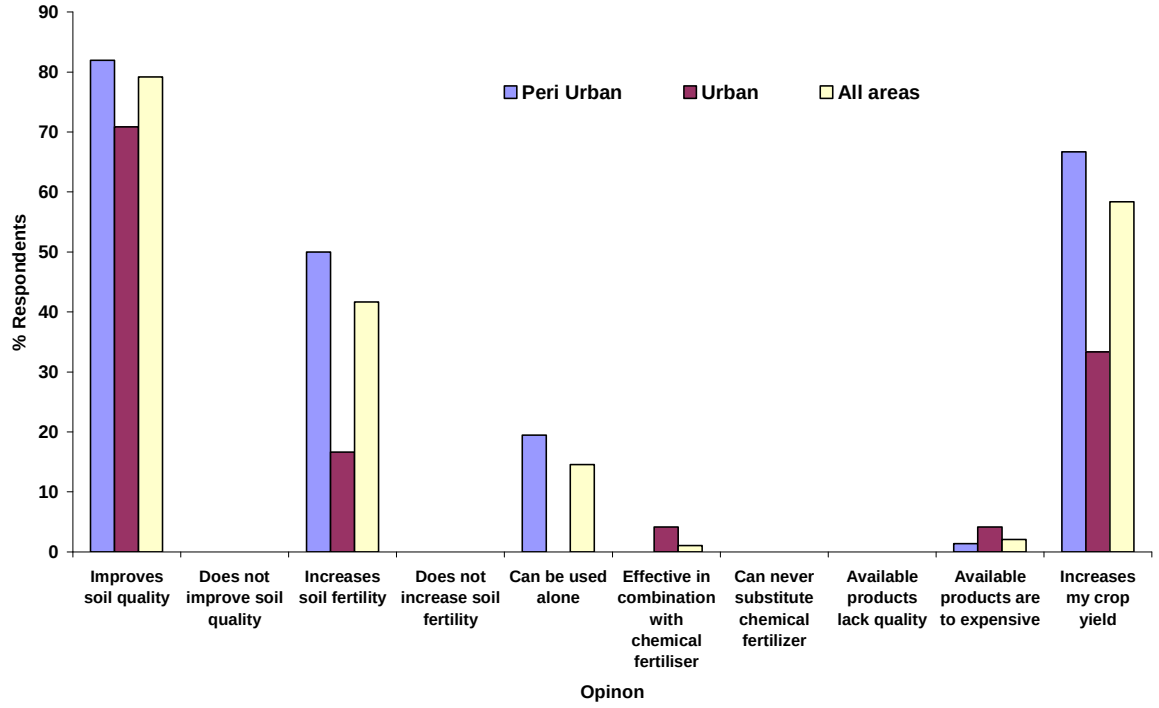

Figure 12: Opinion of the framers on the potential, quality and costs of organic fertiliser

Price was not a major concern for farmers willing to pay for organic fertilizer if it contributed to productivity. Furthermore, almost 80% of the surveyed farmers know about the soil improving potential of organic fertilizer, more than 40% think that it increases soil fertility and more than 50% think that it increases their crop yields. Nobody responded negatively to the potential of organic fertiliser. However, only 15 % thought that organic fertiliser could be used alone, as only applied fertilizer (see Figure 12).

It can be concluded that the use of organic matter as fertiliser is not new for the surveyed farmers. They use manure and they know about the potential of organic fertiliser, but not detailed enough to use it. Education and demonstration would therefore increase awareness and use of organic fertilisers.

5.3 Organic fertilizer market

Due to the consulted and interview organic fertilizer consumers and dealers, nursery shops are the majority dealers of organic fertilizer in Vientiane capital. There are two main factories supplying to the organic fertilizers in Vientiane capital, the Malinee Bio – factory and the Dongxiengdee Bio – factory. The market prices of the Malinee and Donxiengdee organic fertilizers were determined in the performed questionnaire survey and are shown in the Table 12. The nursery shops buy the organic fertilizer in 20 to 25 kg bags for €0,05 to €0,08 per kg and sell those bags to their customers for €0,08 to €0,06 per kg.

Table 12: Organic fertilizer prices at nursery shops

Bio fertilizer	Quantity (kg/bag)	Purchase price	Sale price
Maliny	20-25	950-1000 kip/kg 0,07–0,08 €/kg	1200-1500 kip/kg 0,09–0,12 €/kg
Dongxiengdy	20-25	620-650 kip/kg ~0,05 €/kg	1000-1500 kip/kg 0,08–0,12 €/kg

The shops sell the majority of their products to private residents or "villagers" as they referred to them. The surveys showed that farmer and gardeners are the main users of organic fertilizer, and the low price and the soil conditioning potential of organic fertilizer are the main reasons for their continued use.

6 RENEWABLE ENERGY

6.1 Perceptions of renewable energy

About half of the total respondents said that they have thought about using renewable energy (Table 13). A slightly higher lower proportion of households in urban areas had considered using renewable energy presumably because of the availability of relatively reliable and cheap main-grid electricity. Of those farmers that have an interest in Renewable energy, 43% had considered using PV solar and 28% had considered using biogas (Figure 13). Both these technologies are the most common form of RE in the Vientiane area. Farmers know less about other technologies, especially those which little potential for the floodplain environment around Vientiane such as small-scale hydro or geothermal.

Farmers appear to be conservative in their willingness to implement either biogas plants or energy cropping. Their responses to the survey show that they have very little knowledge of the benefits or potential of either system. The results indicate that future work needs to address this knowledge gap in the cultivation of non-food crops for further development of strategies for energy farming for Laos.

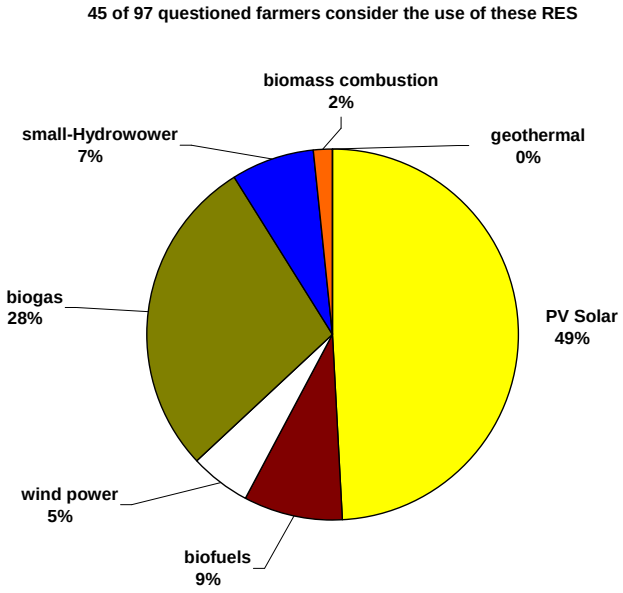

Figure 13: Proportion of farmers interested in various forms of renewable energy

Table 13: Willingness to adopt renewable energy technologies

		Peri Urban		Urban		All Areas	
	%	Yes	No	Yes	No	Yes	No
a.	Have you ever though about using renewable energy?	49	51	42	63	47	54
b.	Have you ever thought about changing the crops you cultivate?	58	42	88	17	66	35
c.	Could you imagine cultivating crops which will not be used for nutrition?	15	85	67	38	28	73
d.	Have you ever thought about treating the manure in a biogas plant?	26	74	38	67	29	72
e.	Could you imagine building a biogas plant only for your farm?	14	86	79	25	30	71
f.	Could you imagine building a biogas plant together with other farmers?	18	82	88	17	35	66

6.2 Perceptions of Energy farming

Energy farming is not known in Lao PDR so the willingness of farmers to adopt such technologies are assessed based on their willingness to change farming practices, especially for the cultivation of non-food crops.

In total 47% of respondents noted changing the crops they plant in response to market demand from both Vientiane and Thailand. A series of cash crops, such as Tobacco, various fruits and vegetables have been abandoned by farmers (Table 14). These crops are grown variously by farmers depending on a range of factors including their access to markets, export demand, and in some cases contract farming. Only one farmer has stopped growing rice, because the price of rice was low and they needed the land for alternative activities.

Table 14: Proportion of farmers which have stopped growing selected crops

	Peri urban		Urban		All Areas	
	n	%	n	%	n	%
Rice	0	0.0	1	4.2	1	1.0
Vegetables	7	9.7	4	16.7	11	11.5
Fruits	4	5.6	4	16.7	8	8.3
Rubber	0	0.0	1	4.2	1	1.0
Cassava	4	5.6	2	8.3	6	6.3
Peanuts	2	2.8	1	4.2	3	3.1
Tobacco	10	13.9	0	0.0	10	10.4
Sugarcane	2	2.8	1	4.2	3	3.1
Soybeans	0	0.0	1	4.2	1	1.0
Corn	8	11.1	0	0.0	8	8.3
Other	1	1.4	0	0.0	1	1.0

The main reason for farmers stopping production of certain crops varies considerably between peri-urban and urban areas. As expected, land use pressure in urban areas is the main reason that farmers abandoned a crop followed by a lack of capital, possibly indicating the higher value of land (Figure 14). In peri-urban areas the main reason farmers stopped production of certain crops was their low market value, indicating the capacity of farmers to abandon or switch crops to pursue higher value markets. Farmers in peri-urban areas are also more prone to natural disaster, including insect infestations, drought and flooding, increasing their overall vulnerability and willingness to adopt cash crops.

In total, 66% of farmers are currently thinking about changing their crops if market conditions are favorable (Table 13). However, farmers in urban areas appear to be far more willing to change their cropping activities than farmers in peri-urban areas, possibly reflecting a more dynamic capacity to persue market opportunities. However, it must also be noted that farmers in peri-urban areas, like rural farmers throughout the country, appear to be more risk adverse; having a greater overall reliance on agricultural production for both subsistence and income (UNDP 2001). The difference in attitude to farming systems is also reflected in the proportion of farmers willing to cultivate non-food crops. Overall farmers have little experience with non-food crops, and even less with food crops that are used for alternative non food uses. Of the total respondents only 28% said they would consider growing crops not for nutrition. However, in urban areas two thirds of respondents said they would

consider growing food crops for alternative uses while only 15% of farmers in peri-urban areas said they could consider such crops.

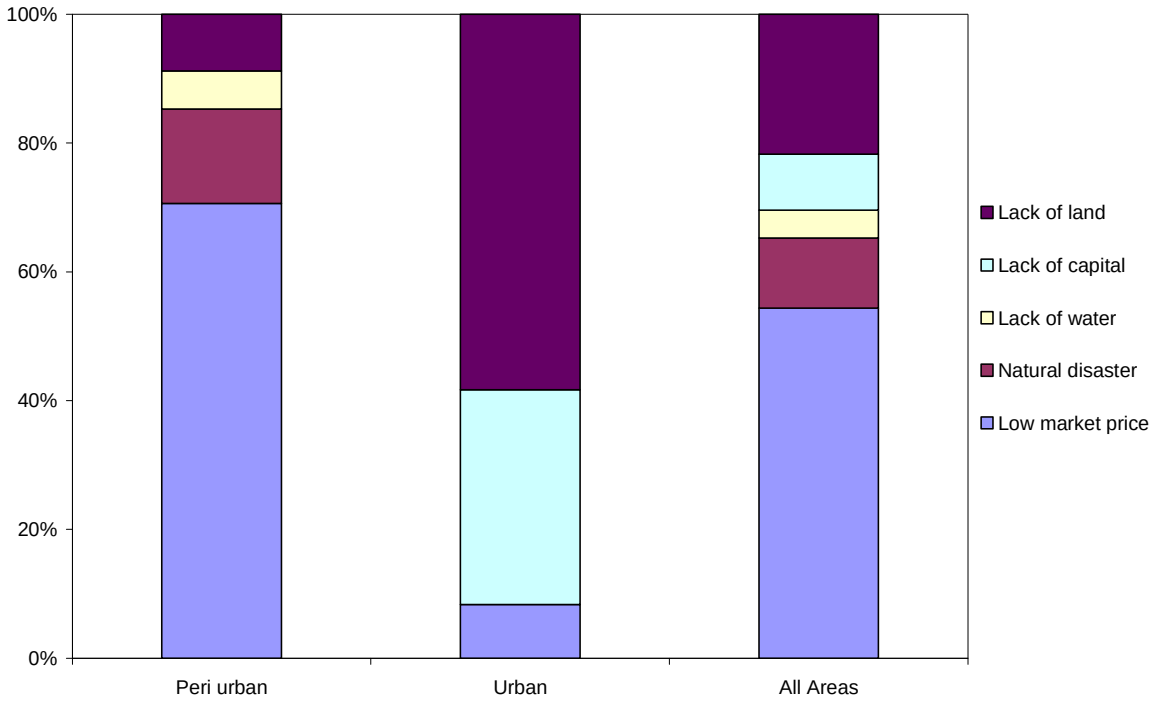

Figure 14: Reason for stopping production of crops

6.3 Capacity for collective forms of RE development and extension

The survey revealed that people are willing to participate in community programmes for the development of agricultural activities and renewable energy. Indeed, there is a long history of village organisations in Lao PDR, including the mass organisations (e.g. Womens Union and Youth Union), village security and management committees, and voluntary development committees for activities as diverse as crop or livestock extension, irrigation pump management, village electrification and road construction.

Apart from the 7% of all respondents that do not participate in the village organisations because of a lack of time or interest, there is considerable experience in collective action within the communities (Figure 15). While some organizations such as the Women Union and village security require individuals to actively participate most involvement in village organisations is as 'general members' which requires contribution only when requested (Figure 16). On average members contribute 16 days per year to their organisations with almost twice the time contribution in urban areas than in peri-urban areas. However, the maximum time contributed in per-urban areas is twice as high as urban areas. Members contribute an average of €7.83 yr/household to their organisations (Table 15). Although the average amount between peri-urban and urban areas is similar the maximum amount contributed in urban areas is twice as high.

Table 15: Contribution to village organisations

	Peri Urban	Urban	Total
Average days/year per household	13	25	16
Maximum	130	65	130
Minimum	0	0	0
Average amount of money/yr/household (€)	7.54	7.85	7.83
Maximum	64.05	120.10	120.10
Minimum	0	0	0

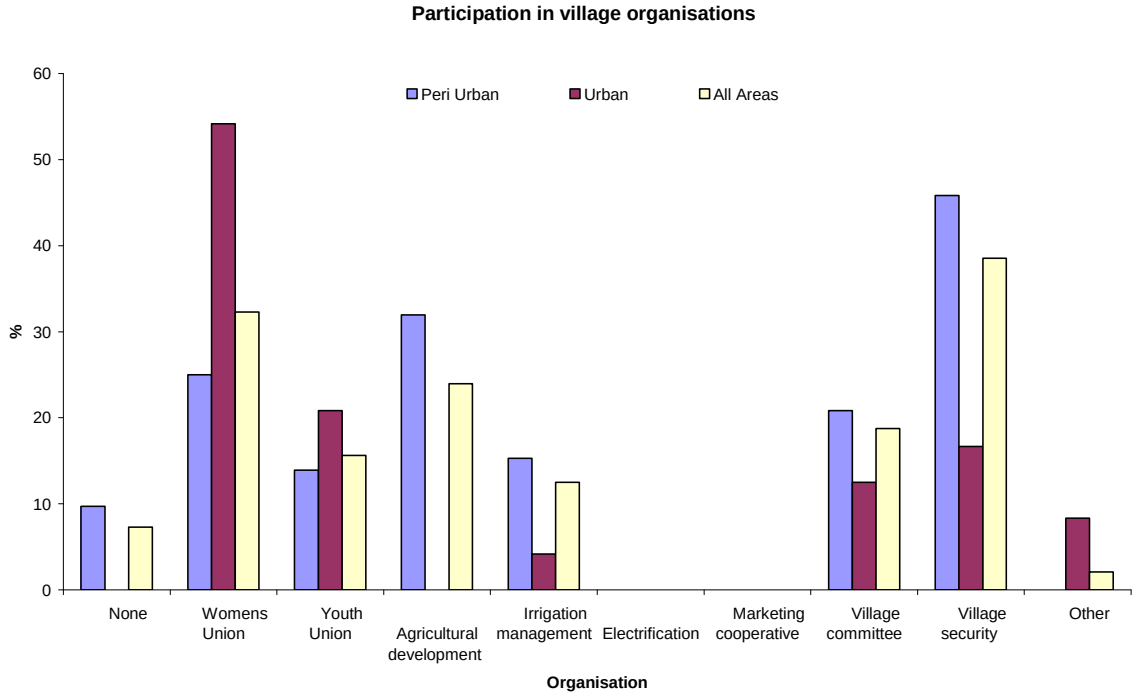

Figure 15: Participation in village organisations

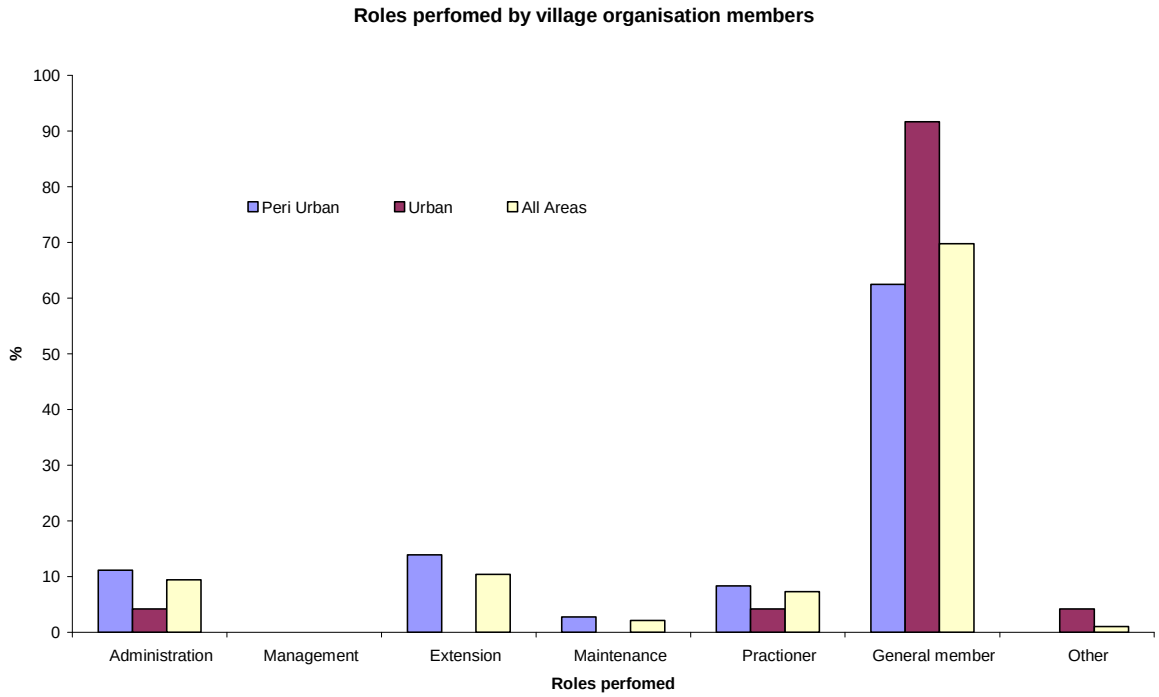

Figure 16: Roles performed by members of village organisations

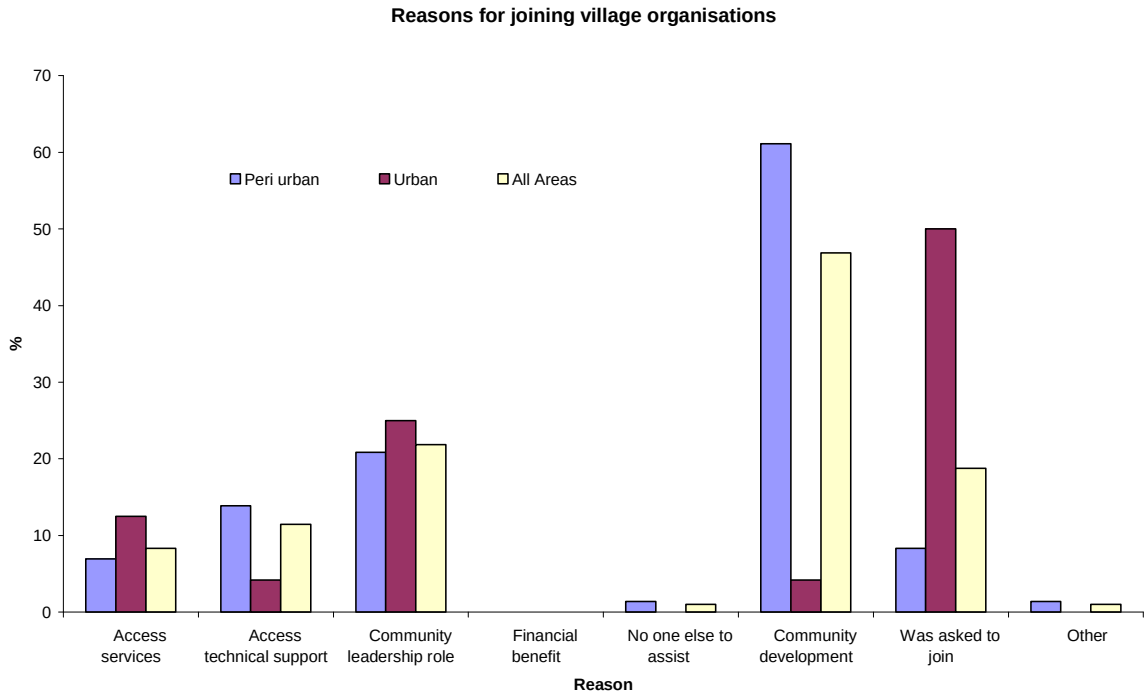

Figure 17: Reasons for joining village organisations

Only a very small proportion of members play an active role in the groups carrying out activities such as administration or providing technical support to other farmers. Participation within these groups is based around either a sense of civil responsibility in 'community development' or through civil obligation by being asked to join. In peri-urban areas over 60% of respondents joined these groups because of civil responsibility while in urban areas over 50% of respondents joined because they were obliged to do so (Figure 17). A smaller proportion of respondents in both areas also saw joining these organisations as a means of accessing technical support. Despite the differences in why people get involved there is a high level of continued support to these groups in both areas (Figure 18).

Just under half of the respondents indicated they are willing to work with an RE development organisation in their communities (Figure 19). Conversely, only a small proportion indicated they would not be interested in such a group while 47% of the respondents indicated they remain unsure if they are interested in such an organisation. The lack of commitment by these respondents appears to be positive for RE development as many stated they did not have enough information about the types or potential benefits of technologies. As such the potential exists for further involvement in community based development of RE. However, the lower proportion of respondents indicating they are willing to undertake training in RE again highlights the lack of knowledge over renewable energy (Figure 20). Any future extension activities should concentrate on the education programmes for renewable energy technologies in order to develop more informed decisions over whether to actively participate in such activities.

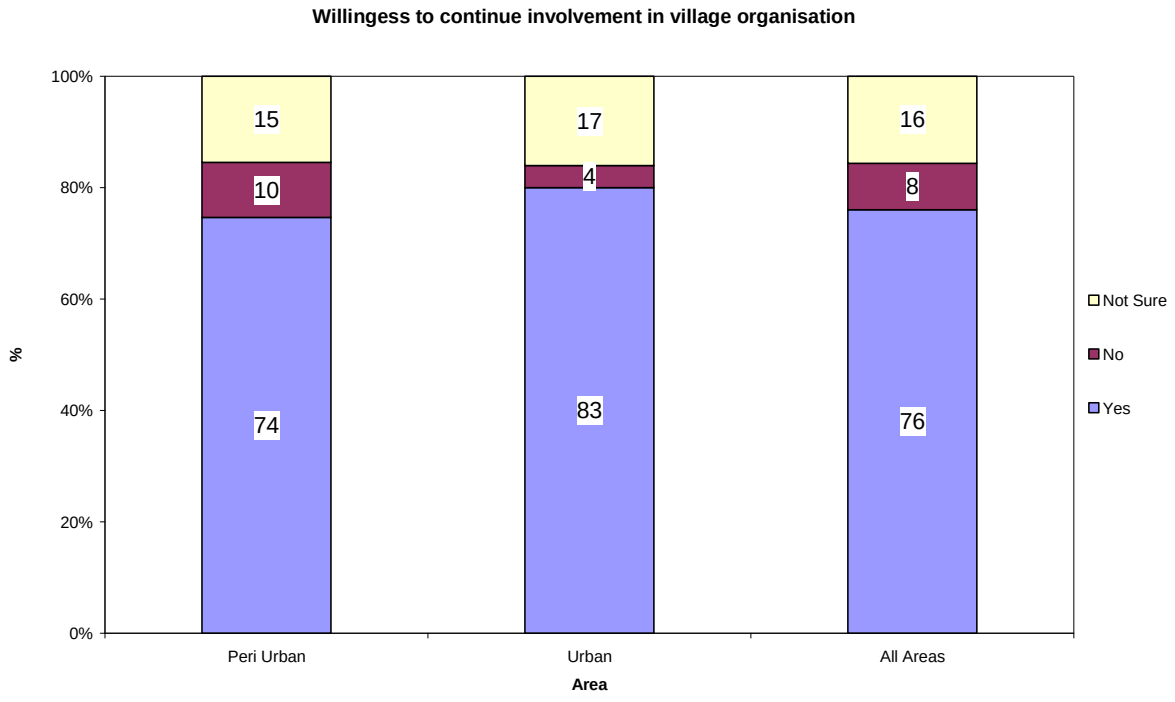

Figure 18: Willingness to continue involvement in village organisation

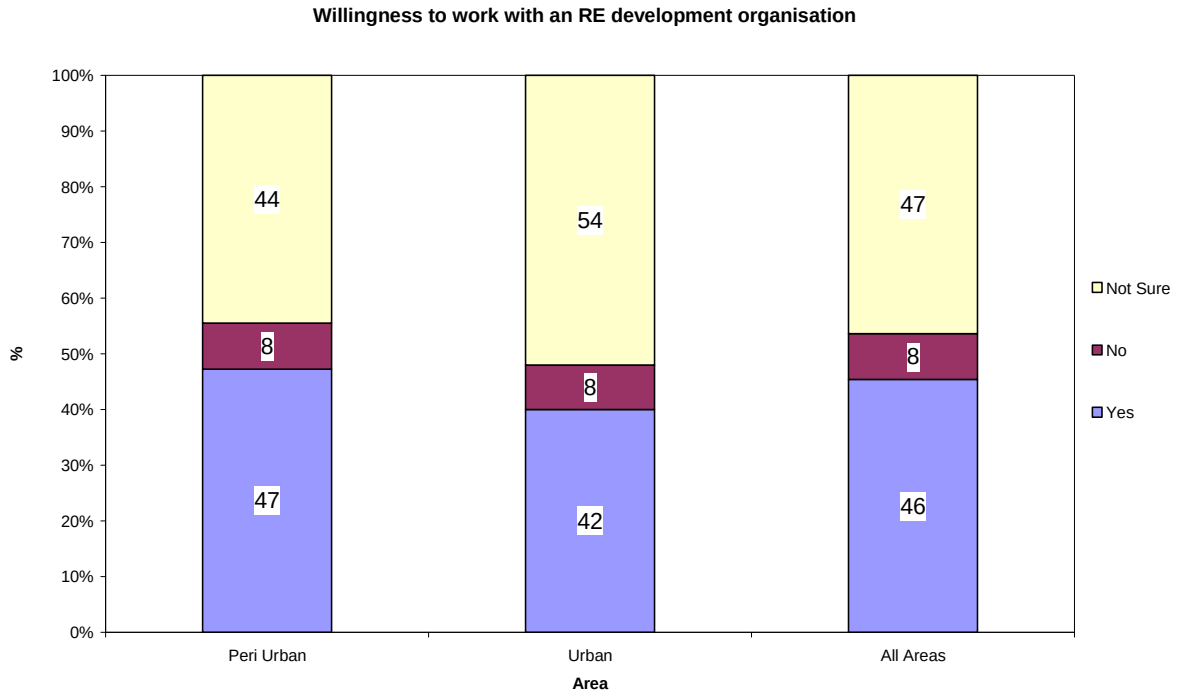

Figure 19: Willingness to work with a renewable energy group

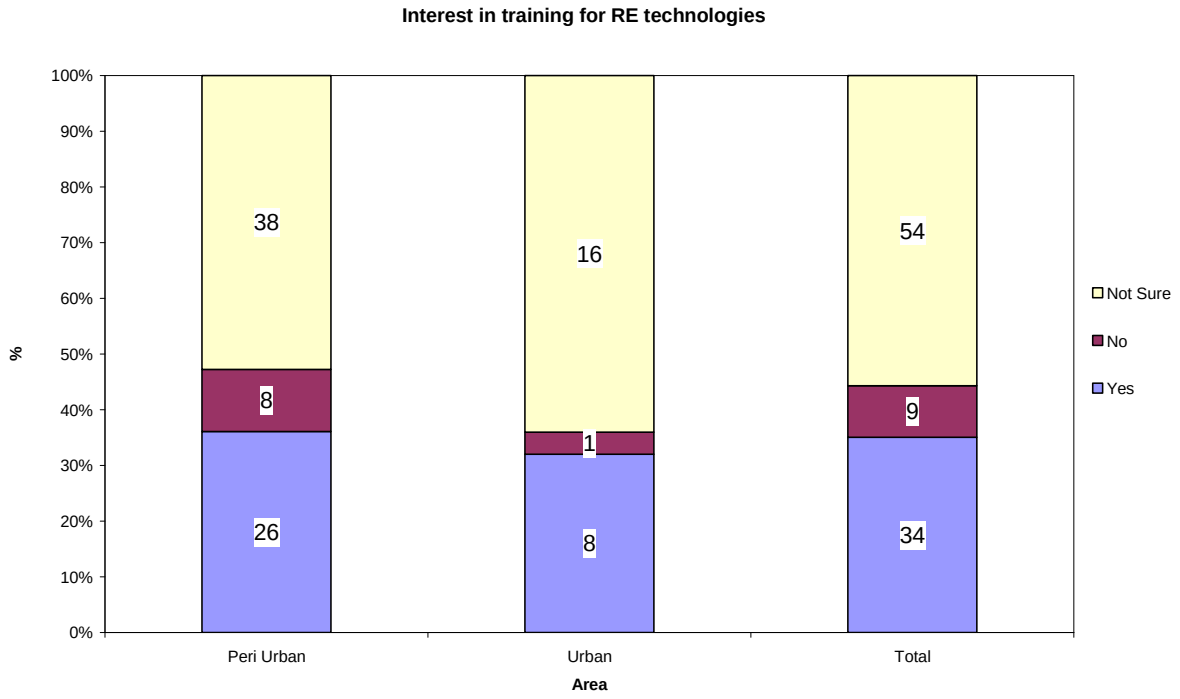

Figure 20: Interest in training for renewable energy technologies

7 OUTLOOK

Organic fertilizer holds great potential to compete with chemical fertilizer as the price of chemical fertilizer rises. The particular niche that Lao farmers fill in providing organic products to the Thai markets should be built upon to ensure that farmers remain profitable. At present organic fertilizer is relatively new to the Vientiane market, therefore the farmers knowledge is limited. However, their understanding of the benefits of manure suggests that they could see the merits of adopting organic fertilizer use in their farms. Furthermore the results of the survey indicated that farmers would be willing to use organic fertilizer if priced suitably/appropriately. Consequently, we conclude that subject to successful demonstration and a "fair" price, demand for organic fertilizer would increase over time.

Overall there is little understanding of the potential or benefits of renewable energy. In particular there was limited understanding of the potential for Energy farming. This was in part due to the lack of commercial farming of food crops. A shift to energy farming would require a significant change in the perceptions of farmers regarding not only the use of food crops but also the willingness to participate more fully in the market economy. Given the lack of knowledge about such activities the demonstration of a successful energy farming system would be necessary to both test and, if successful, improve public understanding. Nevertheless, the results indicate the potential and demand for energy farming in the targeted urban areas, urban areas around the largest urban centre in the country. Once the actual potential for energy farming and organic fertilizer is determined in Vientiane further research should be carried out in various parts of the country based on the specific farming practices, crop types and yields.

There is willingness to contribute to the RE development through village based organisations. Nevertheless, any community development strategy should reflect the relative contribution of these different groups. As such, there is potential for any program or agency to work with farmers to develop collective forms of energy farming development. Any energy program undertaken should clearly demonstrate the potential economic benefits to encourage interest in adopting the new techniques and technologies in farming.

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