

Kansai University Faculty of Economics Working Paper Series F-72

This is a Working Paper which was eventually accepted as an article published by Taylor & Francis in *Canadian Journal of Development Studies* on January 11, 2017, available online:
<http://www.tandfonline.com/doi/full/10.1080/02255189.2017.1263553>

**Agricultural Modernization and Rural Livelihoods in
Rice Farming Villages of Laos**

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Abstract

This paper looks at how rice cultivating households in Laos have been affected by policies to transform and upgrade the subsistent oriented sector into a dynamic and competitive one through intensification and commercialization, and how livelihood strategies of these households in turn have affected such modernization goals set by the government.

While overall rice output has grown significantly over the past few decades, market institutions pertinent to the rice sector remain critically weak, constraining modernization in the rice sector. Contract farming has been promoted within this context, which have led to some positive results for participating households. There has been, however, no significant evidence of a full-fledged sectoral transformation. This could be due to pervasive coordination failures amidst imperfect market institutions, providing disincentives to farmers to commit themselves to livelihood strategies based on such modernized rice cultivation practices.

1. Introduction

Agriculture in developing countries remains important from both a value added and livelihood perspective, and governments often attempt to upgrade this sector into a more dynamic and competitive one as a key component of its national development strategy. Archetypal measures include commercialization through liberalization policies, as well as intensification through diffusion of advanced agricultural practices and large-scale irrigation investment projects. Government policies extend also more indirectly by encouraging private sector involvement in forms such as contract farming. Given this, this paper looks at how livelihood strategies of largely subsistence based agricultural

households in developing countries have been affected by such policies, and how this in turn is affecting these development goals. This paper will in particular focus on rice growing households in Lao People's Democratic Republic (Laos), where such development goals are articulated in major policy documents in precisely these terms (MAF, 2010).

Laos is a small, landlocked country in continental Southeast Asia with a population of about 6.5 million in 2012 (LSB, 2013). Its economy is, however, one of the fastest growing in the world particularly since the 2000s; its per capita GDP has increased from \$204 in 1990 to \$321 in 2000, and further to \$1646 in 2013. This rapid growth has transformed Laos' economic and social structure to a significant extent. The decline of its agricultural sector has been rapid as its share in total value added has shrunk to less than a half; from 61.2 percent in 1990 to 27.9 percent in 2012¹. By the same token, new employment opportunities have emerged in the manufacturing and service sectors in more populated areas, particularly in its capital city Vientiane². Nevertheless, Laos is still predominantly an agricultural society, with 77 percent of its households being classified as "farm households" in 2010 (ACO, 2012)³. Agriculture remains the backbone of its economy, and is practically the most important sector on which the majority of its people build their livelihoods (Goto, 2011; Manivong et al., 2014; Rigg, 2005; World Bank, 2006). Within the agricultural sector of Laos, rice is the most important food crop accounting for about half of its agricultural output and one-fifth of total GDP in 2006 (Setboonsarng et al. 2008). 71 percent of all households in Laos cultivated rice in 2010 (ACO, 2012).

Agriculture in Laos is still primarily subsistence based, and its modernization through intensification and commercialization has been among the top development priorities since the introduction of the New Economic Mechanism (NEM) in 1986 (Thongmanivong and Vongvisouk, 2006). As a result, market-oriented agriculture has gradually started taking root, to some extent replacing subsistence based farming (Wright, 2009). New forms of micro-organizational arrangements in production, such as contract farming, have evolved in this process. While there has been an ongoing debate about whether such arrangements are benefiting farmers or not, the fact remains that an

¹ World Development Indicators (online database), the World Bank.

² In this paper, we will refer to Vientiane Capital as "Vientiane", and the province with the same name as "Vientiane Province" whenever necessary.

³ According to the Lao Census of Agriculture 2010/11, farm households are defined as a household which (1) operated 0.02 ha or more of agricultural land in the 2010 wet season or 2010/11 dry season, or (2) was raising two or more cattle or buffaloes, five or more pigs or goats, or 20 or more poultry at the time of the census, or (3) was raising any other livestock at the time of the census, or (4) had aquaculture facilities at the time of the census (ACO, 2012).

increasing number of smallholder farming households in developing countries are now connected to markets through this (Miyata et al., 2009; Prowse, 2012). Contract farming has also been encouraged by the Lao Government in the last few years to realize agricultural modernization (MAF, 2010).

This paper will focus on the rice sector of Laos, and examine how the Government's policy to intensify and commercialize its subsistence-oriented sector is playing out in attaining its goal of transforming it into a vibrant and competitive sector. Specifically, this paper attempts to draw these implications by looking at the changes in livelihood strategies of rice farming households in Vientiane, amidst prevailing institutional and market conditions, as well as the evolving socio-economic contexts in which these households are embedded.

The analysis on rice farming households is mainly based on household interviews conducted in Vientiane during May, September, and October of 2013. In addition, this paper utilizes a wide range of secondary information and data sources including official statistics, academic papers as well as reports and other types of documents, published by government departments, international organizations, and NGOs.

This paper is organized as follows. The next section provides an overview of rice production in Laos overall, and in Vientiane in particular. Section 3 will describe rice farming households' characteristics and the dynamics of cultivation practices in relation to the socio-economic contexts in which they are embedded. The following section will address the evolving contract farming practices in the production and distribution of rice, and attempt to look at how this has been affecting rice farming households in Vientiane. Section 5 will discuss the results on the upgrading prospects of rice cultivation as well as its policy implications, and the final section concludes.

2. Overview of rice production in Laos and Vientiane

Rice is the main staple grain in Laos as in many other Asian countries. One particular characteristics of rice cultivation in Laos is its heavy focus on glutinous rice⁴; about 92 percent of the rice produced in Laos is of glutinous variety (ACO, 2012). Glutinous rice has been the traditional staple crop in Laos and Northeast Thailand (*Isaan*) for centuries, and Laos has the highest per capita consumption of glutinous rice in the world (Schiller et al. 2006).

Production of rice in Laos was almost entirely based on manual labor, applying primarily traditional varieties and farming practices up until the mid-1990s, with limited use of "modern" inputs such as high yield varieties, fertilizers and irrigation systems.

⁴ Glutinous rice is also referred to as "sticky rice".

Agricultural machinery for land preparation and threshing were introduced only recently. Nevertheless, modernized methods of production have started to penetrate into rice cultivation practices particularly in the more populated areas such as Vientiane (Schiller et al. 2006).

Rice has been regarded by the Lao Government as a key commodity in connection to food security, rural livelihoods, and overall national development. Intensification of rice production has been encouraged since the introduction of the NEM in 1986, and this continues today as manifested in the Seventh Five-Year National Socio-Economic Development Plan for 2011-2015.

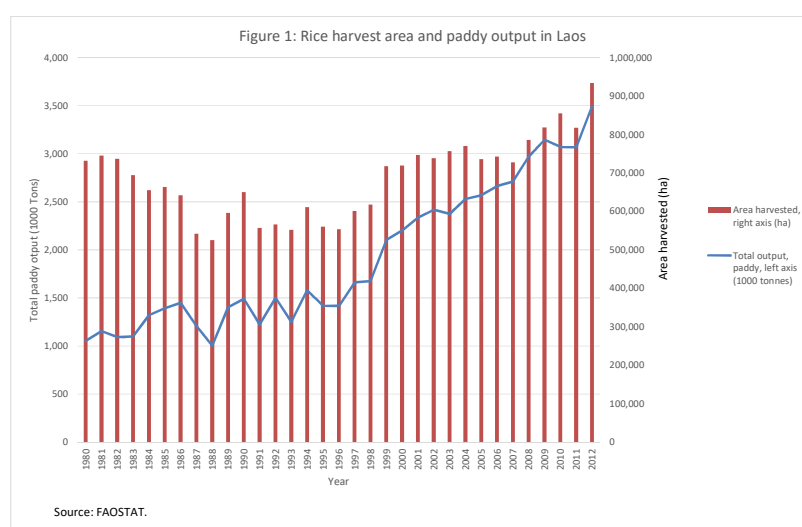


Figure 1 summarizes the changes in rice harvesting area and total paddy output from 1980 until 2012. The harvest area was in a declining trend with almost no significant changes in paddy output up to the mid-90s. The late 70s and early 80s was a period when Laos was struggling with introducing and managing a cooperative mechanism in its agriculture sector, which only led to disappointing output performance. Collective rice farming never took root in Laos, and was altogether abandoned and liberalized in the mid-80s (Ducourtieux et al., 2005). As a result, rice harvest area since late-80s and early-90s have been on an upward trend, along with a robust growth in paddy output particularly from the mid-90s. This rapid output growth is mainly attributed to the expansion of harvest area, as figure 1 clearly indicates, as well as the introduction of high yield varieties along with modern agricultural practices such as increased usages of irrigation systems and chemical fertilizers. The introduction of modern varieties has not just contributed to an increase in yields in a particular harvest, but has also enabled farmers intensify cultivation through double cropping.

Rice in Laos is produced under different eco-systems, typically classified as lowland and upland cultivation. Lowland cultivation is characterized by environments in which rice is grown on submerged soil, which can either be based on rainfall or irrigation systems. Upland cultivation refer primarily to rainfed rice cropping on soil not intentionally submerged, and irrigated farming is hardly practiced in these systems. Rice production can also be categorized seasonally into either wet (rainy)-season (May-November) or dry-season (December-April) rice farming. Wet-season rice farming is primarily associated with rainfed systems, while dry-season rice farming is typically an irrigated rice farming practice, although irrigation systems are also used occasionally in lowland wet-season farming as supplementary water sources during unexpected rainfall shortages.

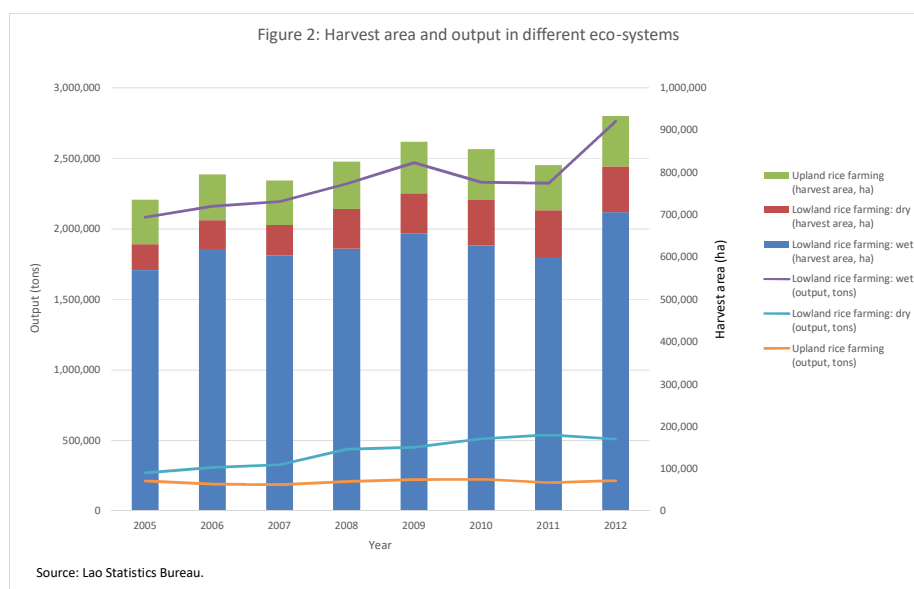


Figure 2 shows the recent trends of harvest area and paddy output under different eco-systems. The dominant rice production system in Laos is rainfed lowland rice farming, followed by irrigated lowland rice farming, and rainfed upland rice farming. Upland farming take place mostly in the northern region and in areas along the border of Vietnam in the central and southern regions, which are typically mountainous. Its output share of total domestic rice production has trended constantly downwards in recent years, dropping from 8.4 percent in 2005 to 6.2 percent in 2012.

Table 1: Rice (paddy) output, provincial level, 2012.							Unit: Tons.	
	Lowland wet rice	Share (%)	Lowland dry rice	Share (%)	Upland rice	Share (%)	Total	Share (%)
Savannakhet	614,600	22.2%	138,915	27.2%	2,139	1.0%	755,654	21.7%
Champasack	459,180	16.6%	66,490	13.0%	0	0.0%	525,670	15.1%
Vientiane Capital	241,645	8.7%	100,945	19.8%	-	-	342,590	9.8%
Saravane	242,000	8.8%	53,950	10.6%	9,171	4.2%	305,121	8.7%
Vientiane	230,430	8.3%	28,850	5.7%	11,570	5.4%	270,850	7.8%
Khammuane	208,160	7.5%	45,265	8.9%	1,350	0.6%	254,775	7.3%
Xayabury	140,025	5.1%	12,585	2.5%	31,124	14.4%	183,734	5.3%
Borikhamxay	124,945	4.5%	29,405	5.8%	6,113	2.8%	160,463	4.6%
Xiangkhuang	88,595	3.2%	365	0.1%	17,030	7.9%	105,990	3.0%
Huaphanh	54,435	2.0%	7,630	1.5%	36,825	17.0%	98,890	2.8%
Bokeo	64,945	2.4%	12,200	2.4%	16,903	7.8%	94,048	2.7%
Luangprabang	55,790	2.0%	3,980	0.8%	32,055	14.8%	91,825	2.6%
Oudomxay	59,100	2.1%	1,840	0.4%	16,081	7.4%	77,021	2.2%
Attapeu	65,485	2.4%	1,140	0.2%	3,760	1.7%	70,385	2.0%
Luangnamtha	50,845	1.8%	2,330	0.5%	8,820	4.1%	61,995	1.8%
Phongsaly	33,600	1.2%	895	0.2%	17,736	8.2%	52,231	1.5%
Sekong	29,370	1.1%	3,135	0.6%	5,463	2.5%	37,968	1.1%
TOTAL	2,763,150		509,920		216,140		3,489,210	

Source: Lao Statistics Bureau.

As table 1 reports, Savannakhet province, located in the south-central part of Laos, was the largest rice producing province in the country, catering for more than one-fifth of its total output in 2012. Champasack, the southernmost province, was the second largest rice producer in the same year, with a 15.1 percent share of total domestic production. Vientiane, which is the focus area of study of this paper, ranked third, with an almost 10 percent share of national output, reflecting its significant position as a rice producing region in the Lao economy. This may be counterintuitive considering its position as the “capital” of Laos. While Vientiane is no doubt the most developed and populated area in Laos with the largest concentration of its non-agricultural sectors, it is nevertheless still rural in nature where rice production remains important from a local livelihood perspective, distinguishing it from the rather de-agrarianized and urbanized capitals and mega-cities of its neighboring countries⁵.

It is interesting to see the disproportionately high domestic share of Vientiane’s output of lowland dry-season rice; 19.8 percent compared to an 8.7 percent share in lowland wet-season rice. This is related to the fact that a significantly higher proportion of arable land in Vientiane has access to irrigation facilities than average (Schiller et al. 2006). This is also logical considering the likelihood of higher land values in Vientiane compared to other regions, leading to stronger incentives for farmers to intensify rice cultivation, particularly in the dry-season.

⁵ Urbanization is progressing in most part of Asia, however this is not necessarily evident in Laos at least in terms of population concentration; while the population share of Vientiane was 11.5 percent in 2000, this has only increased to 12.2 percent in 2012 (authors’ calculation based on Lao Statistics Bureau data, 2001 and 2013).

Table 2: Rice (paddy) production in Vientiane								
	2005	2006	2007	2008	2009	2010	2011	2012
Vientiane								
Lowland rainfed paddy								
harvested area (ha)	52,150	52,640	53,380	39,280	54,335	54,039	50,311	55,548
share	9.2%	8.5%	8.8%	6.3%	8.3%	8.6%	8.4%	7.9%
production (ton)	201,600	200,075	219,685	161,315	225,150	233,935	214,935	241,645
share	9.7%	9.3%	10.0%	6.9%	9.1%	10.0%	9.3%	8.7%
yield (ton/ha)	3.87	3.80	4.12	4.11	4.14	4.33	4.27	4.35
Lowland dry season paddy								
harvested area (ha)	21,656	21,100	20,125	21,049	22,176	21,500	21,300	20,762
share	35.5%	30.8%	28.2%	22.4%	23.5%	19.8%	19.0%	19.2%
production (ton)	98,600	97,100	96,000	99,825	108,025	101,725	103,630	100,945
share	36.4%	31.3%	29.2%	22.7%	23.9%	19.9%	19.2%	19.8%
yield (ton/ha)	4.55	4.60	4.77	4.74	4.87	4.73	4.87	4.86
Share of irrigation rice farming in Vientiane								
harvest area	41.5%	40.1%	37.7%	53.6%	40.8%	39.8%	42.3%	37.4%
production	48.9%	48.5%	43.7%	61.9%	48.0%	43.5%	48.2%	41.8%
Laos total								
Lowland rainfed paddy								
harvested area (ha)	569,750	618,820	604,147	619,950	656,471	627,865	598,358	706,028
production (ton)	2,082,100	2,161,400	2,193,400	2,321,110	2,468,750	2,331,330	2,323,195	2,763,150
yield (ton/ha)	3.65	3.49	3.63	3.74	3.76	3.71	3.88	3.91
Lowland dry season paddy								
harvested area (ha)	61,030	68,500	71,400	94,072	94,309	108,410	112,210	107,967
production (ton)	271,100	310,000	329,200	439,200	452,050	512,430	540,315	509,920
yield (ton/ha)	4.44	4.53	4.61	4.67	4.79	4.73	4.82	4.72

Source: Agricultural Statistics Year Book, Ministry of Agriculture and Forestry.

Table 2 shows the rice production trends of Vientiane with reference to the whole country. The following points merit attention. First, there is a sudden reduction in both the levels of harvest area and output of lowland wet-season rice in 2008, but such a dip is not observed in lowland dry-season output⁶. In addition, as there is no similar fall in the overall domestic output level of wet-season paddy, this unusual decline of output seems rather an idiosyncratic effect to the rainy season in Vientiane of that particular year. One of the plausible explanations of this is the extraordinary flooding in August of 2008, caused by a tropical storm which elevated the water level of the Mekong River to a historical height. Flooding has always been considered as one of the largest risks associated with rice farming in Vientiane and in Laos overall (Schiller et al., 2001; Schiller et al. 2006), and this particular one in 2008 has been reported as probably the worst in the past several decades for Vientiane (DREF, 2008; MRC, 2009; Sonnasinh, 2008). This highlights the important fact that rice cultivation along the Mekong River, and in the Vientiane Plains particular, is highly prone to natural disaster (flood) related risks, which has strong implications to livelihood strategy decisions of rice farming households.

⁶ Note that the “harvest area” is different from, and usually smaller than, the “planted area”. While the “planted area” could have been the same in 2008 as in previous years, as a result of serious flooding which damaged the planted paddy, the area where harvesting was actually possible (“harvesting area”) might have been significantly smaller than the “planted area”.

Second, lowland dry-season rice output in Vientiane has more or less remained constant during the above reference period, while its total domestic output has significantly increased. Its output share in the domestic dry-season rice production has decreased significantly; from 36.4 percent in 2005 to 19.8 percent in 2012. This is interesting as it may suggest that dry-season irrigated rice farming in Vientiane may already have peaked despite its potential for further output growth through accelerated intensification.

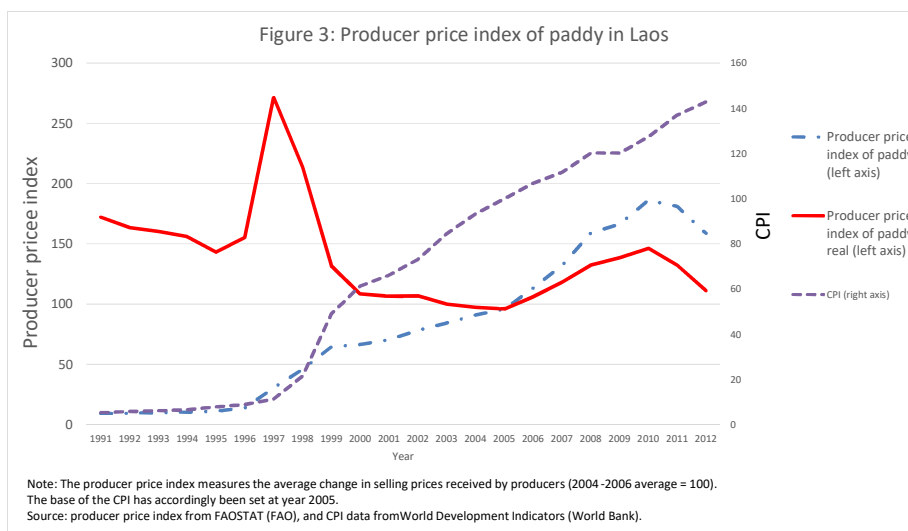


Figure 3 report changes in the producer price index (PPI) of paddy in nominal and real terms, and the Consumer Price Index (CPI) trends. The PPI measures the average change in selling prices received by the producers, where the base is set as 100 at the 2004-2006 producer price average⁷. In order to offset the fluctuations of price levels, a “real PPI” has been calculated using the CPI.

Overall, the rice PPI has been in an increasing trend in nominal terms until 2010. The directions of change in real PPI has been mixed, however in broad terms it has rather trended downwards throughout the reference period, except during the short years of 1995-1997 and 2005-2010. The increase in real PPI in these periods are likely to be attributed to the unusual price increase in the food component of the CPI in Laos, such as the recent hike in food prices in 2008 (Sengxua et al., 2009)⁸. It would be interesting to note, by the way, that the exceptionally high inflation in Laos in the late 90s, as clearly indicated by the CPI curve, is caused mainly by the Government’s ambitious irrigation expansion programs during this period, which have been financed with excessive

⁷ The PPI data are from FAOSTAT database (<http://faostat.fao.org/>), accessed on July 30, 2014.

⁸ Food price volatility is a phenomenon that has also been observed at a global scale, attracting significant attention in recent years particularly in relation to the “global food crisis”. See, for example, studies such as Conceicao and Mendoza (2009) Lang (2010) and Moseley (2013).

seigniorage measures (IMF, 2000; High, 2013)⁹.

Although the reference period is somewhat short to make a generalized and conclusive statement, a noteworthy trend in this figure is the steady decline in real (and nominal) PPI since 2010. This could be related to several factors. First, rising income levels often stimulate changes in general preferences towards a diversified food consumption pattern, which may have led to a decrease in demand for rice in general, and for the traditional glutinous ones in particular. Eliste and Santos (2012) suggest that per capita rice consumption in Laos has already reached, or at least is about to reach, its peak, as it has become an inferior good given the current overall income levels. This seems to be the case especially in the relatively populous areas such as Vientiane. Interviews during our fieldwork suggested a growing perception among rice producers of a decreasing demand particularly for the glutinous variety due to such a preference change.

Second, several studies indicate that Laos has achieved self-sufficiency in the supply of rice in the early 2000s (Schiller, 2006)¹⁰. Being able to generate rice surplus would enable Laos to emerge as a significant exporter of its surplus rice as the Government envisages, however such a trend has not yet been captured in official export statistics. Nevertheless, with a vibrant border trade which transactions are typically not recorded and reflected in official statistics, it is quite likely that a substantial volume of rice are nonetheless been exported informally to neighboring countries, particularly to Thailand.

3. Livelihood strategies of rice farming households in Vientiane

Given the overall context, we now look at household livelihoods that underpin, as well as are shaped by, the contexts described above. This section primarily relies on information obtained through structured questionnaire based interviews conducted in Vientiane with rice farming households. While the reference year for the base-line information was set to 2012, we have also asked for information on a set of selected questions for 2008 and 2003 in order to capture some of the key dimensions of the household livelihood strategy dynamics.

The questionnaire was first prepared in English and later translated into Lao. Initial field testing of the Lao questionnaire was done in May 2013, and the actual interviews were conducted during September and October of the same year using the revised

⁹ The annual inflation rate (CPI increase) was 91 percent and 128 percent in 1998 and 1999, respectively.

¹⁰ However, Laos is well known for its poorly integrated agricultural market, resulting in a major imbalances in food security between provinces, with rice abundance in major rice producing areas in the central and southern provinces and shortages primarily in the northern and mountainous regions (Eliste and Santos, 2012).

questionnaire in Lao. Five villages in four districts of Vientiane were identified as research sites where rice cultivation was the major economic activity, namely Thasommor (Xaythany district), Namhom (Naxaythong district), Donevangpho (Parkngum district), Thadeua (Parkngum district), and Dongkaluem (Hadxayfong district) villages.

As representative sampling frames for the villages were not available at the time of fieldwork, sample household selection was done through a chain-referral sampling method. For more practical reasons, this was probably the only possible sampling method for us at that time, as reference from farmer group leaders and peer rice farming households were in reality essential in obtaining contacts for interviews. This approach allowed us also to establish a more trust-based relationship, inviting less suspicion than otherwise. It also enabled a more targeted sampling towards rice farming households, which made the interviews more relevant in light of our research purpose; we were primarily interested in households which were or had been farming rice, rather than those that never did. It would nevertheless be important to point out that this sampling method is obviously more prone to biases than a purely randomized sampling strategy, because of the serious likelihood of those better connected with particular social networks being overrepresented (Noy, 2008). This becomes a problem when these overrepresented households have distinct characteristics compared to those that are excluded by this sampling design, in terms of their attributes that are important to the main concerns of the study. This is one major caveat that should be borne in mind when interpreting the results. Given this, the information from interviews nevertheless reveal wide variation in important household and rice farming characteristics and related attributes. As a result, a total of 153 households were interviewed, with detailed age and sex-disaggregated work-status information of 513 people (working population) from these households. In addition, in-depth interviews with five rice mills were also conducted.

	Agricultural worker		Non-agricultural worker	
average	40.2		32.0	
sd	13.8		12.2	
t-Stat.	6.277			
Prob. > t	0.000***			
	Female	Male	Female	Male
average	39.2	41.2	30.6	33.0
sd	13.4	14.2	9.9	13.5
t-Stat.	1.345		1.161	
Prob. > t	0.179		0.248	
n	190	172	61	90
Note: * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.				
Source: Interview survey.				

There were on average 5.2 people in a household, with 68 percent being two-generation households, and 27.5 percent three-generation households. 43 percent of the interviewed households were extended families, which are defined here as one that extends the nuclear family to include one or more relatives. The relative high share of extended family is commonly observed in developing countries, and often understood as a household's response of risk sharing and labor pooling in the absence of pertinent formal institutions (Cox and Fafchamps, 2008).

It is interesting to note the clear difference in age composition of those involved in agricultural work, primarily rice farming, and those in non-agricultural work, including off-farm work. Table 3 summarizes the characteristics of households' workers. The average age of agricultural workers was about 40, while that for non-agricultural workers was 32, which difference was significant at a 1 percent level. This is in line with available literature suggesting that younger generations in rural areas of developing countries, including Laos, are shifting from agriculture to non-agriculture jobs in manufacturing and services (Estudillo et al., 2013). The rapid increase of agricultural wages seem to accelerate this trend (Wiggins and Keats, 2014). Studies indicate the increase of the opportunity cost in agricultural work is rising in Laos as well (Manivong et al., 2014), making it difficult for rice farmers to cope with this trend unless a significant increase in productivity (yield) or value added is realized. There was, however, no difference observed between males and females within work categories (agriculture and non-agriculture) that were statistically significant, suggesting no particular gender specific occupational tendencies.

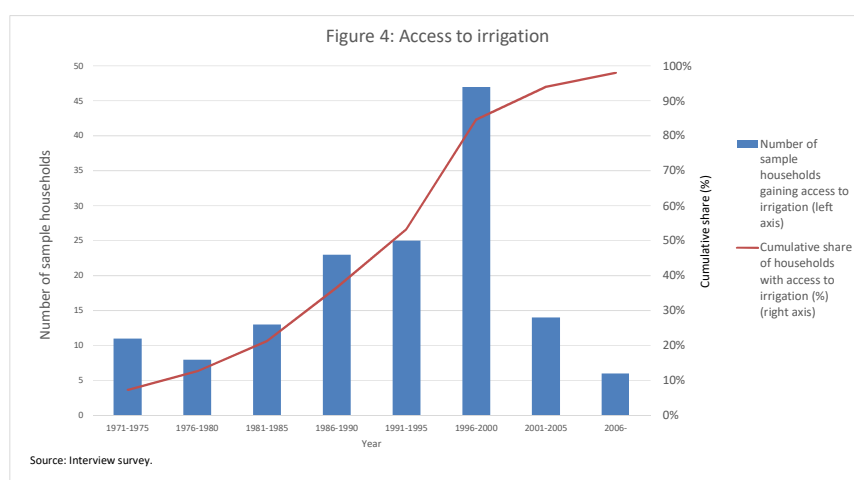
	2003	2008	2012	diff 03-08		diff 08-12		diff 03-12	
				t-Stat.	Prob. > t	t-Stat.	Prob. > t	t-Stat.	Prob. > t
Average size of farmland (ha)	1.43	1.51	1.66	1.39	0.17	2.12	0.04**	2.14	0.03**
Wet season rice cultivation									
Average area of land used (ha)	1.24	1.30	1.40	1.26	0.21	1.83	0.07*	1.94	0.05*
Average share (%)	90.7%	89.6%	88.7%	0.80	0.42	0.80	0.42	1.27	0.21
Dry season rice cultivation									
Average area of land used (ha)	1.09	1.14	1.20	0.48	0.63	0.48	0.63	0.89	0.37
Average share (%)	82.5%	85.4%	82.9%	0.77	0.44	0.71	0.48	0.12	0.90
Irrigation									
% irrigated (wet season)	39.4%	41.0%	40.1%	0.95	0.35	0.69	0.49	0.38	0.70
% irrigated (dry season)	87.4%	89.4%	88.1%	1.31	0.19	1.05	0.30	0.38	0.70
Total output (household average)	5,841	6,561	6,755	3.08	0.002***	0.74	0.46	2.09	0.04**
Yield (kg/ha, per harvest)	2,796	2,856	2,788	0.96	0.34	0.95	0.35	0.08	0.94
Share of glutinous rice (%) ⁽²⁾	96.0%	95.2%	93.8%	1.20	0.23	1.37	0.17	2.49	0.01**

Note: Only two of the sample farm households (n=150) practiced upland rice cultivation, and these are not included in the table. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Source: Interview survey.

Table 4 presents an overview of rice farming of the sample households. Average

farmland size was 1.43 hectares per household in 2003, which has increased slightly to 1.51 and 1.66 hectares in 2008 and 2012, respectively¹¹. Changes were statistically significant at 5 percent during 2003-2012 and 2008-2012, but not during 2003-2008. The cultivation area of wet-season rice farming has increased accordingly, which were significant at 10 percent levels during 2008-2012 and 2003-2012, while there were no such significant changes observed for dry-season farming during the entire reference period. Likewise, changes in the average proportion of farmland used for both wet and dry-season rice farming were also not statistically significant. While total average output per household has increased during 2003-2008 and 2003-2012 (but not during 2008-2012), the average yield has not increased during the entire reference period. These suggest that the slight increase in rice output has been primarily due to a modest expansion of the planting areas in wet-season rice farming, without growth in the overall proportional use of arable land, nor in productivity. The fact that the expansion of rice cultivation occurred in wet-season and not in dry-season cultivation is interesting. It is also interesting to note the decrease of the share of glutinous rice production vis-à-vis non-glutinous rice from 96 percent in 2003 to 93.8 percent in 2012 (5 percent significance).

While just about 5 percent of the rice planted were modern high yielding varieties (HYVs) in the early 90s, they have rapidly started to replace the traditional ones once the improved Lao varieties, particularly the *Thadokkham* varieties (TDK). About 70 percent of the households interviewed used the TDK series, of which the most intensively used one was TDK 8. However, planting several varieties in one season were common, in many cases including traditional varieties.



¹¹ Other studies note similar sizes for average farm sizes for rice cultivation in Laos. For example, Bestari et al. (2006b) notes that the average rice farm size is less than 2 ha.

The share of irrigated land was 40.1 percent and 88.1 percent in 2012 for the wet and dry-season respectively, which has not changed in any significant way since 2003 or 2008. In 2012, about 98 percent of the sample households had access to irrigation facilities. Figure 4 illustrates the years in which irrigation became available. According to this, a large proportion of households have gained access to irrigation systems during the years between 1996 and 2000. Irrigation capacity in Laos increased significantly from 1995 throughout the late 90s as a result of the Government's large scale irrigation projects mentioned earlier, which expansion has been the largest on the Vientiane Plain and in major rice producing areas such as Savannakhet and Champasack (Schiller et al. 2006). These suggest that while access to irrigation systems were practically no longer a constraint, most of the rice farming households nevertheless seem not to be interested in increasing rice output through increased use of irrigation.

Table 5: Labor and fertilizers				Unit: price = LAK					
	2003	2008	2012	diff 03-08		diff 08-12		diff 03-12	
				t-Stat.	Prob. > t	t-Stat.	Prob. > t	t-Stat.	Prob. > t
Labor									
Average number of people working on rice cultivation, per ha									
Rainfed (wet)	3.62	3.76	3.97	1.06	0.29	1.31	0.19	1.85	0.07*
Irrigated (dry)	4.01	4.09	4.68	0.57	0.57	1.82	0.07*	1.98	0.05**
Fertilizers									
Average amount of fertilizer used (Kg), per ha									
Rainfed (wet)	149	156	161	1.38	0.17	0.78	0.44	1.39	0.17
Irrigated (dry)	195	215	245	2.83	0.006***	1.80	0.07*	3.04	0.003***
Average cost of fertilizer (LAK/kg)									
Rainfed (wet)	7,422	10,328	12,485	1.94	0.06*	2.02	0.045**	1.98	0.05*
Irrigated (dry)	7,355	9,696	11,791	1.66	0.099*	2.21	0.03**	1.90	0.06*

Note: Out of the entire sample households, only two practiced upland rice cultivation, and these are not included. The averages for the number of people working and fertilizer used were calculated only with data from households that were cultivating rice in all three reference years. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Source: Interview survey.

Table 5 summarizes usages of key inputs for rice production; labor and fertilizers¹². Dry-season rice cultivation is typically more intensive in labor and fertilizer than wet-season cultivation, and our data confirms similar patterns. For instance, the average number of workers were 4.68 during the dry-season, compared to 3.97 during the wet-season in 2012. Likewise, the average amount of fertilizers used were 161 kg/ha and 245 kg/ha for wet- and dry-season rice cultivation for the same year, respectively.

A weak level of intensification in terms of labor is observed for wet-season rice cultivation during 2003-2012 (significant at 10 percent), while that for dry-season rice farming has been more apparent during the same period (5 percent level). Similarly, while there have been no significant changes in the usage of fertilizers in wet-season rice farming during the reference period, intensification of fertilizers has been significant at a

¹² Note that the averages for the number of people working on rice cultivation and the amount of fertilizer used are based on households which were cultivating rice in all three years.

1 percent level between 2003 and 2012 for dry-season rice cultivation¹³.

Table 6: Household income statistics (monthly)				Unit: Lao Kip (LAK)	
	2008	2012	2008	2012	
	Nominal		Real (CPI adjusted)		
Household average	2,752,903	3,376,641	2,919,304	3,009,484	
Percentage changes	22.7%		3.1%		
	t-Stat. 3.916, Prob. > t = 0.0001***		t-Stat. 0.571, Prob. > t = 0.568		
Average, per person	534,932	656,627	567,267	585,229	
Percentage changes	22.7%		3.2%		
	t-Stat. 3.363, Prob. > t = 0.0003***		t-Stat. 0.555, Prob. > t = 0.579		
Average, per working person	922,210	1,134,670	977,953	1,011,292	
Percentage changes	23.0%		3.4%		
	t-Stat. 3.713, Prob. > t = 0.0002***		t-Stat. 0.546, Prob. > t = 0.606		
n	137	137	137	137	

Note: Income shares and t-statistics are calculated using paired-data only.* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. 1 US\$ was about 7800 Kip in September of 2012.
Source: Interview survey. CPI data are from World Development Indicators, the World Bank.

Interviews with rice farmers reveal increasing concerns to maintain rice cultivation as the main livelihood strategy. Table 6 summarizes the household income statistics of 2008 and 2012¹⁴. As this table depicts, household incomes in nominal terms have increased from a monthly LAK 2.75 million in 2008 to LAK 3.38 million in 2012¹⁵. Likewise, income “per person” and “per working person” have also increased from LAK 535 thousand to LAK 657 thousand, and LAK 922 thousand to LAK 1135 thousand, during 2008 and 2012, respectively. These represent roughly an annual *nominal* income increase of 5.3% in both cases, which differences have all been statistically significant at the 1 percent level. However, the statistically insignificant changes in *real* income during this period is critical, which is in stark contrast with an annual 5.4 percent real per capita GNI growth during the same period¹⁶.

¹³ As detailed information on the particular type of fertilizer was not obtained during the interviews, the results on changes in fertilizers assumes an insignificant change in the type of fertilizers (chemical/organic) and NPK combinations during the reference period, and thus should be treated with caution when interpreting the results. In order to provide a benchmark for the figures reported, the FAO notes that the average standard rate of fertilizer application for rice is 200 to 220kg/ha for N, 140 to 145kg/ha for P, and 150 to 180kg/ha for K (total of 490 - 545 kg/ha) (FAO, 2003). The figures reported in our interview survey are significantly lower than these, which is in line with available research on rice cultivation in developing countries and in Laos in particular.

¹⁴ Data on 2003 was not included as only few responses were obtained in the interviews.

¹⁵ USD 1 was about LAK 7800 in September 2012.

¹⁶ Author’s calculation based on data from World Development Indicators

(<http://data.worldbank.org/data-catalog/world-development-indicators>, accessed on August 11, 2014.)

	2003	2008	2012	diff 03-08		diff 08-12		diff 03-12	
				t-Stat.	Prob. > t	t-Stat.	Prob. > t	t-Stat.	Prob. > t
1. Rice	59.1%	53.7%	52.3%	2.45	0.02**	0.87	0.39	2.64	0.009***
2. Other agricultural produce	15.1%	19.2%	17.6%	2.14	0.04**	1.23	0.22	0.98	0.33
3. Non-agricultural activities, including remittances	25.7%	27.1%	30.1%	0.66	0.51	1.89	0.06*	1.70	0.09*
Share of households with remittances	3.5%	5.2%	6.1%	1.42	0.16	1.00	0.32	1.75	0.08*

Note: income shares and t-statistics are calculated using paired-data only. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Source: Interview survey.

Some changes in basic household livelihood strategies seem to be occurring. An analysis of the households' changes in income share suggests a declining importance of rice farming in relation to other crops, but more importantly to non-agricultural sources of income, including remittances from overseas through labor migration. Table 7 summarizes these results. Average income share from rice per household has been falling, from 59.1 percent in 2003 to 52.3 percent in 2012. Changes have been statistically significant at 5 and 1 percent during 2003-2008 and 2003-2012, respectively.

Likewise, the average share of income from other agricultural sources have increased at a 5 percent significance level during 2003-2008, however the changes have been statistically insignificant for 2008-2012 and 2003-2012¹⁷. Average income share from non-agricultural activities (including overseas remittances) have increased from 25.7 percent in 2003 to 30.1 percent in 2012, which changes were significant at 10 percent levels during 2003-2012 and 2008-2012.

The share of households that were receiving any amount of remittances from family members working overseas (primarily Thailand) was 3.5 percent in 2003, which increased to 6.1 percent in 2012 (change was significant at 10 percent). The average contribution of remittances in these households' income share was 21.6 percent in 2012. This upward trend in international labor migration as an alternative to rice farming has also been reported in a detailed study of rural households in Champasack province by Manivong et al. (2014), where migration and remittance seem to play a much larger role in the evolving local livelihood strategies among households in this province. This may be due to the lesser availability of non-agricultural work in Champasack, compared to the relatively more diversified livelihood opportunities in Vientiane (Askew et al., 2007).

4. Problems in agricultural intensification, contract farming and livelihood

¹⁷ Other agricultural produce include vegetables primarily for own consumption such as beans, cabbages, cassava and cucumbers, as well as other staple crop including maize. Some also bred livestock such as ducks, chicken, pigs and cows.

strategies

4.1 Problems reported by rice farming households

The previous sections have highlighted key dimensions of the changes in rice cultivation practices. First, the increase in rice output is primarily due to a combination of a (1) modest expansion of planting areas in wet-season rice cultivation, with only weak evidence of intensification in labor during a limited period but none in fertilizers, and an (2) increased use of irrigation and fertilizer inputs under dry-season rice cultivation, without any increase in plant and irrigation acreage, even when the availability of irrigation sources became no longer a constraint for many. In other words, wet-season rice cultivation followed an extensification path in rice acreage, while the dry-season cultivation followed a land-saving, intensification path¹⁸. The differences in the dynamic orientation between the two cultivation systems is interesting, considering both being exposed to and embedded in the same socio-economic context. However, as dry-season rice cultivation is more intensive in nature, the increased use of inputs during dry-season cultivation could just be a result of a technological change inherent as a result of adaptation. Thus, if rice farmers would have perceived dry-season rice cultivation as profitable and as an emerging key component of their livelihood strategy, then extensification in this should also have occurred like in wet-season cultivation. This is in stark contrast with rice acreage dynamics in Bangladesh, where Minten et al. (2012) report a significant increase in dry season (*boro*) rice cultivation and a drastic decline in wet-season rice (*aus*) acreage and output as a result of increased availability of HYVs and key inputs (irrigation and fertilizers).

Second, the stagnant growth in average real income of rice-based households is remarkable compared to the recent robust overall national economic performance. In line with this, the younger generations in these households seem to be increasingly preferring non-agricultural sectors jobs, negatively affecting the labor supply in local rice cultivation. These are all interrelated dimensions of the ongoing socio-economic changes surrounding the households, which have culminated to the extent to induce them to shift their livelihood strategies away from rice and more towards non-agricultural orientation, as well as towards less intensive rice cultivation practices.

¹⁸ See a similar discussion on the definition of agricultural intensification in Manivong et al. (2014).

Issue	Share (%)
Lack of workers	60.3%
Lack of capital	54.3%
Lack of technical expertise	41.7%
Market access	26.5%
Rice price too low ⁽¹⁾	15.9%
Irrigation costs	10.6%
Pests and diseases	6.0%
Floods	4.6%

Note (1): Low levels of rice price has mainly been perceived as a problem in relation to high input costs, particularly fertilizers.

Source: Interview survey.

Table 8 summarizes the main problems reported by the sample households in the cultivation of rice. From this, it is interesting to note that about 60 percent of the sampled households regarded the lack of workers, or the difficulties in recruiting and retaining workers (both family members and outside agricultural labor) for rice cultivation, as one of the main problems. The rapid rise in agricultural wages is an emerging issue for a number of countries in Asia, including Laos, as mentioned earlier.

The lack of capital has been well acknowledged as one of the key problems in developing countries, and this has also been perceived as a major constraint by more than half of the households; only 36 percent of the sample households received some form of credit from financial institutions. As agricultural intensification is essentially a modernization strategy which is capital intensive, access to credit is crucial for farm households with limited financial resources to cope with the need for increased inputs. Interviews with farmers indicate that capital is most needed for fertilizers and irrigation, which are the two main ingredients for intensive rice cultivation.

The lack of technical knowledge and skills in rice cultivation is also regarded as a major bottleneck by the households. This would become particularly important in the process of agricultural intensification using modern HYVs, as they require more sophisticated knowledge and management skills. For instance, the introduction of HYVs can result in a significant growth in output with proper fertilizer application in terms of its timing and volume, however most of the rice farmers in Laos seem to lack these knowledge, and have therefore not been able to benefit from its full potential (Douangngeune, 2010; Schiller et al., 2001). Agricultural extension services do often play major roles in disseminating such information, however in Laos such services are still very limited (Eliste and Santos, 2012).

The lack or serious underdevelopment of an integrated local rice market has also been regarded as a major problem. The Government has, at least in the past, intervened in the marketing of rice through monopolistic state-owned enterprises, price controls, and

through lengthy bureaucratic procedures for licenses and permits, which all led to crowding out private trade and stalling paddy output growth (Bestari et al., 2006a; Setboonsarn et al., 2008; World Bank, 2006). Information from MAF officials however suggest that while temporary price ceilings may be introduced during an unexpected event of price hikes, the Government currently does not appear to have active price control policies for rice in general, and marketing of rice in general in Vientiane seem to be fairly liberalized. Nevertheless, liberalization will not automatically lead to an instant birth of a well-functioning market and competitive, dynamic agricultural sector, primarily due to institutional deficits, as evident in serious agricultural and factor market failures in Laos.

The low farm-gate price of rice is also identified as a major problem. Ample studies analyzing rural incomes and agricultural output from an agricultural household model's perspective suggest that the increase in crop prices do not necessarily lead to an increase in supply of that crop by farm households, especially those that are more subsistence oriented, precisely because of the indivisibility of those as a producer and a consumer of the particular agricultural crop (Singh et al., 1986; Taylor and Adelman, 2003). Therefore, prices may not necessarily be good indicators to evaluate sectoral performance particularly in subsistence or semi-commercial based rural economies. Nevertheless, most of the households in our case have referred the low price issue in relation with the disproportionately increasing input costs, primarily fertilizers and irrigation¹⁹, suggesting negative profit trends.

Issues related to pests, diseases and floods are also commonly referred to as challenges in rice cultivation. In Laos, however, pests and diseases have been reported as minor constraints compared to others such as inadequate amount of water, and a general lack of farmers' crop management knowledge (Schiller et al., 2001). Floods are regarded as among the biggest problems in the Vientiane Plain along the Mekong River. While this is without doubt problematic for the Government from a food security point of view, it is also amongst the defining issues for rice farmers on their livelihood strategies.

4.2 Contract rice farming as a problem solver?

The problems reported by rice farming households are primarily interrelated structural and institutional issues, common to other developing countries. For instance, labor shortages in rice cultivation arise with changes in economic structures, particularly when alternative non-agricultural working opportunities increase. This would in turn raise rural wages (Wiggins and Keats, 2014), and the shadow wages for self-employed farmers.

¹⁹ According to the interviews, farmers have reported an increase in average unit cost of fertilizer of 22 percent during 2008 and 2012.

Increased labor migration to neighboring countries will add to this effect. However, this would also make it more difficult for rice farmers to hire workers or sustain rice cultivation practices, unless they can increase their productivity levels leading to higher per unit value added. Previous sections show no particular signs of upgrading in these aspects, probably due to the reported problems such as difficulties in access to credit, technical support, inputs, and markets.

These problems are likely due to underdeveloped financial institutions, weak or inadequate public extension services, high transaction costs, and fragmented and imperfect input and output markets, as reported by the rice farming households. Contract farming is often seen as a solution to these problems, or at least as a temporary alternative, supplementing institutional weaknesses often undermining market functions in developing countries (Miyata et al., 2009).

It is under these circumstances in which the Lao Government has been encouraging private sector involvement through contract rice farming. In connection to this, an increasing number of rice cultivation households are now being connected to both local and international markets through private contract farming arrangements (Fullbrook, 2007; Setboonsarn 2008).

	Independent	Contract	All households	t Test of difference (Independent and Contract)	
				t-Stat.	Prob. > t
Size of farmland (ha)	1.60	2.05	1.66	1.241	0.217
Size of land used in wet season (ha)	1.35	1.75	1.40	1.361	0.176
Size of land used in dry season (ha)	1.11	1.80	1.20	2.662	0.009 ***
Fertilizers used in wet season, per ha	145.1	221.3	155.9	3.043	0.003 ***
Fertilizers used in dry season, per ha	218.9	369.9	239.7	3.340	0.001 ***
% irrigated in wet season	37.9	58.1	40.3	1.859	0.065 *
% irrigated in dry season	87.3	94.2	88.1	1.006	0.710
Yield (kg/ha)	2,714	3,218	2,785	1.683	0.095 *
Price, wet season (LAK/kg)	2,427	2,413	2,425	0.107	0.915
Price, dry season (LAK/kg)	2,611	2,393	2,587	1.609	0.110
Profit, wet season (LAK/kg)	1,155	1,272	1,168	0.508	0.612
Profit, dry season (LAK/kg)	1,114	1,137	1,117	0.112	0.911
% rice sold, wet season	41.1	58.8	43.0	2.189	0.030 **
% rice sold, dry season	55.6	78.2	58.0	2.352	0.020 **
Monthly household income	3,059,108	5,373,148	3,338,656	2.639	0.009 ***

Note: The averages for "all household" may be slightly different from those in Tables 4, 5, and 6, as these tables only uses "paired data" (excluding household data with omitted years for the particular question) for the t-tests. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Source: Interview survey.

Table 9 summarizes the contract farming effects²⁰. Contract farming was introduced quite recently in Laos (Manorom et al., 2011), which was also the case in the sample households in the research area; the earliest households have started producing under contracts since 2008 while the majority participated after 2010. The main buyers who coordinated the contracts were wholesalers, but also included rice mills, government departments, foreign buyers, and a beer brewing company²¹.

First, while there was no statistically significant difference in the size of total farmland and wet-season rice acreage between an average independent and a contract farming household, the rice acreage of dry-rice cultivation was substantially larger for contract farming households; 1.11 ha and 1.80 ha respectively (difference significant at 1 percent). Fertilizers were more intensively used by contract households in both wet- and dry-season cultivation at 1 percent significance levels, however intensity of irrigation use was only slightly different in wet-season cultivation (significant at 10 percent). Yield was almost 20 percent higher for contract farmers compared to independent ones (3,218 kg/ha and 2,714 kg/ha), which was also significant at a 10 percent level.

Surprisingly, there was no difference in farm-gate paddy prices, nor in per unit profits between independent and contract farmers. However, as cost structures can differ considerably between farmers in different groups (independent or contract), these results should be interpreted with caution. In addition, intra-group variation in contractual terms of farms cultivating under contracts may also be significant, suggesting the associated difficulties in interpreting the results particularly on prices. For example, while some rice cultivating households may receive all inputs, credit for irrigation costs, and technical advice from contractors in advance for free, others may have to invest in some of these themselves²². Differences in the timing of negotiating paddy prices (pre-planting or post-harvest) matter as well, as the price difference will incorporate the structure of risk allocation between the contractor and the farm regarding possible fluctuations in market and weather conditions (Grosh, 1994).

It is interesting to note the stark difference in the average monthly income between independent and contract households, however, the causal relationship of this income

²⁰ It should be noted that there were only 18 households (about 12 percent of the entire sample) that were producing rice under contract farming arrangements.

²¹ It appears that there is significant variation in the organization of rice production in Laos, with various actors involved, assuming coordinative roles such as in contract farming. See Sengxua et al. (2009) for detailed descriptions.

²² The term “2+3” is often used in Laos to describe this pattern of responsibility allocation in contract farming among the stakeholders involved. Typically, this refers to a contract in which farmers contribute two elements, namely land and labor, while contractors contribute three such as the provision of inputs, technical advice and access to markets (Fullbrook, 2007). However, it is also noted that there are wide variations in the actual contractual forms.

difference and contract farming is not clear. In fact, it has often been argued that the relatively better-off, larger farmers tend to be the ones being able to participate in contract farming arrangements and benefiting disproportionately in comparison to smallholders who are more likely to be excluded (Key and Runsten, 1999). Reasons for this include observable attributes such as their potential higher productivities due to larger acreages, locational advantages such as being closer to roads and major markets, capital availability, and also due to unobservable attributes such as better crop management knowledge and diligent work attitudes (Miyata et al., 2008). Nevertheless, overall it seems that contract farmers were in fact able to reap higher profits, not because of higher unit profit margins but because of higher yields, which may have contributed to higher households incomes.

5. Discussion

The rice sector is important for Laos from both a food security and livelihood perspective, and the Government has been pursuing measures to transform this into a modern sector through intensification and commercialization. In this process, modern HYVs were introduced, large investment projects in irrigation systems took place, and markets were liberalized. The roles of the private sector has also been highlighted in this process. Contract farming has in particular been encouraged, where private firms are expected to link subsistent oriented smallholder rice farmers to markets as well as to facilitate their access to key inputs including seeds, fertilizers, technical advice, and credit. An increasing number of rice cultivating households are now participating in this particular form of rice production in Laos.

Rice cultivation in Vientiane has been affected, probably disproportionately, from these initiatives because of its location and position as the capital. Given its intensive nature, dry-season rice cultivation should be more appropriate under the relative factor conditions in the rice producing areas of Vientiane vis-à-vis other rice regions, where the value of land would be lower, as pointed out earlier. Nevertheless, official statistics as well as our interview data suggests that dry-season rice cultivation in Vientiane in general does not seem to be growing as one might expect. This is in particular puzzling when there are indications of acreage expansion in wet-season rice cultivation.

The fact that rice acreage in dry-season rice cultivation is not expanding in Vientiane suggest that market liberalization, availability of HYVs and irrigation systems do not automatically translate into self-sustaining intensification and growth dynamics of the sector per se. As discussed in previous sections, the rice sector in Laos is facing a wide range of interrelated problems including high irrigation costs, lack of proper crop management skills, insufficient use of inputs, underdeveloped input and output markets,

and limited extension services. While these are, without question, all key issues that holds these rice farmers back from intensification particularly in dry-season rice cultivation, what further undermines a dynamic upgrading of the sector is the presence of a serious coordination failure.

For instance, the difficulties in obtaining modern inputs such as HYV seeds and fertilizers by smallholder rice farmers may be mitigated through contract farming arrangements where buyers closer to such markets can more easily access them. However the buyers in the contract may at the same time lack the appropriate incentives to commit to the contractual relationship and supply farmers the full package of the inputs needed to realize its maximum potential. This could be due to an extremely weak ability of those buyers to enforce contracts on the rice farmers, who might take opportunistic behavior by shirking, such as side-selling the paddy to other higher bidding buyers after harvest. Likewise, farmers may face problems in investing appropriate levels of certain inputs and labor in the cultivation process, particularly when they are uncertain of whether the buyers will purchase the paddy at a pre-agreed price. The lack of institutional capacity to enforce contracts in Laos is widely known (Fullbrook, 2007; World Bank, 2006), and contract farming is always prone to sub-optimal levels of commitments because of the underlying uncertainties. These are typical results of coordination failures observed in many rural areas in developing countries where markets are typically imperfect, with apparently a perpetuating and self-enforcing effect. Kydd and Dorward (2004) argue that the importance of addressing these types of market failures are often overlooked by governments in their course of planning and implementing agricultural policies in developing countries, and suggest a need for governments to play much active roles in promoting coordination by a wide range of policy measurements including in (but not limited to) regulatory environments, market infrastructure, and insurance systems, which also seem to be the case in Laos.

6. Conclusion

Rice has been among the most important food crop in Vientiane, on which a significant number of its population is dependent on. The Lao Government has been emphasizing its importance particularly from a food security point of view, and has attempted to modernize its lowland rice sector through modernization and intensification through market liberalization, irrigation investments, and introduction of HYVs. As a result, output has increased drastically through productivity enhancement and acreage expansion particularly since the mid-90s, and Laos reached domestic sufficiency in rice in the late 90s.

However, ample studies suggest that production are still low in terms of intensity, and market institution pertinent to the production and distribution of rice remain critically weak. Under such conditions, contract farming has in recent years been promoted by the Government to further modernize the sector. This seemed to have led to some positive results. Rice farming households under contract farming arrangements in Vientiane were, on average, able to attain higher profits due to higher yields, which suggests that such private arrangements can, at least to some extent, bridge the formal institutional gaps in prevailing conditions pertinent in a rural context of a developing country. However, the stagnating expansion in acreage may well be an outcome of the associated difficulties of farmers due to institutional coordination failures, providing disincentives to further commit themselves to a livelihood strategy based on intensified rice cultivation.

While each of the specific policies related to rice cultivation are beneficial to the rice sector in general, it seems that this has not necessarily played out in its modernization and upgrading as envisaged. Rather than a collection of narrowly focused set of policies on rice cultivation, the key to dynamic modernization for a competitive rice sector in Laos seems to be related to the Government's capacity to play much positive roles in the provision of supporting institutions to address coordination failures to make rice production more profitable and thus desirable as a livelihood strategy, even without contract farming arrangements.

Acknowledgement

This is a product of research which was financially supported by the Kansai University Subsidy for Supporting Young Scholars, 2013. Kenta Goto was a visiting researcher at the Asia Institute of the University of Melbourne under the Kansai University's Overseas Research Program for the academic year of 2014 when this paper was written. He is grateful to Professor Pookong Kee for hosting him at the Institute and granting access to the University's resources.

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