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Rice Policy Study: Implications of Rice Policy Changes in Vietnam for Cambodia's Rice Policy and Rice Producers in South-Eastern Cambodia



Ear Sothy, Sim Sokcheng, Chhim Chhun and Khiev Pirom

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**CDRI
Cambodia Development Resource Institute**

Phnom Penh, December 2017

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Acronyms

CDRI	Cambodia Development Resource Institute
CPS	Centre for Policy Studies
LMPPI	Lower Mekong Public Policy Initiative
MAFF	Ministry of Agriculture, Forestry and Fisheries
MARD	Ministry of Agriculture and Rural Development
S&T	Science and Technology
USAID	United States Agency for International Development

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Abstract

There are many studies about rice production in Cambodia, but none focus on the geographical location of rice production, particularly in the south-eastern provinces of Prey Veng, Takeo and Svay Rieng. Farmers in these areas produce mainly low value rice (IR504) most of which is exported as wet paddy to Vietnam. The Vietnamese government recently decided to restructure its economic and agricultural policy by shifting from low value rice to high value rice and other agricultural crops. It is strongly believed that this policy shift will have severe impacts on rice production in Cambodia, especially on farmer livelihoods in the south-eastern provinces. This paper explores the implications of rice policy changes in Vietnam for rice production and rural household incomes in the eastern and southern areas of Cambodia near the Vietnam border. Interviews, focus group discussions and a household survey revealed that it will take Vietnam at least three years to implement its restructured policy fully. So, in the near term, Vietnamese traders and exporters will continue purchasing paddy from Cambodia if there is still a market for low value rice. For some 20 percent of the surveyed households, more than half of their income comes from rice farming. This population will be severely affected if Vietnamese traders stop buying their rice. Rice cultivation was reportedly the main occupation of most of the surveyed households, yet off-farm employment was their main source of income, accounting for about 35 percent of the total. Interviews with local traders found that due to limited processing capacity, local millers would be unable to absorb leftover paddy if there were a demand shock from Vietnam.

1. Introduction

1.1 Background of the study

Thailand, Vietnam and Cambodia are well known for rice production and export. In 2015 Thailand was the second highest rice exporter, exporting around 9.8 million tonnes (worth USD4.5 billion), followed by Vietnam, which exported about 6.6 million tonnes (USD2.8 billion). Thailand exports mainly high quality – aromatic – rice, while Vietnam produces and exports mostly non-aromatic or low quality rice (UN Comtrade 2017).

Rice is Cambodia's staple food, principal crop and main source of income for 85 percent of rural households. It contributes about 4.5 percent of GDP and 20 percent of total household income. Household income from crops accounts for 20.1 percent of total household income and the income from rice represents more than 50 percent of that. The share of income from crops has been increasing annually as a result of increased yields due to improved inputs and higher crop prices. The rapid poverty reduction in rural areas, from 59 percent in 2004 to 24 percent in 2011, was driven by higher rice prices, higher rice production, higher revenue from non-farm businesses and higher rural wages and job growth in urban areas. Almost half of that poverty reduction was directly attributable to higher rice prices (24 percent) and increased rice production (23 percent). Yet, that drop could quickly be reversed by even the slightest income shock; it is estimated that an average decline of just USD0.30 in daily income would push 3 million Cambodians back into poverty, instantly doubling the current poverty rate to about 40 percent.

Table 1: Rice balance sheet 2015 (tonnes)

Items	Tonne
Production (Paddy)	9324170
Seeds	684500
Available (Paddy)	8639670
Available (Milled equivalent)	4751819
Total consumption (milled)	2703447
Rural consumption (milled)	2241229
Local urban market (milled)	186846
Inter-provincial trade (milled)	275372
Milled rice exports	538000
Total used milled	3241447
Unofficial exports (Milled equivalent)	1510371
Total exports (milled equivalent)	2048371
Unofficial exports (paddy equivalent)	2746130

Source: Frédéric Lançon (CIRAD) 2016

Despite progress and considerable policy attention, rice remains one of the most controversial issues in Cambodia, particularly with regard to markets. The country produced around 9.3 million tonnes of paddy in 2014, including both aromatic and non-aromatic varieties (MAFF 2015a). In 2015 Cambodia officially exported around half a million tonnes of milled rice to EU and Asian countries (MAFF 2015b; UN Comtrade 2017). The remaining paddy was informally

traded with neighbouring Vietnam and Thailand. Farmers along the border in the south-eastern provinces traditionally trade most of their dry season paddy with Vietnam through Vietnamese or Cambodian merchants. Thus the local rice market has evolved in such a way that dry season paddy demand and prices are effectively dictated by Vietnamese traders. The concomitant price instability and market uncertainty discourage farmers from investing in higher quality production.

Based on data from the Ministry of Agriculture, Forestry and Fisheries (MAFF 2015b), a recent study in support of the Commercialisation of the Cambodian Rice Project created a per capita consumption, supply and demand balance sheet for rice (Table 1). It is estimated that the domestic market requires 2.7 million tonnes of milled rice. As official milled rice exports in 2015 amounted to 0.54 million tonnes, an estimated balance of 2.05 million tonnes of milled rice, equivalent to 2.7 million tonnes of paddy, was most likely exported to Thailand and Vietnam. The bulk of paddy exports go to Vietnam, meaning Vietnam would have imported no less than 2 million tonnes.

The Vietnamese government recently changed its agricultural policy, particularly rice policy, shifting focus from high yielding but low quality (non-aromatic) rice to lower yielding but high quality (aromatic) rice. Vietnam's rice export structure has since changed significantly: exports of aromatic jasmine rice grew 66 percent between 2012 (nearly 600,000 tonnes) and 2013 (more than 900,000 tonnes) (Dwight and Quan 2014), and in 2013 aromatic rice accounted for up to 14 percent of total rice exports. Moreover, Vietnam's rice market has shifted from Africa to Asia, particularly China. Aromatic rice is playing an increasing role in Vietnam's exports, a trend that is likely to continue as Vietnam's Ministry of Agriculture and Rural Development has indicated that the country should focus more on producing high value rice for export. It is therefore expected that Vietnam will produce and export lower volumes of low quality rice, and that Vietnamese rice traders and/or exporters will demand more high value rice and purchase less low quality rice from Vietnamese and Cambodian rice producers.

Agricultural policy changes in neighbouring countries, particularly Vietnam, could have severe consequences for rice producers in south-eastern Cambodia, especially dry season rice farmers. A dramatic drop in Vietnam's demand for rice due to changes in its rice export policy will have a significantly negative effect on the incomes of rice producers in Cambodia unless they grow different rice products or shift to other farming and economic activities in response to changing market demand.

1.2 Objectives

The major objectives of this study are to:

- explore the implications of rice policy changes in Vietnam for rice production and rural household incomes in eastern and southern Cambodia near the border with Vietnam;
- assess the potential of new rice production practices in response to changes in market demand;
- provide policy options to government to help rice producers avoid income shocks.

2. Methodology

The study employed both qualitative and quantitative approaches. Quantitative and qualitative questionnaires were used to interview actors in the rice value chain. Three types of research tools were designed and employed to obtain different types of information (Table 2).

Table 2: Analytical frameworks and research tools

	Research tool	Stakeholders	Expected output
Quantitative approach	Quantitative questionnaire	Rice farmers in south-eastern Cambodia	Data on farm products and household characteristics, e.g. production costs, income, farming practices Cost-benefit analysis of rice cultivars
Qualitative Approach	Key informant interviews	<i>Cambodia:</i> Policymakers Rice traders Rice millers Rice exporters <i>Vietnam:</i> Policymakers Rice traders Rice millers Rice exporters	Information about rice demand and supply, import and export Perceptions of demand shock from Vietnam Reactions and suggestions about Vietnam's rice policy and rice production in south-eastern Cambodia
	Focus group discussions	Rice farmers in south-eastern Cambodia	Difficulties facing rice production, reactions and alternatives if there is demand shock from Vietnam

3. Data collection and sampling

This cross-country study involved many different interview subjects. Therefore three policy research institutes – Cambodia Development Resource Institute (CDRI), Center for Policy Studies (CPS) and An Giang University (AGU) – collaborated in the data collection and analysis. Data collection used both qualitative (key informant interviews [KIIs] and focus group discussions [FGDs]) and quantitative questionnaires (household survey). Data in Cambodia was collected by CDRI and CPS, CDRI on the lower part of the rice value chain and CPS on the upper part of the chain. Data in Vietnam was collected by AGU and CDRI. AGU conducted KIIs with representatives of Vietnamese companies in the private sector and CDRI did the KIIs with representatives of Vietnamese public sector agencies and research think tanks. Data collection in Cambodia entailed a household survey, KIIs and FGDs. The quantitative survey questionnaire was designed based on the objectives of the study.

As the focus of this research is south-eastern Cambodia, which borders Vietnam, the three provinces of Takeo, Prey Veng and Svay Rieng were selected as the study area. The study randomly interviewed 600 households in the three provinces, which means 200 households were equally selected from each province. The number of interviewed households was equally and randomly distributed among the ten villages, which means 20 households per village (200 households per province; 600 households for the three provinces).

Figure 1: Map of the study area



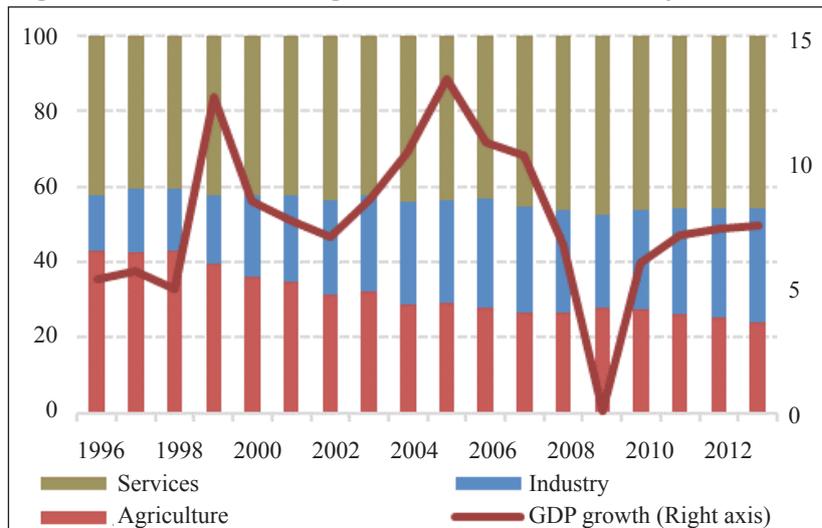
To collect information on the upper part of the rice value chain, 10 KIIs were conducted with millers, exporters, milling association representatives and government officials who had experience in the rice sector and deep knowledge of the rice industry in Cambodia. For the lower part of the chain, 15 KIIs were conducted with local authorities, officers from the provincial departments of agriculture and commerce, local rice millers, traders and exporters located in the study area. To obtain qualitative insights, FGDs were conducted with rice farmers in each province. Data collection in Vietnam included KIIs with representatives from the public sector, research think tanks and the private sector, especially those involved in trade with Cambodia. (See details of data collection and sampling in Annex 1.)

4. Literature reviews

4.1 Overview of the rice sector in Cambodia

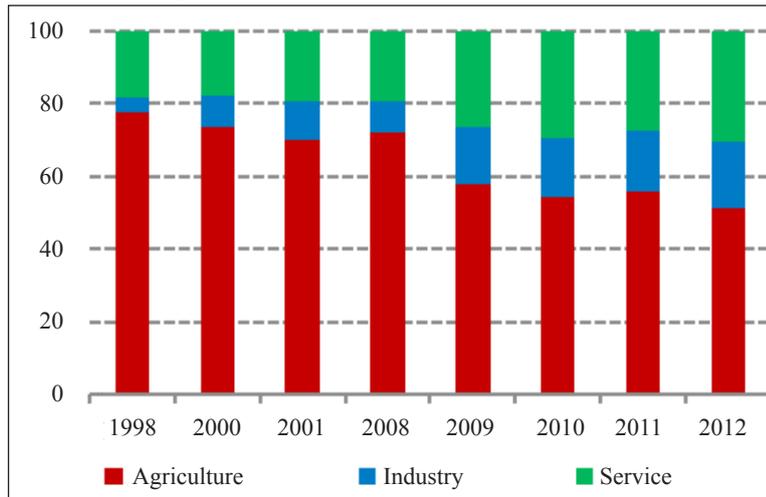
Agriculture has played a crucial part in Cambodia's economy. Historically, it has long been the main occupation of the majority of Cambodians. However, robust economic growth over the last two decades led to rapid structural change. Industry's share of GDP doubled from only 15 percent in 1996 to almost 30 percent in 2013; conversely, that of agriculture almost halved from nearly 43 percent to about 24 percent. The service sector's contribution remained stable, hovering around 40 percent (Figures 2 and 3). Despite its relative decline in the last 20 years, agriculture is still considered the driving force and foundation for a strong and resilient economy, and maintains its role as the main source of income for the majority of Cambodians, particularly in rural areas. At around 5.4 percent, agricultural growth remained remarkably strong throughout the global financial crisis while industry was hit hard, with growth dipping to 0.1 percent. Since then, the Cambodian government has paid special attention to agricultural development with a policy focus on making the country a key exporter of milled rice, called Cambodia's "white gold", in the global market.

Figure 2: Structural change of Cambodia's economy, 1996-2012



Source: Key indicators for Asia and the Pacific (ADB 2014)

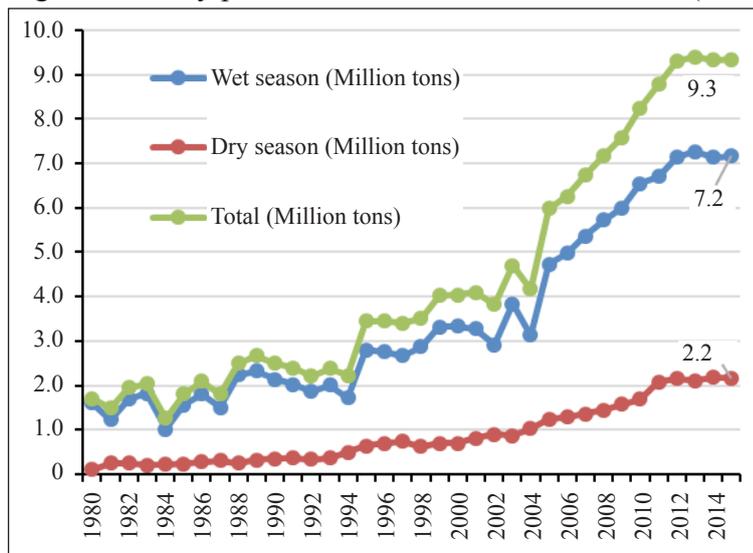
Figure 3: Employment by sector, 1998-2012



Source: Key Indicators of Labour Market (ILO 2014)

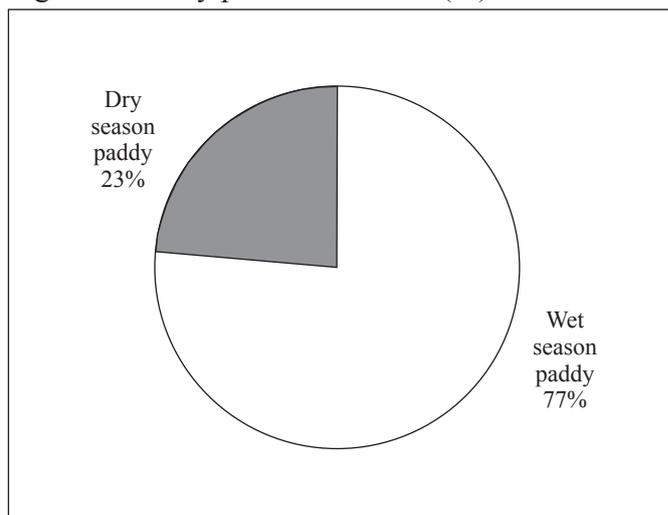
Crops are the third engine and account for 9 percent of GDP growth. Paddy/rice has long been the main crop in Cambodia, and rice production alone represents half of total crop production. Paddy production has increased dramatically (Figure 4), from around 1.7 million tonnes in 1980 to 9.3 million tonnes in 2015. The varieties grown include traditional non-aromatic rice, IR rice (mostly dry season paddy) and fragrant rice (wet season paddy). Official statistics are lacking; however, it was estimated recently that IR varieties account for about one-fourth to one-third of total output. From 1980 to 1992, most paddy was wet season paddy. Dry season paddy production started to gain momentum in 1994, rising from only 0.4 million tonnes in 1980 to 2.2 million tonnes in 2015, equal to 23 percent of total paddy production (Figure 5). Cambodia’s rice harvests have risen significantly since 2005 (AusAid and World Bank 2012), largely owing to improved and expanded irrigation and attractive farmgate prices.

Figure 4: Paddy production in Cambodia 1980-2015 (million tonnes)



Source: MAFF Annual Repot 2016

Figure 5: Paddy production 2015 (%)

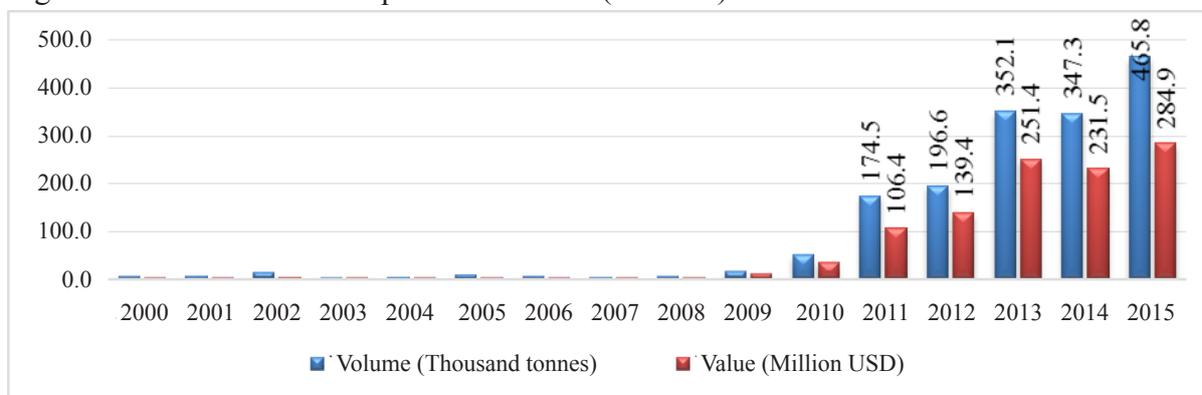


Source: MAFF Annual Report 2016

Despite rapid growth in paddy production, Cambodian rice exports remain low. In 2000 Cambodia produced around 4 million tonnes of paddy (Figure 4), yet the country exported only 6,000 tonnes of rice that year (Figure 6), reflecting low milling and export capacity. Rice exports soared from around 51,000 tonnes in 2010 to 174,500 tonnes in 2011 after the government adopted its rice production and export policy in 2010. In 2015, Cambodia exported nearly 466,000 tonnes of rice, valued at almost USD285 million. Exports are still low compared to the volume of paddy produced (9.3 million tonnes in 2015). Almost half (47 percent) of Cambodian rice exports are of aromatic rice.

Rising production has contributed to a burgeoning exportable surplus which is informally shipped to Thailand and Vietnam by well-financed traders. The relative volumes, the mix of varieties and whether milled rice is included depend on the price differentials in the neighbouring markets in a given year. Typically, about one-third of the surplus flows to Thailand and the balance to Vietnam. A mix of varieties is shipped in each direction, but most of the surplus fragrant rice is usually sold to Thai millers in the border areas, while the IR varieties are predominantly traded to Vietnam.

Figure 6: Cambodia's rice exports 2000-2015 (HS1006)



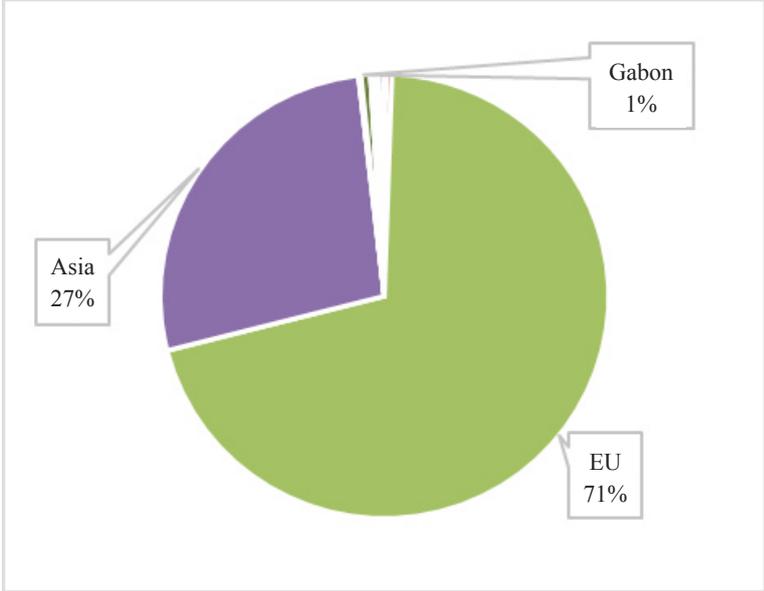
Source: UN Comtrade Database 2017

In order to keep more value added in the local market and create more employment, Cambodia has aimed to export more milled rice. In 2010, the government adopted and published its rice production and export policy, setting an export target of 1 million tonnes of milled rice by 2015. As a result, the Cambodian rice market has been experiencing significant change. Major investments in larger rice mills and polishing factories continue to be made. Exports of milled rice are rising. According to the UN Comtrade database (2017), exports were 0.35 million tonnes in 2013 and 0.47 million tonnes in 2015. This is far short of the target of 1 million tonnes. Estimated milled rice exports for 2016 are similar to those in 2015; the recorded export volume from January to November 2016 stood at around 0.48 million tonnes.

Cambodia exports rice mainly to Europe, followed by Asia. Cambodian rice is able to enter the European market freely because of preferential treatment (Everything but Arms) to developing countries. As shown in Figures 7 and 8, in 2015, 71 percent of Cambodia’s rice was exported to Europe: France 15 percent, Poland 11 percent, Netherlands 8 percent, around 5 percent to Italy and around 4 percent each to the United Kingdom, Belgium and Czechia. In Asia, Cambodia exported mostly to China (14 percent) and Malaysia (10 percent).

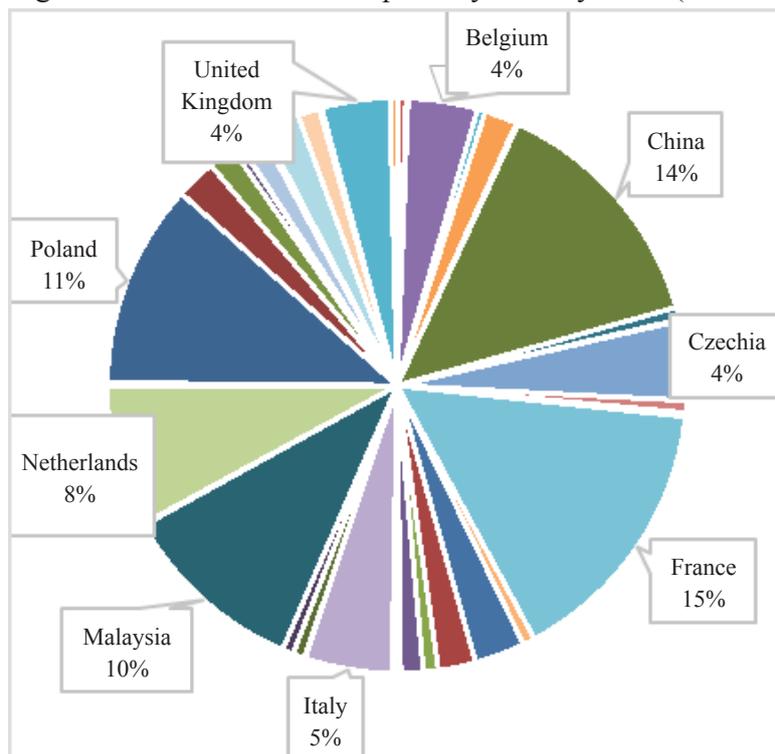
Surprisingly for a rice exporting country, Cambodia also imports rice, though the amount is relatively small: around 68,000 tonnes, worth USD11 million in 2015. In 2014, it was only 24,000 tonnes (UN Comtrade 2017). In 2015, 88 percent of Cambodian rice imports were from Vietnam, followed by Thailand, around 10 percent, and USA 1 percent (Figure 9).

Figure 7: Cambodia’s rice exports by region 2015 (volume)



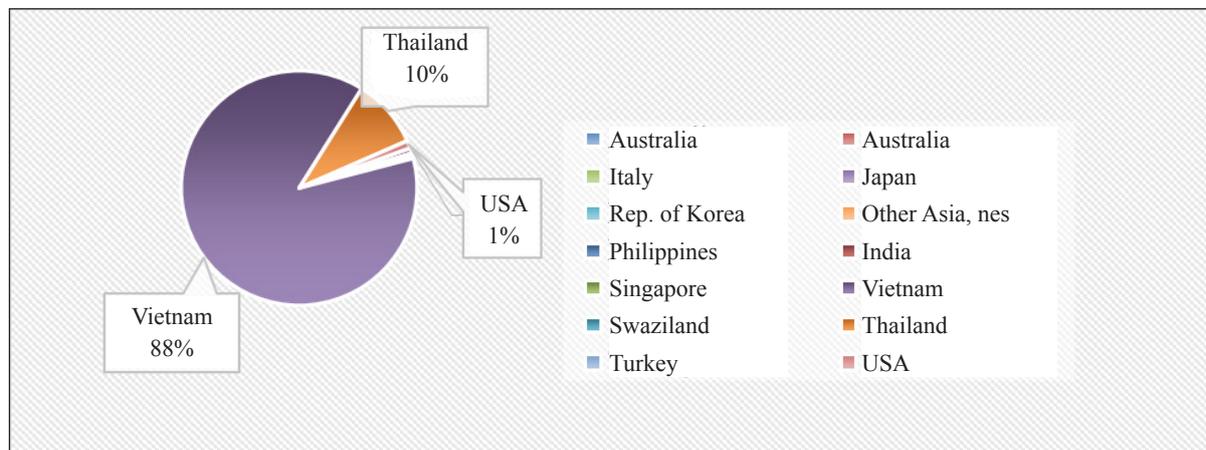
Source: UN Comtrade 2017

Figure 8: Cambodia's rice exports by country 2015 (volume)



Source: UN Comtrade 2017

Figure 9: Cambodia's rice imports 2015 (volume)



Source: UN Comtrade 2017

4.2 Rice in south-eastern Cambodia

Farming level

Cambodia's south-eastern border consists of Takeo, Svay Rieng and Prey Veng provinces. These provinces serve as trade corridors, especially for agriculture. Paddy rice production significantly contributes to the local economy. The wet season paddy area covers approximately 648,000 ha, around 25 percent of the total area in the whole country (MAFF 2015b). The most popular paddy varieties are IRs, particularly IR504.

Cambodian farmers in the southeast have a long-term relationship with traders from Vietnam. The farmers are provided with seed, mainly IR504, fertilisers and other necessary inputs by Vietnamese traders. The transactions sometimes are on credit, which helps relieve short-term cash flow pressures on farmers. However, in this type of business transaction, Cambodian farmers are obliged to sell their paddy to Vietnamese traders.

Distribution and sales

Most paddy rice from the southeast is exported to Vietnam immediately after harvesting, due to Vietnamese traders' effective logistics, large volume acquisition and quick sales turnaround. During the harvest season, Vietnamese traders go directly to Cambodian rice fields and buy paddy on the spot with upfront payments.

Vietnamese traders' logistics are very effective. They can access most rice fields via truck and inland waterways. Paddy is loaded in bulk and delivered to Vietnamese rice millers. With sufficient working capital and quick sales, Vietnamese traders can handle large volumes of paddy acquisition in a short period, which is important during the harvest season. As a result, these Vietnamese traders have huge purchasing power.

Paddy price

Due to their purchasing power, Vietnamese traders tend to become price makers. Their transaction price is adopted by Cambodian traders and rice millers, who purchase lower volumes because of their working capital constraints.

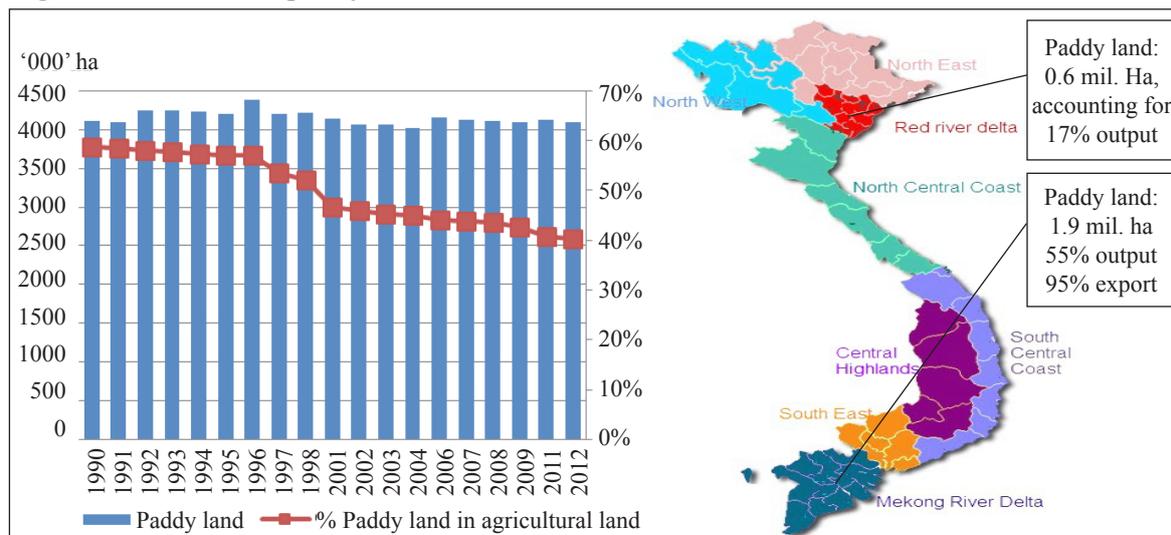
The price of paddy swings considerably, based on fluctuating demand from Vietnamese traders. If there is a shortage of local paddy in Vietnam, the price of paddy in south-eastern Cambodia is expected to rise. If there is a shortfall in demand from Vietnamese traders, the paddy surplus in the area is expected to rise because the demand from local traders and rice millers is relatively low. Local demand for paddy rice is not able to play a role as a price stabiliser.

4.3 Overview of the rice sector in Vietnam

Vietnam is the biggest rice producer in the ASEAN region after Thailand. Rice is Vietnam's most important crop and plays a significant role in the country's agricultural development. In 2012 paddy covered around 40 percent of total agricultural land; at roughly 4 million ha, the size of the paddy area has barely changed since 1990 (Figure 10). The main rice growing areas are the Red River Delta (0.6 million ha) and Mekong River Delta (1.9 million ha). Between them, these two areas account for 51 percent of the total paddy fields. However, the share of paddy land in total agricultural land has fallen steadily, from nearly 60 percent in 1996 to 40 percent in 2012, reflecting increases in other crops.

Vietnam's paddy production increased from around 30 million tonnes in 1996 to about 45 million tonnes in 2012. The Mekong River Delta contributed around 55 percent of total production and the Red River Delta 17 percent. Almost all the paddy produced (95 percent) in the Mekong Delta was exported, while paddy grown in the north was used for domestic consumption. The fact that paddy production has increased even though the area planted with paddy has remained stable implies that yields must have risen. Average paddy yield is around 5.6 tonnes per ha.

Figure 10: Vietnam's paddy land

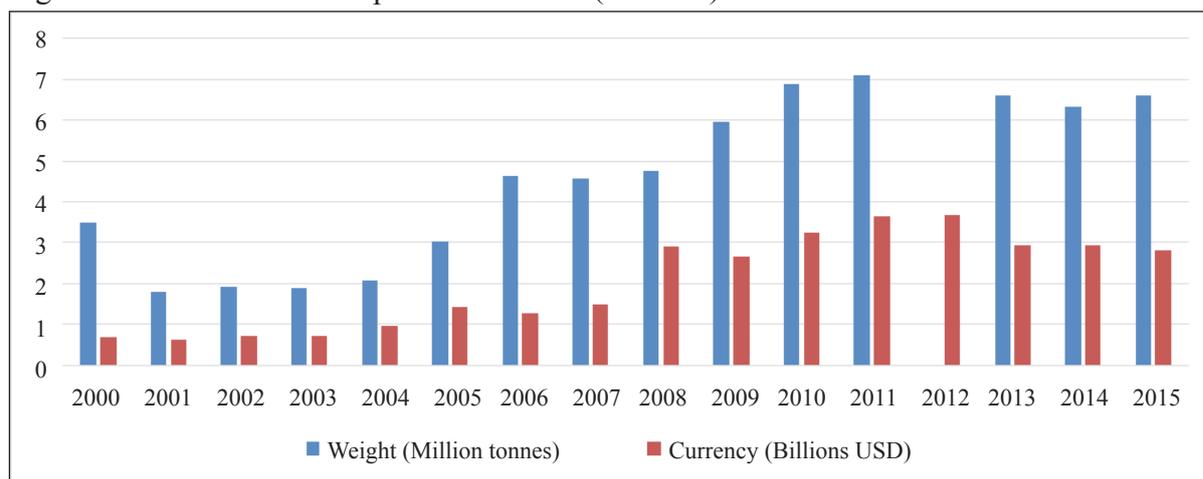


Source: Adapted from slide presentation by Dr Tran Cong Thang 2016, cited in GSO

Figures 11 and 12 illustrate Vietnam's rice exports by year and by country. Rice exports soared between 2001 and 2011, from almost 2 million tonnes (USD0.6 billion) to around 7 million tonnes (USD3.6 billion). The figure then dropped slightly, to an average of around 6.5 million tonnes, in 2013-15.

Vietnam's export structure, has been changing. As shown in Figure 12, in 2010 Vietnam's largest export markets were in the ASEAN region (around 50 percent) and Africa (around 20 percent). However, between 2013 and 2015, the country's largest export destination was China, accounting for about 35 percent of the total. In 2015, the share of ASEAN countries in Vietnam's rice export was around 35 percent, while African countries' was around 10 percent.

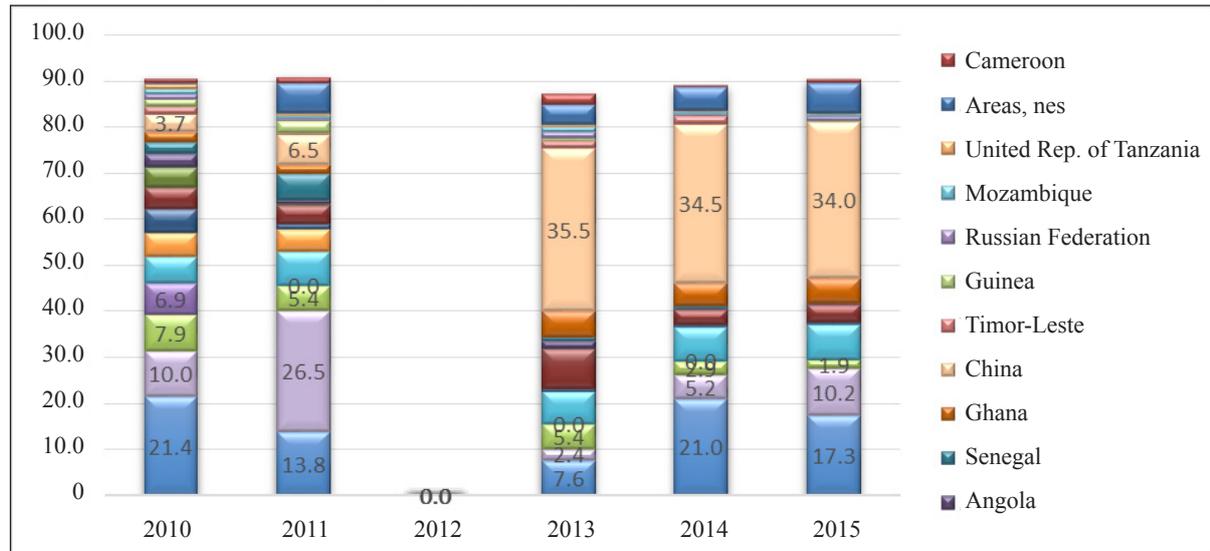
Figure 11: Vietnam's rice exports 2000-2015 (HS1006)



Source: UNCOMTRADE 2017

Note: Full data for 2012 was not available

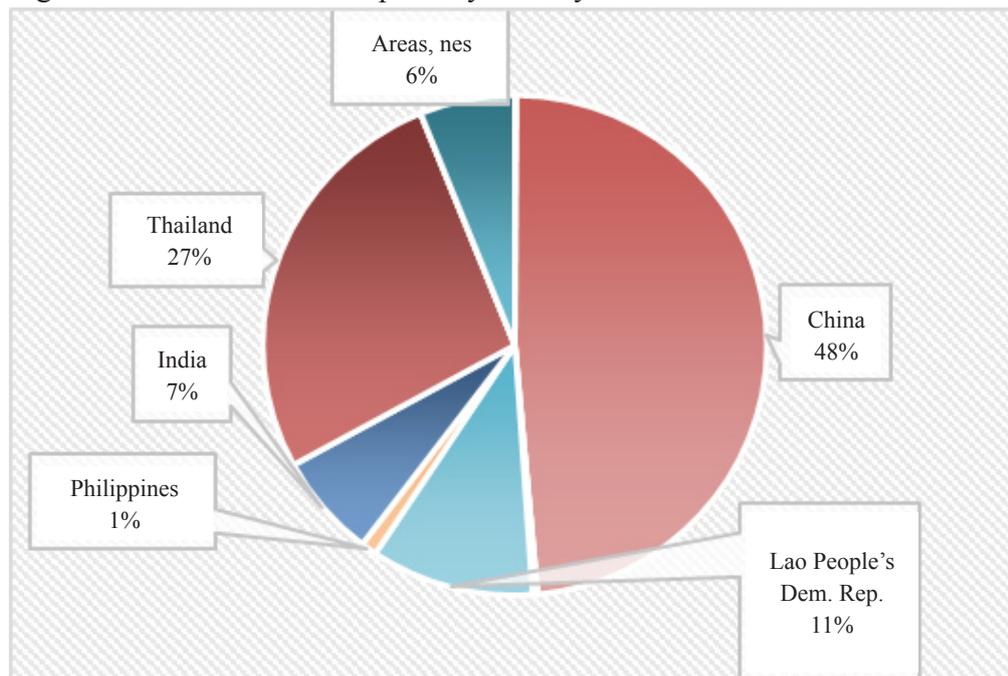
Figure 12: Vietnam's rice exports by country 2010-2015 (HS 1006)



Source: UNCOMTRADE 2016

Note: The data is not fully available in 2012

Figure 13: Vietnam's rice imports by country 2015



Source: UNCOMTRADE 2017

Even though Vietnam is a big rice exporter, it also imports around 50,000 to 60,000 tonnes of rice per year, mainly from China (48 percent) and Thailand (27 percent) (Figure 13). Surprisingly, according to the UNCOMTRADE 2017 database, there is no record of rice imports from Cambodia. Although official statistics do not show this, it is estimated that Vietnam imports not less than 2 million tonnes of paddy from Cambodia per year (Table 1).

5. Key qualitative findings

5.1 Vietnam's agriculture and rice policy

Agriculture has played a remarkable role in Vietnam's economy, and rice production has made a significant contribution to agricultural development. Rice farming has been the main source of income for rural people: 70 percent (around 9 million) of rural households are rice farmers. Since the 1980s, aiming to feed more than 50 million people then and around 93 million in 2016, rice policy has prioritised quantity through high yielding crops. Investment in irrigation systems was a major focus of the government. After three decades of intensive rice farming, Vietnam has become the world's leading rice exporter. However, the growth rates of both output and yield have levelled off in recent years. Natural resource exhaustion, environmental pollution, weak competitiveness, changes in international and domestic demand, fast industrialisation, urbanisation and climate change are the factors that require Vietnam to restructure its economy as well as its agricultural policy (Dang 2014).

Interviews with different policymakers consistently indicated the Vietnamese government's intention to shift from low value to high value rice crops or other high value crops. They expressed the view that growing only high yielding but low value paddy cannot improve the livelihoods of farmers and has harmed the environment. Despite many supporting policies, farmers earned very small margins on their rice production, while traders and exporters earned much higher profits. The farmgate price is too low for farmers to make high profits, said one of the interviewees. They also commented that even though Vietnam has exported a huge amount of rice to the international market, the profit margin is smaller than for other agricultural produce. They observed that the international rice market is tremendously competitive, and exporters do not have much bargaining power, not even a big rice exporter like Vietnam. Exporting rice is also complicated and costly. Some countries, such as the Philippines, require foreign export companies to bid for the right to import rice, which lowers the price almost to break-even point.

In brief, in both interviews and discussions, policymakers and researchers consistently agreed that, given the high degree of land and water contamination and changing market demand, Vietnam should not rely solely on intensive production of low value rice, but needs to diversify by shifting to high value paddy or other high value crops and agricultural products,. However, all were concerned at the prospect of shifting focus, that it would take several years to raise awareness among farmers. Also, successful policy implementation will require sufficient resources. Indeed, a review by Tran and Nguyen (2015) mentioned a limitation of crop restructuring policies being that awareness of the policies is uneven among farmers. Funds to support the policy are not sufficient, especially for infrastructure and irrigation. More importantly, the market for new crops during the conversion period is not stable and cannot absorb a big increase in production. Similarly, a KII with Dr Dang Kimsun indicated that it is sometimes difficult to change farmers' ideas and behaviours, especially when they have been practising something for a long time and the market and networks are already there. Therefore, more time and resources are required to change the rice value chain so that production and markets can be shifted at the same time.

5.2 Key informant interviews with Vietnam's private sector

Experience of Vietnamese farmers in An Giang province

The KIIs with Vietnamese farmers were conducted by AGU in An Giang province employing semi-structured questionnaires. An Giang is among the provinces that produce the highest quantities of short-term high yielding rice in the Mekong delta. Before the 1980s, farmers mostly produced one crop of floating rice during the rainy season (May to December), rotated with beans and sesame in the dry season (December to May). After 1985, farmers in some areas of the province adopted short-term high yielding varieties and shifted to two crops of rice. The first crop was called “winter-spring”, being produced from November to February, the second “summer-autumn”, from May to August. From August to November, the flooding of rice fields induced sedimentation and renewed the soil. From the 1990s, more farmers shifted to two rice crops, and after 2000 more farmers shifted to three crops. Now, more than two-thirds (165,000 ha) of rice land in An Giang province has been converted to three rice crops.

Before 2010, most farmers used their own stored rice seed. However, more farmers have started to use certified seeds in recent years because they recognise their importance. Of the five farmers interviewed, four were not using IR50404 seeds; instead they used DS1, IR6976, OM6976 and other IRs.

The farmer cultivating IR50404 had a small plot of 1.5 ha. Production costs per ha came to around VND11,945, 000 (USD529); the highest proportion (17 percent) went on harvesting, followed by land preparation (16 percent), fertiliser and pesticide (14 percent) and labour for applying pesticide and fertiliser (11.6 percent). The yield of IR50404 is 9.3 tonnes per ha, but prices are low (around USD0.22/kg).

The other four farmers who had been growing non-IR50404 varieties estimated their total production costs per ha for one crop to be in the range of USD500 to USD1,100. Yields are lower than IR50404 at 6.7 to 8.0 tonnes per ha, but prices are higher at USD0.22-0.29/kg. Thus non-IR50404 varieties may contribute more to farmers' livelihoods.

The interviewed farmers had different means of selling their rice. Half had a written contract with traders or companies before they started growing rice, while the other half had no official contract. Instead, they had oral agreements with traders made just before harvesting. Noticeably, those who had a contract were satisfied with the price, while those who had no contract tended to cooperate with neighbouring farmers to negotiate the price with traders. The interviews revealed non-contracted farmers' dissatisfaction with the price.

Experience of Vietnamese traders and exporters

The team from AGU conducted three KIIs with Vietnamese traders and another three with exporters. One of the traders used to buy rice in Cambodia. In the past he would go to Cambodia himself to buy paddy, but now he buys Cambodian rice via agents whom he pays USD0.09 per 100 kg of paddy as a commission fee.

A company owner shared his experience of doing business in Cambodia. The price varies with the type of rice and the time of year. He has to compete with Thai traders, who pay a higher price. However, Vietnamese traders have a geographical advantage being situated near the border, while Thai traders cannot access remote areas. The quality of IR50404 from Cambodia is lower than from Vietnam. Husks are thicker, so there is less milled rice; for example, the milling rate is 0.78 for Vietnamese IR504 and 0.72 for Cambodian IR504.

Cambodian infrastructure is not good (inadequate and bad roads). Institutional arrangements at the border are not efficient. In some cases, traders have to use informal channels to import rice from Cambodia. Vietnamese traders must buy rice via Cambodian intermediaries.

Two of the three export companies (Phat Tai and Quang Phat) purchase and export both IR504 and high quality rice, while Loc Troi trades only high quality rice. Loc Troi mainly buys paddy from the Mekong Delta and to ensure quality has invested in facilities to inspect produce and farming procedures, control chemical residues and avoid mixing rice varieties. It exports rice mainly to Hong Kong (70.7 percent of total) and China (13.4 percent), with around 15 percent to Singapore, Europe and the USA.

The other two companies export almost entirely to China (90 percent of total), with the other 10 percent going to Africa, Malaysia and the Philippines. IR504 makes up around 55 percent of their total exports. They reported that they prefer to export high quality rice because it provides a higher margin. They want to export to the USA and Europe but they also want to keep their existing markets in China and Africa. They mentioned that Vietnam still has potential to produce low quality rice. China has a huge demand for low quality rice, mainly for producing powder, while African countries need it for consumption.

Table 3: Share of exports by country (%)

Company name	China	Malaysia	Guam island	Philippine	Hong Kong	Singapore	Europe	USA	Africa
Phat Tai	90.00	8.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
Loc Troi Group	13.45	0.00	0.00	0.00	70.77	5.17	4.39	6.22	0.00
Quang Phat	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00

The three export companies agreed that the market for high value rice is more profitable than for low quality. However, some countries preferred high quality rice while others preferred low quality. Exporters need to be flexible to meet customers' needs. So far, Vietnam had not prioritised a specific rice, which allowed the market to determine production. Loc Troi suggested that government must have a clear strategy for rice, not only for production and farmers, but also for other agents in the value chain. More importantly, Vietnam should have a rice trademark for the international market. The government should support companies to develop and promote Vietnamese rice. Quang Phat predicted that the market for IR504 will remain stable next year, but it will depend on the weather in other exporting countries such as India, and the global market. The company will continue buying IR504, but the volume will depend on the market. It also suggested that the bank interest rate should be reduced.

5.3 Situation of the rice sector in south-eastern Cambodia

Rice production

Cambodia has two major seasons: dry and wet. The wet season lasts from June to December, the dry season from mid-December to April. In the past, due to the lack of irrigation, farmers could grow rice only in the wet season, leaving the land free after harvesting. Now, owing to economic development, improvement of irrigation systems, and climate change, some farmers can grow rice in both wet and dry seasons. Many new rice varieties have emerged for both seasons. Varieties can be categorised based on crop duration: short-term (less than 90

days), medium-term (90-150 days) and long-term (more than 150 days). Second, they can be grouped as aromatic (high value¹) and non-aromatic (low value) varieties. In general, aromatic varieties require more growing time than non-aromatic rice. Normally, aromatic rice varieties are medium-term or long-term, while non-aromatic varieties are short-term.

Various rice varieties have been planted in south-eastern Cambodia in both seasons. Because of the weather and soil conditions, farmers in this region grow aromatic rice in the wet season and non-aromatic rice in the dry season. Farmers normally call their rice by the season. Thus, in most cases, “wet season rice” refers to aromatic rice and “dry season rice” to non-aromatic rice. However, due to changing demand, there is a new trend for farmers to grow non-aromatic rice (mostly IR varieties) in the wet season.

Based on the FGDs in the three provinces, farmers grow dry season rice or IR varieties for commercial purposes, and tend to grow wet season rice for family consumption. Some farmers sell some of their wet season rice, though only a small percentage of it. In the dry season, farmers mainly grow IR varieties. Most of them grow IR504, which is a short-term variety. However, according to the FGDs, IR504 requires massive inputs of chemical fertilisers and pesticides, which means farmers have to go to the farm often. They have to spray pesticide² every three to four days, said one farmer.

Furthermore, the FGDs revealed that even though IR504 requires a lot of effort, farmers in the three provinces prefer to grow this short-term variety (even in the wet season) for several reasons. First, the yield is very high (around 5 tonnes/ha) compared to other varieties (around 2.5 tonnes/ha), especially aromatic rice. Second, demand is more stable than for other varieties. Even though the price can fluctuate slightly depending on the season, there is always demand from Vietnam for this variety. Farmers said that in spite of the low price, the high yield can provide better income than other varieties. Third, Cambodian farmers grow IR504 by borrowing fertilisers and pesticides from Vietnamese merchants, promising to sell the harvested paddy to the merchant to repay the debt. Vietnamese traders charge a monthly interest rate of up to 2 percent. Most of the fertilisers and pesticides used in south-eastern Cambodia are imported from Vietnam.

Notwithstanding the high demand from Vietnam, farmers in the southeast said that they earned very little profit from rice. Some stated that they do it just for family consumption. They grow rice because they inherited the skills from their ancestors. Besides growing rice, they can get construction and factory jobs, work as motor taxi drivers, or migrate to Phnom Penh or abroad. Some of them do logging or fishing.

Farmers declared that there will be a severe impact on their livelihoods if Vietnam stops purchasing and there is no replacement market. Yet, they would continue growing rice at least for family consumption. Alternatively, they could migrate to work in a factory or get jobs in the village such as agricultural work or raising animals. Notably, they said that, given the current soil conditions and fertility, they can switch to aromatic rice if there is a secure market for aromatic rice. “We can switch and adapt our production to any rice variety as long as there is a secure market”, said many farmers during the FGDs.

1 Sticky rice is categorised as high value rice in this study.

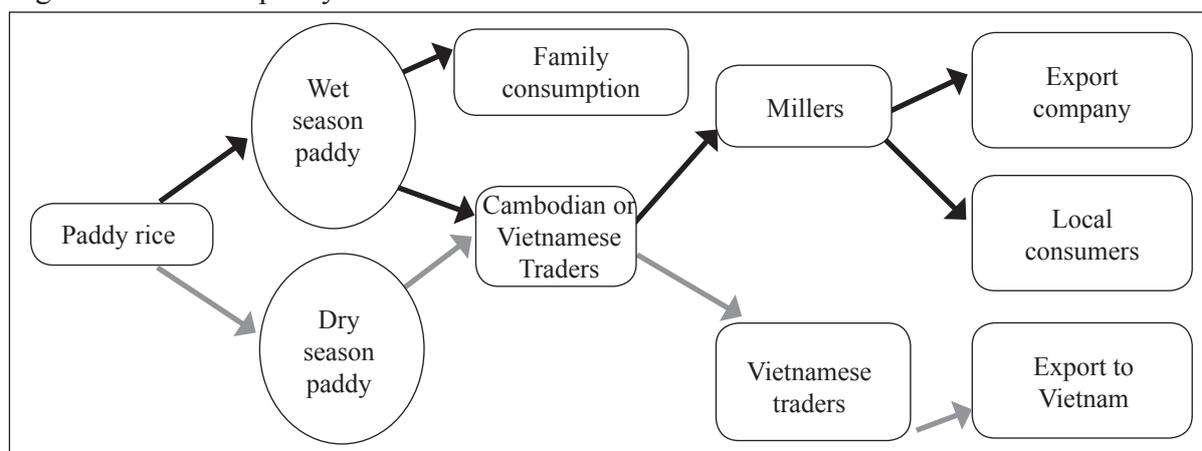
2 The fertiliser and pesticide application rates for IR504 are detailed in the next section.

Demand of rice

Figure 14 illustrates the flow of paddy rice, based on information gathered in the KIIs and FGDs. Although the flow is similar to the normal rice value chain, the field survey revealed some specific characteristics. Wet season rice produced in the region is traded mainly with local rice millers and after milling exported to countries other than Vietnam and Thailand or sold for domestic consumption. Vietnamese traders also purchase wet season rice (mostly as paddy), but relatively little compared to their demand for dry season paddy. To ease trading and reduce the cost of paddy collection, Vietnamese traders normally purchase through Cambodian traders. In some cases, especially along the border, Vietnamese traders enter Cambodia and purchase paddy directly from farmers.

Vietnamese traders prefer to purchase paddy wet rather than dry, which means Cambodian farmers sell their paddy immediately after harvesting. The traders said that drying paddy by sunlight is not reliable and can lower its quality and affect its storage. Processing in Vietnam (drying and milling) is more advanced and cheaper than in Cambodia because of cheap electricity and better infrastructure. Another significant factor is that Cambodian farmers harvest using machines. They stated, “We cannot sundry our paddy anymore because we harvest using machines, and it takes just one or two days to collect all the paddy. Thus, there is not enough space for drying. Plus the weather is uncertain.” Therefore, both Vietnamese traders and Cambodian farmers prefer to trade wet paddy.

Figure 14: Flow of paddy rice in south-eastern Cambodia



Source: Compiled by authors based on field observations

A remarkable finding from the KIIs with rice traders and millers is that the end market for dry season rice or IR504 is Vietnam. Vietnam determines the price for this variety in all three provinces. Vietnamese traders offer a price to Cambodian traders. Then those Cambodian traders offer a lower price to farmers in the village. Usually there are a few traders in each village; the prices paid by those traders are almost the same. “They collude with each other to determine the price”, said a farmer during an FGD. Some farmers said that they would be happy if more Vietnamese traders entered the village to collect paddy, as this might increase competition. There is no cooperative or farmer association in the villages to help the farmers in price negotiations. Farmers sell their paddy individually, with some discussion with their neighbours.

However, the interviewed rice traders said that the number of local traders has increased in recent years, making their business difficult and lowering their profit margin. The price of IR varieties is around USD0.17-0.20 per kg, while it is about USD0.20-0.25 per kg for aromatic rice. They claimed that their trading volume (particularly IR504) with Vietnam has increased yearly. Moreover, the profit margins for IR504 and aromatic rice are remarkably similar; however, the market for IR504 is larger and more convenient. The traders also talked about the difficulties they face, including transport bans by local authorities, bad roads, informal fees and climate change.

The interviewed traders indicated that Vietnamese traders come to purchase paddy from Cambodia for three main reasons. First, Cambodian rice is cheaper than Vietnamese rice: a profit margin is left after subtracting all the costs. Second, Cambodian paddy, particularly IR504, is grown using less chemical fertiliser and pesticides than Vietnamese paddy. Third, Vietnam dominates the low value rice market and requires a huge amount of rice to meet its market demand.

Lastly, the local rice millers pointed out that they have no capacity to absorb extra paddy if Vietnam stops buying it. They estimated that the current milling capacity in the three provinces can handle only about 5 percent of the total rice produced.³ They need more capital and stable international markets to increase their purchasing power and capacity. All the interviewed millers borrow 20 to 70 percent of their working capital from financial institutions. The average monthly interest rate is around 1 percent. Millers dry and mill paddy mainly for export. Around 70 to 80 percent of the milled rice is sold to export companies; only 20 percent is sold domestically. They described their difficulties as a shortage of working capital, high interest rates, unstable orders, informal payments, high energy costs and a shortage of labour.

5.4 Rice policy in Cambodia

The main development agenda of the Cambodian government is outlined in Rectangular Strategy (RS) III, including improvement of agriculture, aiming at strengthening and expanding the foundation for economic growth, accelerating poverty reduction and improving living standards (RGC 2013). Agriculture is important in supporting economic growth, ensuring equity and food security and enhancing rural economic development. The Agricultural Strategic Development Plan 2014-2018 adopted by MAFF has a three-pronged strategy: productivity improvement, diversification and agricultural commercialisation through interrelated measures such as infrastructure development and information and communication technology; improved provision of extension services; and improved agricultural inputs, land management reform, finance, marketing, farmer organisation, and institutional building and coordination (MAFF 2015c).

In 2010 the government launched the policy for the Promotion of Rice Production and Export, issuing significant policy measures for each stage, including for (1) paddy production, (2) paddy collection and processing, (3) logistics and (4) marketing (SNEC 2010). MAFF formulated a detailed action plan to increase support services and interventions such as transferring appropriate technology and techniques to farmers and intensifying rice variety development research to ensure better suitability to soil and climate conditions and market demand. A recently completed Rice Policy review indicates that the Cambodian rice sector is still far from competitive internationally and has not been able to raise productivity and farmer income

³ As reported by the local millers interviewed in the three study provinces.

consistently. As a result, a new rice policy was formulated to build upon the achievements of the 2010 Rice Policy. The aim is to help Cambodia's rice sector become a leader in global rice trade and a reliable source of food security and farm income. The new rice policy⁴ is based on the key principles of participation, transparency, competitiveness and sustainability. It aims to cover all aspects, including improved production through innovation and higher benefit-cost ratio investment, better understanding of demand and the competitive landscape, closer coordination among stakeholders, building a big picture and a clear vision of the way forward. (Details of the new rice policy are presented in Annex 3.)

MAFF realised that the current agricultural extension system, which mostly focuses on rice, faces numerous problems, such as limited support and regulations, and lack of human resources, funding, new and appropriate technology, extension materials and facilitation skills. Extension plays a significant role in the government's policy and strategy for agricultural development. To modernise and promote commercialisation, MAFF has developed agricultural extension policy that aims to transfer knowledge, information and technology to farmers and farming communities and link them to markets. This policy is essential for delivering agricultural extension services. It will serve as a foundation and guidance for effective service delivery to farmers (MAFF 2015a).

This study conducted KIIs with two main provincial departments (Agriculture and Commerce) and included a section on extension services received in the household questionnaire. According to the key informants, the Provincial Department of Agriculture has many programs, such as enhancing production, promoting economic development and training on rice seeds and other crops, animal raising and agricultural value chains. The provision of extension services, loans and grants to farmers are the major crop development activities of the provincial departments of agriculture. However, the interviewed officials admitted that their activities did not cover all the villages in their provinces because of limited financial and human resources. Many other extension activities were implemented by NGOs, private sector actors and other development partners.

Figure 15 indicates that up to 90 percent of the surveyed households in the three provinces had received extension services at least once. Around 17 percent obtained extension services from their provincial department, the majority (54.5 percent) from NGOs, and only 6 percent from rice traders.

Water management and disease and pest control are the major extension services reportedly provided by NGOs (Table A5 in Annex 3). The major services provided by provincial departments of agriculture are disease and pest control, chemical fertiliser application and rice seed selection.

4 This policy was drafted in late 2016 and is to be adopted in 2017.

Figure 15: Households who received extension services at least once (%)

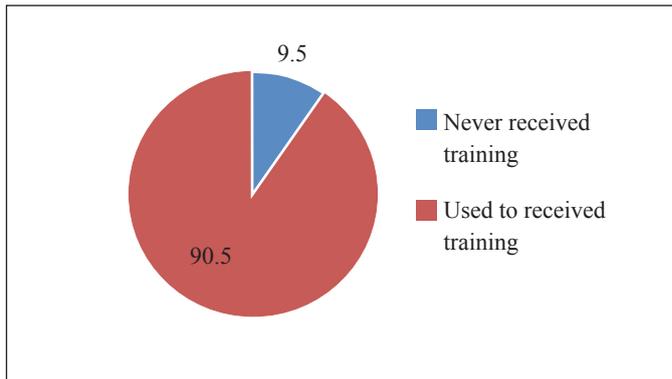
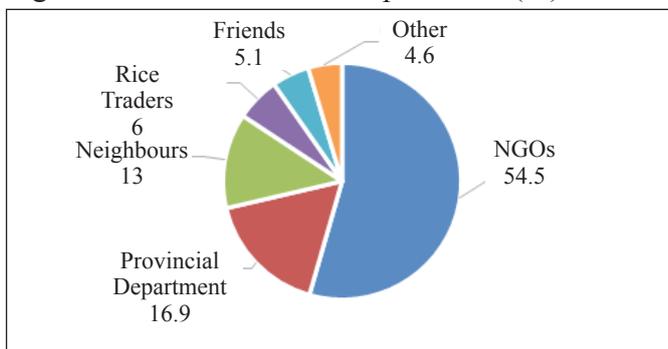


Figure 16: Extension service providers (%)



According to the provincial departments of agriculture, the ministry wants to promote 10 rice varieties: short-term varieties – Senpidor (សែនពិដោរ), IR66 and Cholesar (ជួលសារ); medium-term varieties – Pkarumdoul (ផ្ការំដេង), Pkaromiet (ផ្ការមៀត), Pkarumdeng (ផ្ការំដេង), Pkarchansensor (ផ្កាចាន់សែនសរ); and long-term varieties – CAR4 (ខា៤) CAR6 (ខា៦) and Raingchey (រាំងជ័យ).

However, in practice, farmers grow IR504 based on demand from Vietnam. This is a short-term variety that can grow in any season and has a very high yield. Provincial Department of Agriculture officials said that it depends on the market: “we cannot force them to grow the recommended varieties because we cannot guarantee buyers for their produce”. They added that agriculture is facing climate change issues, which they still cannot totally monitor. In short, they suggested that farmers should shift their production from IR504 to a high quality rice recommended by the government. The government has been looking for a market for those rice varieties in China and Malaysia.

During the KIIs, officials from the provincial departments of commerce explained that the department does not have a specific program or project to promote the rice market. The current policy and action all focus on agricultural commodities. The major activities so far are arranging an exhibition for agricultural products in Phnom Penh or joining overseas exhibitions.

6. Key quantitative findings

The major objective of the household questionnaire was to analyse the situation of farmers' livelihoods in the south-eastern provinces of Cambodia. The questionnaire also enabled the research team to compare the costs and benefits of different rice cultivars.

In order to compare household livelihoods, households were categorised based on the type of rice varieties they had been growing: only wet rice, only dry rice, or both. The categories refer to rice varieties, regardless of the season.

The terms “wet rice variety” and “dry rice variety” are widely and commonly used by farmers in the survey region to refer to different rice varieties. Wet rice refers to varieties that are sensitive to photoperiod and other growing conditions. Most are aromatic premium varieties. Dry rice varieties are insensitive to photoperiod but need irrigation (CARDI 2011). It is possible to cultivate dry season rice in the dry or wet season if irrigation systems are fully supported.

Lastly, this study did a cost and benefit analysis (presented in Section 6.5) of the rice cultivars, which were categorised based on their duration: short-term, medium-term and long-term. Indicators such as yield, cost and revenue were generated for the comparison. Because the majority of farmers in the survey areas grow mainly IR504 and the study intended to focus on this variety, IR504 varieties were separated from other short-term varieties and compared with medium- and long-term varieties in order to calculate which ones are more beneficial for farmers.

6.1 Sample features

This section describes the characteristics of the study provinces, selected villages, their poverty status and the number of rice crops per year. The study was conducted in Prey Veng, Svay Rieng and Takeo provinces with a total sample of 600 households, 200 households each province. The selected villages were divided into three groups: wet season rice only, dry season rice only, and both wet and dry season rice. Table 4 indicates that 80 percent of the sample was in dry season rice villages, only 20 percent in wet season villages. Of the total households, 50 percent in Prey Veng, 57 percent in Svay Rieng and 78 percent in Takeo grew only dry rice varieties.

Table 4: Details of sample (%)

		Only wet rice	Only dry rice	Both	Total
Province	Prey veng	20	50	30	33
	Svay rieng	20	57	23	33
	Takeo	16	78	6	33
Sample Villages	Wet rice	92	0	8	20
	Dry rice	0	77	23	80
ID Poor	IDPoor	26	62	12	13
	Non IDPoor	18	62	21	87
Number of rice crops per year	Single cropping	43	53	4	43
	Double cropping	0	68	32	41
	Triple cropping	0	71	29	16
	Quadruple cropping	0	0	100	0.3
Total		19	62	20	100

Poverty status was identified by whether a household had an IDPoor card; 87 percent of households were not poor. Interestingly, as Table 4 indicates, households that grew dry rice varieties had a better livelihood than those that grew only wet rice varieties or grew both varieties.

Around 43 percent of the interviewed households grew one rice crop a year, 41 percent grew two, and 16 percent grew three. Surprisingly, around 0.3 percent grew up to four rice crops a year. Sixty-two percent of the interviewed households grew only dry rice varieties, 19 percent grew only wet rice varieties and 20 percent grew both. Of course, households that grew only wet rice varieties grew only one crop a year, while those that grew only dry rice could grow up to three.

6.2 Demographic

Table 5 presents the demographic characteristics of the sample households. Average household size is 4.4; the average household size of those growing both rice varieties is slightly higher than that of only wet and only dry rice households. The dependency ratio⁵ of households growing only wet rice varieties is higher than that of households growing only dry rice varieties or both. Most of the sample households are headed by men. The average household head is of working age.

Table 5: Household General Information (%)

Demographic	Only wet rice	Only dry rice	Both	Total
HH size (number)	4.3	4.4	4.6	4.4
Dependency ratio	0.66	0.61	0.61	0.62
Male-headed HH (%)	83	93.2	88.1	90.3
Age of HH head (years)	53	46	51	48
Average years of education of HH head	5.5	5.5	4.9	5.3

The education level of the household head is an important indicator of household human resources and can have significant impacts on the extent to which a household is able to meet its livelihood requirements and manage difficulties. The average years of schooling of household heads is five, which means that most household heads had primary school education. Sample households were also classified by the educational attainment of their household head; about 51.2 percent of household heads had completed primary school.

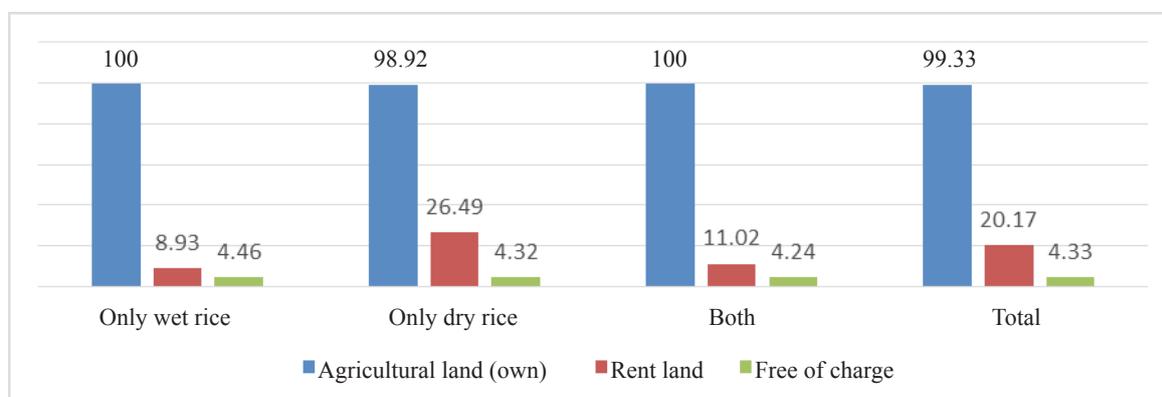
Table 6: Education level of household head (%)

Education's Level	Only wet rice	Only dry rice	Both	Total
Pre-school	11.6	11.1	10.2	11.0
Primary (1-6)	54.5	48.7	55.9	51.2
Secondary (7-9)	25.9	28.4	27.1	27.7
High school (10-12)	4.5	8.9	5.9	7.5
University	0.9	0.8	0.0	0.7
Vocational training	0.9	1.1	0.9	1.0
Literacy class	1.8	1.1	0.0	1.0

⁵ The dependency ratio is the number of household members aged 0-14 years and over 65 years divided by the number of people 15-64 years.

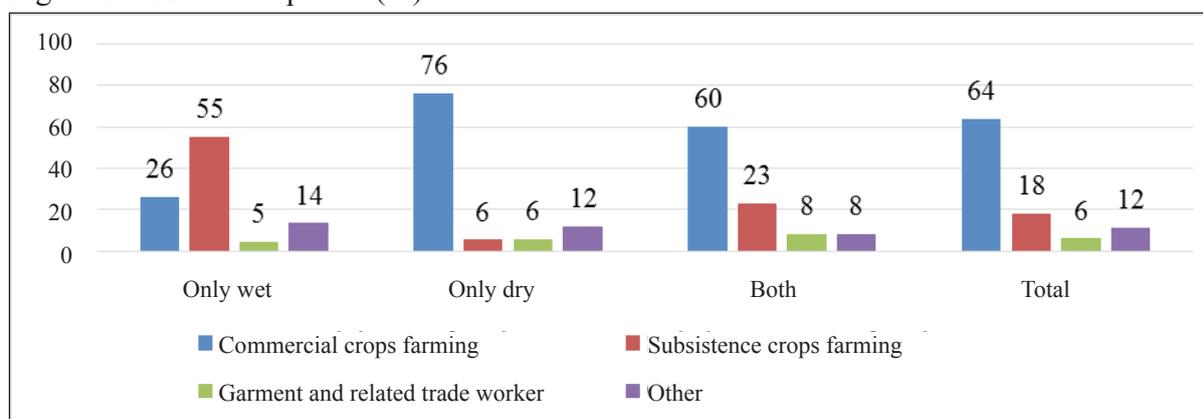
Land is the most valuable asset for the majority of the population in both urban and rural areas. More than 98 percent of households reported owning agricultural land. Households growing only dry rice needed to rent land to increase their production; more than one-fourth of those households did so. Roughly 4 percent of the households in each group used land for free.

Figure 17: Land ownership (%)



The questionnaire recorded both primary and secondary occupations of the household head. Figure 18 illustrates the main occupation, and Table 7 indicates the secondary occupation. The main occupation was growing crops; 64 percent grew for commercial purposes, and 18 percent mainly for family consumption. Garment factory or trade-related work was the main occupation of only 6 percent of household heads. The majority of households whose rice was for family consumption grew only wet rice varieties; the households growing rice for commercial purposes grew dry rice varieties or both.

Figure 18: Main occupation (%)



Source: Quantitative household survey of this research

Table 7 shows that growing rice for commercial purposes is the main secondary occupation, followed by agricultural, forestry and fisheries labour and work in construction and mining.

Table 7: Percentage of second occupation

2 nd Occupation (%)	Only wet rice	Only dry rice	Both	Total
Market-oriented crops	10.0	23.1	13.5	18.8
Agricultural, forestry and fishery labour	4.3	7.0	24.4	9.5
Mining and construction labour	16.4	4.9	10.9	8.3
Shop salespersons	5.7	7.7	3.4	6.6
Subsistence fishers, hunters, trappers	3.6	7.2	4.2	6.0
Fishery workers, hunt	0.0	8.6	0.8	5.5
Subsistence crop farm	15.0	2.3	3.4	5.1
Raise animal for living	5.0	5.6	0.8	4.7
Animal producers mark	3.6	4.2	5.0	4.2
Food processing and r	5.0	2.8	6.7	3.9
Street food snack selling	2.9	3.3	2.5	3.1
Others	28.5	23.1	24.4	24.5

Source: Quantitative household survey of this research

Table 8 reports the food and non-food consumption of households in the surveyed area. On average, the total daily food and non-food consumption per household is USD 10.2. Households that grew only wet rice spent less than other households. This is consistent with the finding that households growing only wet rice do so mainly for family consumption. Households that grew both rice varieties spent more than households that grew only wet or only dry rice.

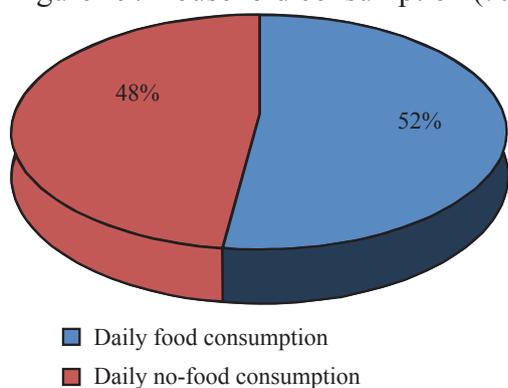
Table 8: Food and non-food consumption per household (USD/day)

Food and non-food consumption	Only wet rice	Only dry rice	Both	Total
Daily food consumption	4.8	5.4	5.7	5.3
Daily non-food consumption	4.1	5	5.5	4.9
Total food and non-food consumption per day	8.9	10.4	11.2	10.2

Source: Quantitative household survey of this research

Household consumption is presented in Figure 19. Food takes 48 percent of consumption and non-food consumption 52 percent. This implies that household expenditure on food and non-food is almost the same.

Figure 19: Household consumption (%)



6.3 Source of household income

Figure 20 shows the share of each household income source in total income. Six sources of household income were reported in the household survey: rice farming, vegetable farming, other farming, business, employment and other. The largest source of household income was paid employment, followed by rice farming. Notably, less than 1 percent of income was obtained from vegetable farming, reflecting the small proportion of households growing vegetables.

Figure 21 breaks down the sources of household income by household category. The largest source of income for all households was paid employment, but the share was considerably smaller for households that grew only dry rice varieties.

Figure 20: Source of household income (%)

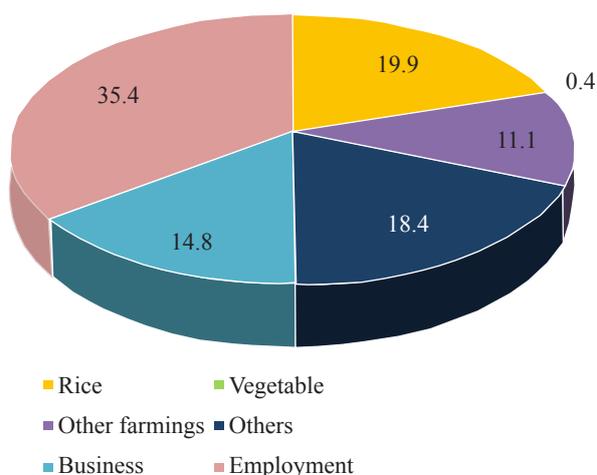
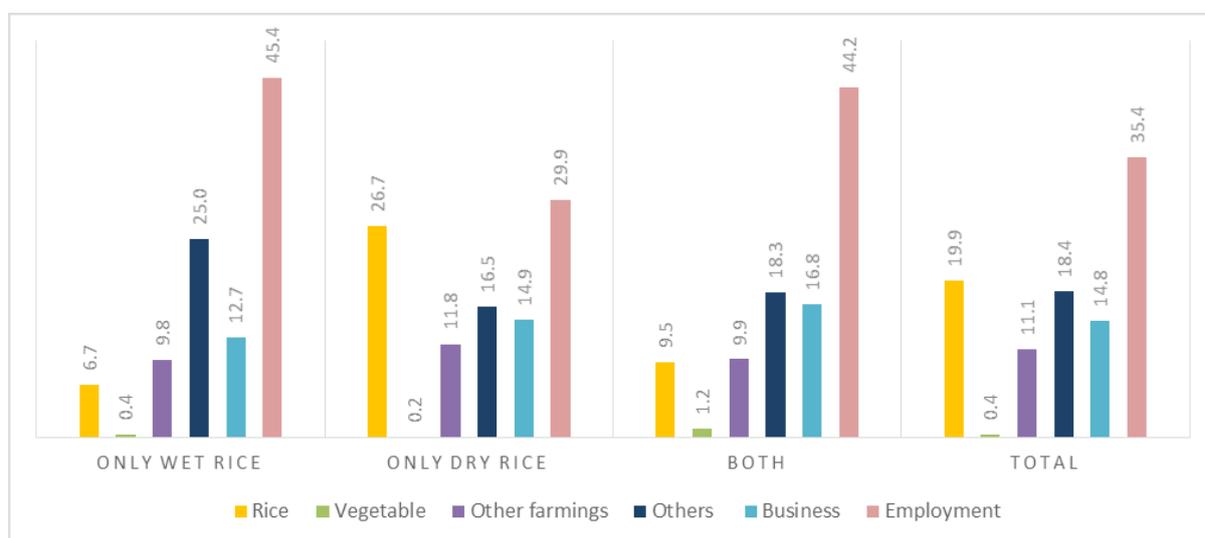


Figure 21: Income by household category (%)



As Table 9 shows, households earn on average around USD497 per year from rice farming. The highest income source was paid employment, around USD883 per year. Households earn very little from growing vegetables.

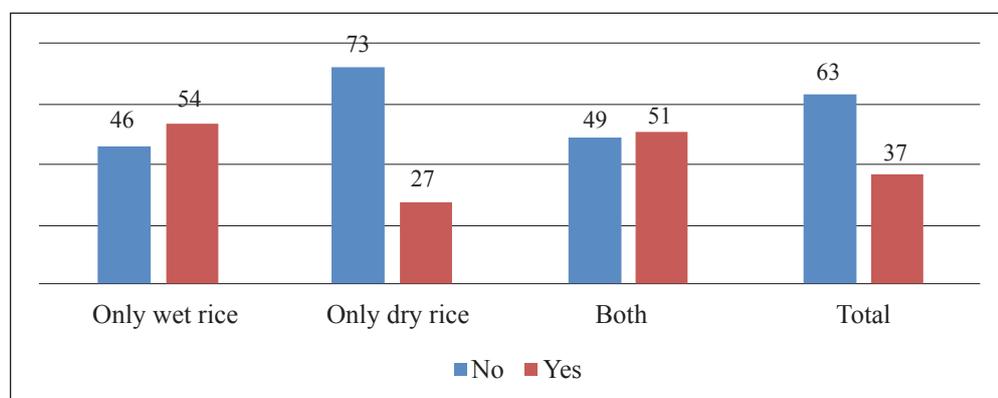
Table 9: Average household income by source (USD/year)

Source of Income	Only wet rice	Only dry rice	Both	Average
Rice	170.4	686.9	211.3	496.9
Vegetable	11	4.4	27.2	10.2
Other farming	248.4	305	219.9	277.7
Others	634.8	425.5	406.9	460.9
Business	321.2	383	373.2	369.5
Employment	1152.5	770.9	980	883.2

6.4 Vegetable production and inputs

The percentage of households growing vegetables is reported in Figure 22; about 37 percent grew vegetables for home consumption or commercial purposes.

Figure 22: Households growing vegetables (%)



The types of vegetables grown by households in the study areas are shown in Table 10. Most vegetables are homegrown for the family; only 40 percent of households had sold vegetables in the previous 12 months. Fewer households growing only dry rice had sold vegetables than the other two categories (Figure 22). Total vegetable sales averaged USD27.6/year, which is a meagre income compared to rice farming. The vegetable sales of households growing both rice varieties are higher than that of those growing only wet or only dry rice (Table 10).

The households that sold vegetables were asked to estimate their total input costs (Table 12). Expenditure on inputs for vegetables grown for own consumption was not reported. However, USD8.2/year appears to be the average costs of inputs for growing vegetables in the study area. Average sales of USD27.6/year minus average input costs of USD8.2/year give a net revenue of around USD19.4/year. Overall, the result implies that dry rice only households focus more on rice farming than vegetable growing.

Table 10: Vegetables grown by sample households (%)

Vegetables	Only wet rice	Only dry rice	Both	Average
Large smooth fibrous gourds	19.05	26.24	16.43	21.07
Water convolvulus	19.48	14.89	19.25	17.63
Wax gourd	9.09	16.67	14.08	13.5
Cucumber	7.79	7.45	7.98	7.71
Long green beans	8.23	6.74	3.76	6.34
Pumpkin	5.63	6.03	6.1	5.92
Eggplant	6.93	3.9	5.16	5.23
Other vegetables	23.8	18.07	27.25	22.61

Figure 23: Households that sold own-grown vegetables in the 12 months before survey (%)

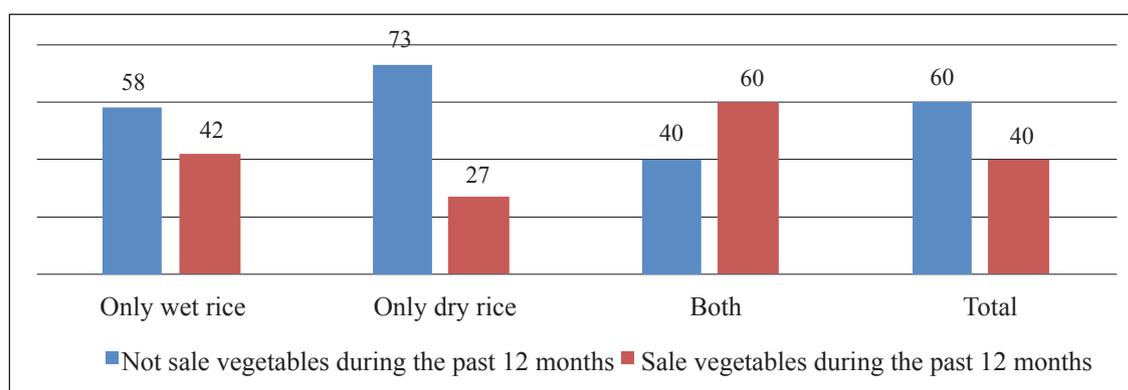


Table 11: Total vegetable sales and input costs (USD/year)

Sale value and Input's cost (n=221)	Only wet rice	Only dry rice	Both	Average
Total sales	20.6	16.2	53.5	27.6
Total input costs	6.2	8.1	10.3	8.2
Net revenue	14.4	8.1	43.2	19.4

Table 12: Vegetable inputs (USD)

Vegetable' Input	Only wet	Only dry	Both	Average
Seed	2.5	4.0	2.1	3.1
Chemical fertiliser	1.2	1.8	2.7	1.9
Pesticide	0.2	1.0	0.3	0.6
Other inputs	1.6	0.9	3.6	1.8
Other inputs	0.7	0.4	1.6	0.8

6.5 Cost-benefit analysis of different rice varieties

6.5.1 Land size

Table 13 provides information about land size by three different rice varieties: short-term, medium-term and long-term.⁶ The average cultivated and harvested land area are almost the same (1.7 ha). This reflects small pre-harvest losses of paddy (just 1.8 percent of total cultivated land). Although the average harvested area of medium-term rice is smaller than for long and short-term varieties, the percentage of damaged paddy land is smaller. This reflects the fact that households using short and medium-term varieties tend to be more agriculture oriented.

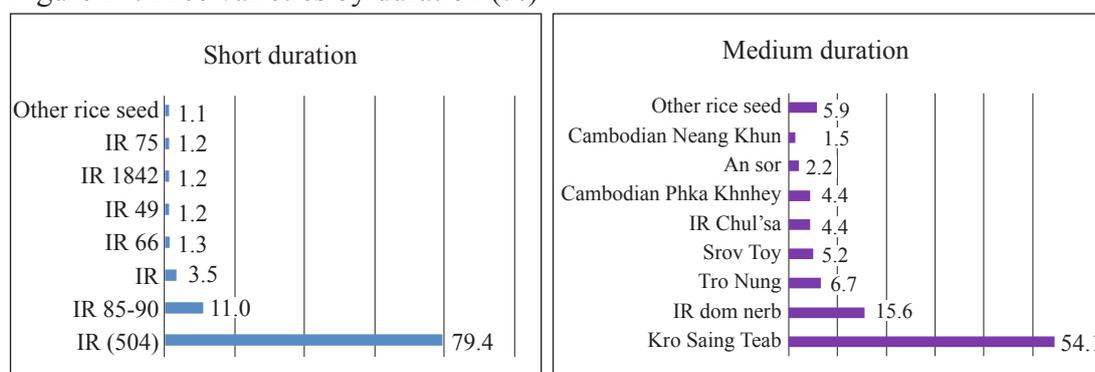
Table 13: Land size by rice duration

Land	Short duration	Medium duration	Long duration	Average
Cultivated area (ha)	2.07	0.90	0.98	1.7
Harvested area (ha)	2.04	0.89	0.95	1.7
Crop loss (% of total cultivated area)	1.45	1.11	3.06	1.8

6.5.2 Rice varieties

Figure 24 provides information about the different rice varieties grown in the study area, categorised by duration to maturity. The names of varieties were recalled by farmers. A huge majority of short duration rice was IR504, followed by other IRs. More than half of the medium period variety is Kro Saing Teab, followed by RI Dom Nerb, Tro Nung and Srov Toy. The different long-duration rice seeds include Phka Rumduol, glutinous rice, Chhmar La Eth, Kro Hom Thngun, Somaly and Mom Meang (Figure 24).

Figure 24: Rice varieties by duration (%)



⁶ Defined as days to maturity: short (95 days), medium (100-150 days) and long-term (more than 150 days).

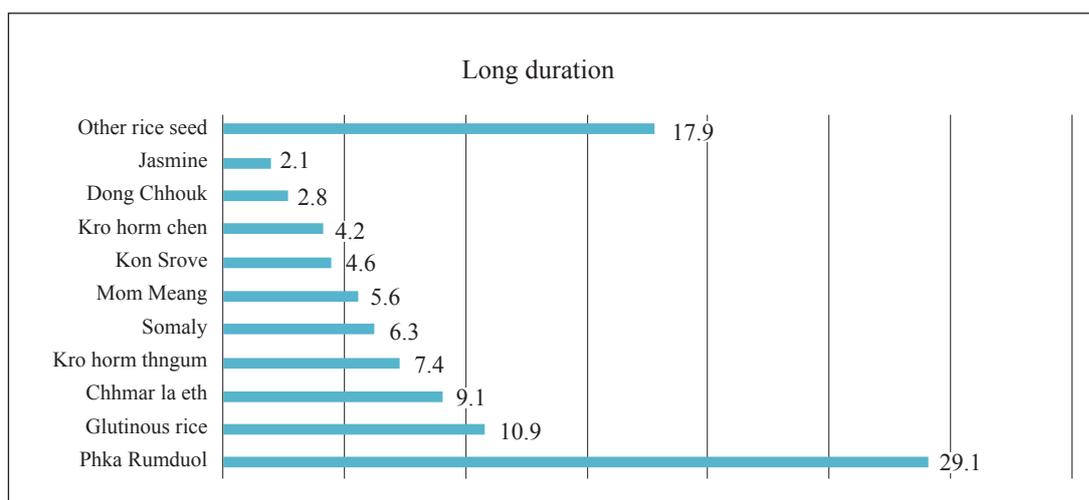


Figure 25 indicates the number of days to maturity for IR504, other IRs and non-IRs, by wet and dry season. IR504 and other IRs reach maturity in less than 100 days. Non-IR varieties take longer to reach maturity in the wet season but need a much shorter growing period in the dry season.

Figure 25: Days to maturity

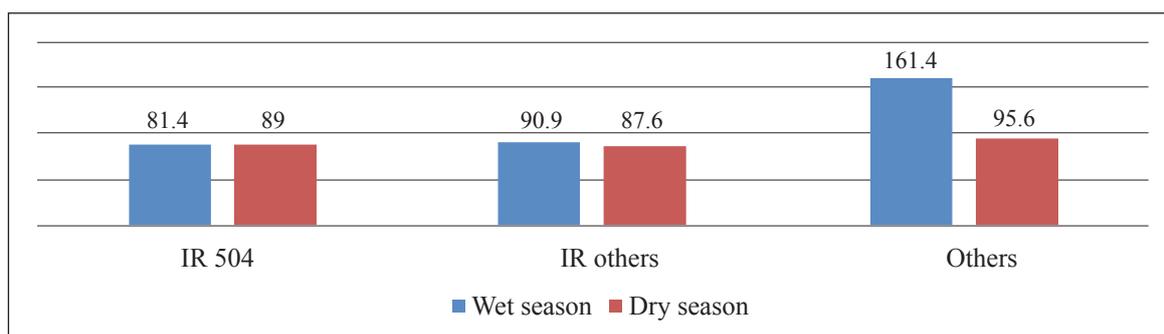


Table 14 shows that broadcasting is the main method of sowing rice seed in the study area. Transplanting is not common, but occurs more with long duration rice varieties. Broadcasting can cut down on both time and labour, though it uses more seed.

Table 14: Percentage of broadcast or transplant

Broadcast/transplant (%)	Short duration	Medium duration	Long duration	Total
Broadcast	99.6	99.2	98.9	99.4
Transplant	0.4	0.8	1.1	0.6

6.5.3 Rice yield

Generally, yield is an essential proxy for the productivity of rice farming. As shown in Table 15, the average yield of short duration rice is the highest among the three varieties. Dry season yield is higher than wet season yield for both categories grown in both seasons (no farmers used long duration seed in the dry season). There was no difference between the average yields of medium and long period varieties. In the wet season, short duration varieties have the highest yield.

Table 15: Rice yield (tonnes/ha)

Rice Yield (Ton/ha)	Short duration	Medium duration	Long duration	Total
Wet season	4.1	2.3	2.4	3.2
Dry Season	4.5	3.1	-	4.5
Total	4.3	2.4	2.4	3.7

6.6 Rice inputs

The main inputs are seed, fertiliser, pesticides and hired labour; others may include water and machine rental. Table 16 indicates the average input use reported by farmers. Short duration rice varieties required the highest seeding rate in kg/ha, while long duration rice varieties required the lowest. Similarly, those farmers used the highest amount of basal fertiliser. Fertiliser use was considerably higher in short period farming than in medium and long period farming. Farmers could not estimate the exact amounts of the different pesticides they applied to their rice fields. However, they recalled the actual expense, which was considerably higher for short period rice. Some households hired outside labour; this cost was higher for medium period rice than for others although the percentage of households hiring labour was greater for short period rice.

The cost of rented machines was lowest for medium period crops, though almost 100 percent of all categories rented machinery. Water costs were highest for short period rice, and a much higher percentage of households growing short period rice used a water pump.

Table 16: Inputs for rice production

Input	Short period	Medium period	Long period	Total
Seed (kg/ha)	322.1	147.6	122.2	257.5
Basal fertiliser (kg/ha)	111	93.5	78.5	94.5
Top dressing (kg/ha)	349	216	198	301
Total fertiliser (kg/ha)	352	223	203	305
Pesticide (USD/ha)	116.7	39.7	21.3	94.5
Hired labour (USD/ha)	27.4	62.5	32.5	30.9
Rented machine (USD/ha)	108.1	93.2	114.2	107.9
Gasoline for farm machinery (USD/ha)	21.3	23.5	17.1	20.9
Water (USD/ha)	71.4	33.4	17.9	67.3
Water pump (USD/ha)	45.5	30.3	17.9	43.5

Table 17: Households using hired labour and machinery (%)

Labor and machinery	Short period	Medium period	Long period	Total
Hired labor	27.6	17	16.8	23.98
Machinery	100	98.5	99.6	99.76
Water pump	80.5	31.8	11.2	59.39

Sources of water for farming in the study areas include rivers and lakes, government irrigation systems, private irrigation systems, groundwater and rain. About 40 percent of the water used for farming is rainwater, followed by water from other natural sources. Medium and long-period crops are highly dependent on rain; more than half of the water for short-period rice comes from natural sources and private irrigation systems. The least used water source is government irrigation systems.

Table 18: Sources of water

Sources of water (%)	Short period	Medium period	Long period	Total
Natural sources (water from river, lake, pond, stream ...)	28	16	4	21
Government irrigation system	11	4	1	8
Private irrigation system	28	0	0	19
Groundwater	18	4	1	12
Rainwater	15	76	94	40

6.6.1 Rice sale

Figure 26 reports rice sales in the 12 months before the survey. Households growing short duration varieties sold the most rice, and households growing medium duration varieties sold the least, meaning that many medium duration varieties served as subsistence for the family. Most households sold wet paddy. Fewer than one in 10 sold milled rice.

Figure 26: Rice sales (%)

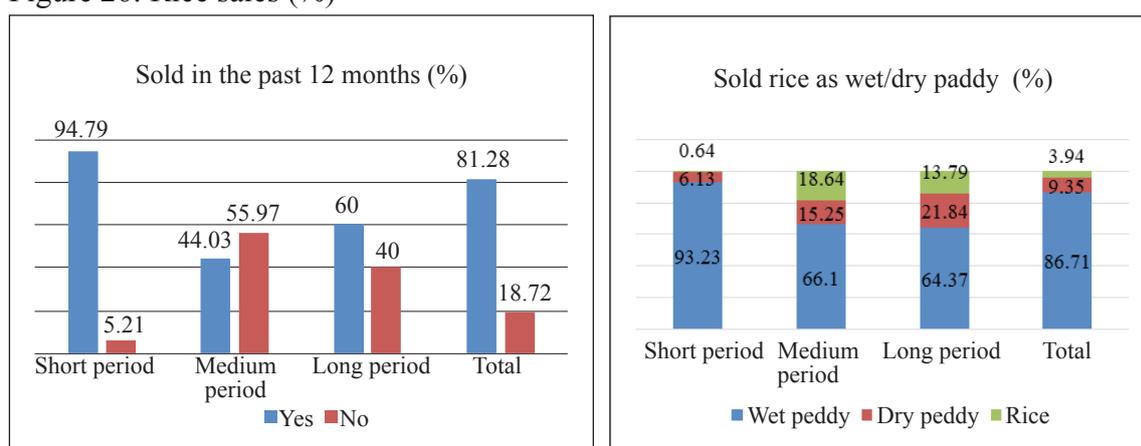


Table 19 compares the prices of the different rice varieties. There is a big difference between paddy and rice. This difference is greatest for long duration varieties.

Table 19: Paddy unit price (riels/kg)

Paddy and rice	Short period	Medium period	Long period	Total
Wet paddy	750	898	879	773
Dry paddy	843	1067	1015	933
Rice	1700	1873	2287	2100

6.6.2 Costs and benefits of growing IR504 and other varieties

The majority of farmers in south-eastern Cambodia grew dry rice varieties for commercial purposes. IR504 is the short-term variety well known for its high yield. It is the dominant crop grown by farmers in the region. In Vietnam, it can yield up to 10 tonnes per ha if farmers apply more chemical fertilisers and pesticides. However, interviews in Vietnam reported that intensive farming of this rice variety is harmful to the environment, especially degrading soil and water quality. Even so, this variety is still popular with farmers in Vietnam as well as in Cambodia, because of its high yield and high demand from buyers.

Table 20 compares the costs and benefits of growing IR504 with medium and long duration varieties. IR504 is more profitable than both medium and long duration varieties even though it fetches the lowest price. Medium duration rice fetches the highest price but it is the least profitable. Even though the price is lower, farmers can make more profit from growing IR504 because of its high yields.

Table 20: Comparison of IR504 and other rice varieties (one production cycle)

Inputs	IR504		Medium duration		Long duration		Total	
	USD/ha	%	USD/ha	%	USD/ha	%	USD/ha	%
Seed	88.1	15.6	46.1	15.3	38.6	14.0	69.7	15.3
Hired labour	7.7	1.4	10.7	3.6	5.5	2.0	7.5	1.7
Water	26.4	4.7	1.4	0.5	0	0.0	16.3	3.6
Pump	39.4	7.0	9.2	3.1	2	0.7	25.7	5.7
Farm machinery	107.5	19.1	91.8	30.5	113.8	41.2	107.2	23.6
Fertiliser	173.5	30.8	116.3	38.6	102.5	37.2	147.5	32.5
Pesticide	120.7	21.4	25.9	8.6	13.6	4.9	80.5	17.7
Total input costs	563.3	100.0	301.4	100.0	275.9	100.0	454.4	100.0
Average price (wet paddy) (riels/kg)	749.7	-	898.5	-	879.4	-	776.6	-
Outputs	827.2	-	508.9	-	487.4	-	697.4	-
Profit	263.9	-	207.5	-	211.5	-	243	-

Table 20 shows that while IR504 requires less fertiliser, it requires much more pesticide than the other varieties. IR504 farmers spent 52 percent of their total costs on fertiliser and pesticide, while medium and long duration variety farmers spent 47 and 42 percent, respectively. The total of all inputs for growing IR504 is much higher than for the other two rice varieties.

Although IR504 is more profitable than the other two varieties, high spending on fertiliser and pesticide is not a good sign of rice quality. According to the Vietnamese agricultural think-tank IPSARD (Institute of Policy and Strategy for Agriculture and Rural Development), regularly applying chemical fertilisers and pesticides is harmful to human health and in the long term damages soil and water, which can negatively impact the ecosystem as a whole.

Based on the interviews, it is suggested that farmers consider growing medium rice varieties instead of IR504, given the former's high price and lesser harm to human health and the environment. First, according to the FGDs with farmers in the three provinces, growing medium rice varieties is not as labour intensive as growing IR504. Farmers do not have to apply fertilisers and pesticides very often, leaving them more time for off-farm work. Second, farmers said that they grow IR504 because of the demand from Vietnam. They can shift to fragrant rice, especially medium duration varieties, as long as there is a market for it.

7. Discussion: Stakeholder analysis

There are two major hypotheses in this study. The first is that the Vietnamese government has been restructuring its rice policy to shift concentration from low value to high value rice varieties. Second, farmers in south-eastern Cambodia largely grow IR504, the demand for which depends heavily on Vietnamese traders.

First, through the desk study and interviews with representatives from the Vietnamese public and private sectors, the first hypothesis is found to be true regardless of its implementation. According to the KIIs, the Vietnamese government is now diversifying crops, shifting emphasis to high value rice varieties and other crops such as vegetables, or shifting to animal or fish raising. Vietnam's rice export structure is changing. According to the KIIs, some export companies are starting to export high value rice and are earning better profits. Also, some Vietnamese farmers are thinking to change their rice crops. However, not many have changed yet. Farmers in the Mekong delta are still growing low value rice varieties because it has been their practice for many years and the market is still there. In short, both public and private sector actors stated that the policy is still new, and time is needed for implementation. It may be the medium term before the government sets concrete implementation, seeking new stable markets and helping farmers to become well informed and to adapt. Therefore, in the near term, Vietnamese traders may continue purchasing low value rice from Cambodia.

Second, through the FGDs with farmers and KIIs with Cambodian local traders and provincial departments of agriculture and of commerce, the second hypothesis has also been confirmed. Vietnam is the major buyer in the three studied provinces. The market is almost a monopoly, as Vietnam is the only main buyer. Cambodian farmers produce both wet rice (aromatic or high value) and dry rice (low value) varieties. Dry rice varieties are grown commercially, while wet rice varieties are mainly for family consumption, or surplus is traded. Very few grow vegetables. If Vietnamese traders were to stop their purchases, there would be a large negative impact on the livelihood of farmers in south-eastern Cambodia.

Third, millers and traders in the studied areas have no capacity to absorb the excess paddy if Vietnam stops its purchases. Millers are in need of working capital and low interest rates in order to expand their capacity. There are a few big rice millers in Cambodia; however, given the insufficient infrastructure and logistical arrangements, they could not efficiently collect additional paddy. Further, because farmers spend less time harvesting their paddy, traders and millers need to enlarge their purchases during the harvest season, which requires a large storage and high drying and milling capacity.

Fourth, the public sector in Cambodia realises the importance of markets for agricultural produce. They are looking for new markets to diversify away from neighbouring countries. China is one success in seeking new rice markets. The government is encouraging farmers to grow fragrant rice varieties, which are medium duration. They have identified 10 varieties that farmers should grow for export.

Key messages from stakeholders

Vietnam

PUBLIC SECTOR:

- Government-led restructuring of agriculture is underway
- Restructuring requires the implementation of many decisions and policies
- Policy scope and farmers' awareness of new policy are limited
- In the short-term, there will be no demand shock on imports of low value rice from Cambodia.

Private Sector:

- Exporters make higher profits from high value rice.
- They want the government to seek new high value rice markets, but keep existing low value rice markets

Cambodian traders/millers/exporters

- Rice mills in the study area are small-scale with low milling capacity
- Infrastructure (roads, irrigation) is inadequate and poor quality.
- Electricity is expensive and supply erratic, impeding the establishment of large-scale rice mills.
- Millers cannot buy leftover paddy should Vietnamese traders stop buying it
- Millers need more capital to buy more paddy and enlarge processing capacity.

Cambodian farmers

- Farmers will be hit hard if Vietnam stops its purchases; they will grow other rice varieties that are in demand or seek factory work in urban areas or abroad
- They may continue growing rice for own consumption.
- Too much or too little water and low rice price and price volatility are the main constraints facing farmers
- They suggest that government 1) finds them a secure market, or 2) purchases their paddy
- They can shift production to any variety as long as there is a secure market

Cambodian public sector and associations

- MAFF can help farmers improve their production techniques but its ability to forge market linkages is limited
- Government wants farmers to grow fragrant or high value rice varieties, but it is hard to influence farmers to do so because of high demand for IR504 from Vietnam
- More human and financial resources should be allocated to the Provincial Department of Agriculture.
- If Vietnam stops buying low value rice, the Provincial Department of Agriculture will encourage farmers to grow high value rice varieties and engage millers and exporters in seeking new markets
- Provincial Department of Commerce has a general trade policy, but there is no specific policy to seek new rice markets

8. Conclusion

Natural resource exhaustion, environmental contamination, weak competitiveness, changes in international and domestic demand, fast industrialisation, urbanisation and climate change are very serious concerns for Vietnam. These factors have pushed the Vietnamese government to restructure national economic and agricultural policies. Our interviews with policymakers revealed that intensive production of high yielding low quality rice using huge amounts of chemical fertilisers and pesticides is no longer considered a viable option. It raises production costs, reduces rice value and contaminates soil and water. New policies encourage Vietnamese farmers to concentrate on high value rice varieties and to consider converting to other crops such as vegetables or to livestock farming or aquaculture. Many incentives have been implemented, but policy actions remain relatively small and weak due to production rigidity, farmers' lack of awareness of the new policies, and limited resources for policy implementation. Markets are the most important factor: new stable markets are needed to replace current low quality rice markets. Interviews with rice farmers in An Giang province indicated that more than 50 percent of farmers in the Mekong Delta grow high yielding low quality rice, including IR504. However, they can shift to new crops as long as there is sufficient infrastructure, new technology and especially a stable market. A contract before the start of planting can give farmers a better price. High value rice provides exporters bigger profit margins, though they opined that the government should not completely abandon existing low quality rice markets. Overall, the intention to convert rice production from low to high quality varieties may not be accomplishable in the short term. Therefore, Vietnam's demand for Cambodian paddy will not drop drastically in the near future.

Rice production in south-eastern Cambodia depends heavily on demand from Vietnam, which, as the major buyer, largely influences the price of paddy. A few small Cambodian traders operate in the villages, collecting and selling paddy to Cambodian millers and Vietnamese traders. Only a very small proportion is sold to domestic millers. A few Vietnamese traders visit the rice fields just before the crops ripen and determine the harvesting date for Cambodian farmers. In this case, some farmers sell their paddy directly to Vietnamese traders.

Farmers in the surveyed areas grow both wet (fragrant) and dry rice varieties. Dry varieties are grown mainly for commercial purposes and wet varieties for household consumption. A few farmers trade their surplus wet rice. Dry rice varieties are dominated by IR504, and wet rice varieties are primarily aromatics. Farmers trade their paddy wet, without any value added, which keeps the price low. Very few farmers grow vegetables.

Paddy demand shock from Vietnam will negatively affect households that rely mainly on rice farming income. Around 20 percent of the households surveyed make more than 50 percent of their income from rice farming. This population will be severely affected if Vietnamese traders stop their purchases. However, the impact may not be as severe for others. The majority of survey respondents consider growing rice their main occupation. The main secondary occupation is employment in garment factories and trade. Surprisingly, rice farming is not the main source of household income, providing only around 20 percent of total income. Rather, the main source of household income is working as an employee, accounting for about 35 percent of total income. Only 0.4 percent of household income comes from selling vegetables.

Interviews with local traders found that the processing capacity of local millers is still limited. Millers admitted that they would have no spare capacity to absorb any leftover paddy if there is a demand shock from Vietnam. Their drying and milling capacity is far lower than total rice production in the study areas. There are a few big rice millers elsewhere in Cambodia, but insufficient infrastructure and poor logistics means that they would be unable to collect any paddy surpluses.

The study compared the costs and benefits of rice crops grown in the south-eastern provinces. The results indicate that IR504 (short duration) is the most profitable crop for farmers, followed by medium duration and then long duration varieties. Although IR504 has high yields, it also carries high economic and environmental costs: intensive application of agrochemicals contaminates soil and water and reduces the quality and value of agricultural products. Based on FGDs with farmers and KIIs with policymakers, farmers should switch from IR504 to medium duration varieties, the price of which could almost triple if farmers sell it as dried paddy or milled rice. Therefore, for long-term economic reasons and for sustainable rice production, medium duration rice varieties should be promoted, together with stable market demand and price.

9. Policy suggestion

Based on the interviews, this study suggests:

In the short term, to avoid demand shock, the Cambodian government may have to seek a bilateral agreement with Vietnam, especially with the local governments of border provinces, at least to maintain the current situation and secure the paddy export market. Also, in order to maintain the production structure for the next period, it is necessary to increase production effectiveness, overcome production system weaknesses, and improve the upper rice value chain.

Given the current situation, it is better for government to diversify paddy production in the study areas. There is not enough data to prove that vegetable farming is profitable; therefore, further studies should seek to identify the potential for shifting to other crops in the region.

Farmer training on fertiliser and pesticide use is crucial. It is important to encourage farmers to grow medium duration rice varieties.

Selling wet paddy is a loss for farmers and exporting wet paddy is a loss for the country. In the long term, it is suggested that Cambodia exploit its advantages over older exporters like Vietnam. Cambodia's environment is cleaner and chemical usage is not abusive yet, so there are favourable conditions to produce high value traditional varieties, which can benefit from EU preferential treatment. In order to promote the production of fragrant rice, a substantial investment must be made in infrastructure such as irrigation, transport and milling capacity. However, to exploit new markets while the capabilities of Cambodian companies are limited and infrastructure is weak, the best approach would be to attract Vietnamese enterprises to invest in rice production in Cambodia in order to improve storage and processing and help Cambodian exporters be more proactive and aggressive in increasing their exports of higher added value rice.

In the long term, the market for fragrant rice must also be diversified and secured. As Vietnam restructures its rice policy by shifting to high value varieties, Cambodia can adjust its production structure by growing more high value fragrant rice to meet the demand from Vietnam. Contract farming should be widely encouraged to secure the agricultural market. The weak capabilities of Cambodian enterprises make it difficult for them to develop rapidly. It is desirable to develop farmers' organisations in the coming years because international experience has proved that they are a significant factor in underpinning the sustainability of contract farming.

Government should pay attention to policies for market development and protection and investment cooperation rather than for production subsidies.

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Annexes

Annex 1: Data collection and sampling

Data collection in Cambodia: Quantitative approach – household questionnaire

The quantitative household questionnaire was designed in accordance with the research objectives. As the research focuses on south-eastern Cambodia, which shares a border with Vietnam, the three provinces of Takeo, Prey Veng and Svay Rieng were selected for study. Historically, the paddy and milled rice produced in these provinces have long been traded, formally and informally, with Vietnam, especially dry-season rice.

The research team randomly selected 600 households (200 in each selected province) for interview. The sampling was done in two steps. First, five districts were purposively selected from each province based on the criteria irrigated continued crop, irrigated double crop, irrigated single crop, and rainfed crop, using a cartography database (IRRA 2010). Irrigated districts grow dry season rice, and rainfed and irrigated single crop districts grow wet season rice. Even though the focus of this study is dry season rice, wet season rice farmers were interviewed for comparison purposes. Consequently, three dry season districts and two wet season districts were selected from each province. Second, two villages were randomly selected from each dry season district and two villages (one wet and one dry) from each wet season rice district. As a result, we obtained eight dry season rice villages and two wet season rice villages for each province. However, the field survey revealed that farmers in a selected dry season village and district (Peam Chor) did not grow dry season rice, so another district and village in Prey Veng province were added.

Figure A1: Map of the study area



Sample households were equally and randomly selected from the 10 selected villages in each selected province (20 households per village; 200 households per province; 600 households for the three provinces). During the fieldwork, enumerators under the direct supervision of CDRI researchers, randomly selected households in each village.

Table A1: Sampling for household interviews

Province	District	Commune	Village	Households
Prey Veng	Kamchay Mear	Kranhung	Angkrong Ti Pir	20
		Smaong Cheung	Thnonh Khang Lech	20
	Kampong Trabaek	Peam Montear	Ta Kaev	20
		Prasat	Chambak	20
	Peam Chor	Kaoh Chek	Speam	20
	Pea Reang	Prey Pnov	Samreab	20
		Prey Sniet	Prey Sniet	20
	Preah Sdach	Preah Sdach	Anlong Char	20
		Sena Reach Otdam	Samnoy	20
	Svay Antor	Angkor Tret	Angkor Tret	20
Svay Rieng	Chantrea	Samraong	Chek	20
		Toul Sdei	Toul Sdei	20
	Kampong Rou	Samyaong	Ruessei Lieb	20
		Thmei	Chob Pring	20
	Romeas Haek	Kampong Trach	Ta Khob	20
		Mream	Mream Khang Cheung	20
	Svay Chrum	Ta Suos	Ta Pa	20
		Svay Thum	Chamreh	20
	Svay Teab	Popeaet	Svay Koy	20
		Romeang Thkaol	Kranhung	20
Takeo	Angkor Borei	Ba Srae	Poun Kak	20
		Prey Phkoam	Prey Phkoam Ko	20
	Borei Cholsar	Doung Khpos	Doung Khpos	20
		Kouk Pou	Kampong Youl	20
	Kiri Vong	Saom	Daeum Rumdael	20
		Saom	Pong Tuek	20
	Kaoh Andaet	Krapum Chhuk	Trapeang Ta Uy	20
		Prey Khla	Chumrum	20
	Treang	Sambour	Prey Phdau	20
		Thlok	Svay	20
Total				600

KIIs for the upper part of the rice value chain

Two research consultants from CPS conducted KIIs with millers, exporters, milling association representatives and government officers (MAFF, SNEC, MOC) to collect information on the upper rice value chain. CDRI researchers took part in these interviews as necessary. The KIIs were designed by CPS in collaboration with CDRI. Ten key informants with experience in the rice sector and deep knowledge of the rice industry in Cambodia were selected for interview. The sample was divided into three groups – paddy associations and development

partners, public institutions, and rice millers/exporters. The sample was designed to include key players who could provide different perspectives on the impact of regulatory changes, policy making and practice on farmers. Each interview lasted approximately 90 minutes. The face-to-face interviews were equivalent to a discussion. Every informant was interviewed once. Each interview was administered by two interviewers who took turns to write notes and ask questions. Questions were not provided prior to interview.

Table A2: List of interviewee of upper rice value chain

<i>Category</i>	<i>Interviewee</i>	<i>Establishment</i>	
<i>Miller associations and development partners</i>			
1	Cambodia Rice Federation	Mr Sok Puthivuth (President)	2014
2	Cambodia Agricultural Value Chain Program (CAVAC)	Mr Pieter Ypma, (Program Manager)	2010
<i>Public institutions</i>			
3	Ministry of Agriculture, Forestry and Fisheries	Mr Ngin Chhay (Director of Department of Rice Crop)	NA
4	Ministry of Commerce	HE Thao Sokmuny (Assistant to Minister)	NA
<i>Rice millers/exporters</i>			
5	Apsara Rice	Mr Ith Vichet (Former Director)	2014
6	Boost Riche Cambodia	Mr David Van (Director)	2014
7	Crystal Rice Kampuchea	Mr Thab Maren and Mr. Sim Sophea (Admin. Manager and Marketing Manager)	2014
8	Golden Daun Keo Rice	(Export Manager)	2012
9	Golden Rice	Mr Sok Hach (GM)	2009
10	Signature of Asia	Mr Chan Vannak (GM)	2013

KIIs for the lower part of the rice value chain and the FGDs

The CDRI team conducted 15 KIIs with three main agents located in the study area. First, KIIs were conducted with officers from the provincial departments of agriculture and commerce, the two main institutions directly responsible for enhancing rice production and rice markets in each province (six KIIs in total). Second, the team interviewed two rice millers in each province (six millers in total) to obtain information on their milling capacity and purchasing ability, and to understand the real situation in the study area. Lastly, the team interviewed one rice trader in each province (three traders in total) with experience doing trade with Vietnam.

In order to obtain qualitative and insightful information from the study area, CDRI team also conducted three FGDs with rice farmers in each province (nine FGDs in total). At least eight farmers took part in each FGD.

Table A3: KIIs and FGDs in the study area

<i>Category</i>	<i>Number of interviewee</i>	<i>Total</i>	
KIIs			
1	Provincial Department of Commerce	One in each province	3
2	Provincial Department of Agriculture	One in each province	3
3	Rice miller	Two in each province	6
4	Paddy and rice trader	One in each province	3
FGDs			
	FGD	Three in each province	9

Data collection in Vietnam: KIIs with representatives from the public sector and research think-tanks

Coordinated by LMPPI, two researchers, one from CDRI and another from CPS, went to Vietnam to conduct KIIs with Vietnamese policymakers and researchers. The CDRI team designed the KII questions. LMPPI arranged three official meetings and a working lunch in Hanoi. Dr Nguyen Van Giap, LMPPI researcher, accompanied the two Cambodian researchers to Hanoi. The research team spent one full day in Hanoi meeting three different stakeholders. These meetings were friendly, productive and informative. Plenty of insightful information about agricultural and rice policies, production and markets in Vietnam and Cambodia was exchanged.

Table A4: Interviewed public sector representatives in Vietnam

Interviewees	Position	Institution	Meeting
Ms. Pham Thi Kim Dung	Researcher	IPSARD	KII and Discussion
Dr. Tran Cong Thang	Vice Director General	IPSARD	Presentation, KII and Discussion
Dr. Dang Kim Sun	Director General	IPSARD	Working Lunch and Discussion

KIIs with private sector representatives

AGU, led by Dr Kien Van Nguyen, helped the CDRI team conduct research in Vietnam. The key informants in Vietnam were divided three groups: rice producers, rice traders, and rice exporters. CDRI designed the KII questions. The AGU team translated the KII questions from English to Vietnamese and conducted 11 KIIs: five with rice producers, three with rice traders and three with rice exporters.

Annex 2: Vietnam's agriculture and rice policy

Agriculture has played a remarkable role in Vietnam's economy. Rice production has contributed significantly to the development of this sector. Rice farming has been the main source of income for rural people – 70 percent of rural households (around 9 million households) grow rice. Since the 1980s, aiming to feed a huge population (more than 50 million in the 1980s and around 93 million in 2016), agricultural policy has prioritised rice production, focusing on quantity and high yielding crops. Investment in irrigation was a major priority of the Vietnamese government at that time. After some three decades of intensive rice farming, Vietnam has become the world's leading rice export country. However, the growth rate of rice production and yields have stagnated in recent years. Natural resource exhaustion, environmental pollution, weak competitiveness, changing international and domestic demand, rapid industrialisation, urbanisation and climate change are the significant factors pushing Vietnam to restructure its economy as well as its agriculture policy (Dang 2014).

Dr Dang Kimsun, in his presentation on Agriculture Sector Structure and Restructuring (2014), highlighted the remarkable restructuring of Vietnam's agriculture sector ranging from crops, livestock, aquaculture, forestry and salt production to food processing and rural industry. Due to tough competition and rapid change in world demand, Vietnam can no longer focus only on rice production, but needs to adjust to the market. Therefore, a systematic policy ranging from input supply, rice farming, processing to storage and trading is crucial to the restructuring of its agriculture sector.

Agricultural sector restructuring scheme

Crop Restructuring: Focus on production development, large scale, concentrated farming in association with processing, storing, and trade.

Livestock Restructuring: Focus on concentrated farming large family farms and farms, Science and Technology (S&T) application and food safety assurance.

Aquaculture Restructuring: Focus on intensive farming with key commodities, applies international standards, promote off-shore fisheries.

Forestry Restructuring: Focus on increasing economic value in association with forest reservation; environment and biodiversity production; and climate change adaption.

Salt Production Restructuring: Focus on industrial scale production, mechanization, automation, efficiency and quality improment.

Processing Industry and Rural Industry Restructuring: Focus on improving the added value and protect rural environment.

Source: Dang 2014; Decision 899/QĐ-TTg, 10 June 2013

Dr Tran Cong Thang, Vu Huy Phuc, Dinh Thi Bao and Nguyen Le Hao published three articles in 2015 and 2016, reviewing Vietnam's agricultural and rice policy. These papers provide a synthesis of all the decisions and policies that directly and indirectly influence rice sector development in Vietnam. They point to the increasing attention being paid to agriculture, particularly the rice sector. Plenty of supporting policies have been enacted and continually updated in order to support and address the current issues facing the sector. The papers also highlight the strengths and shortcomings of the policies. In general, the authors categorise Vietnam's policies into three types: rice production, rice trade, and value chain development.

The following sections present a brief review of the three articles (Tran and Dinh 2015; Tran and Nguyen 2015; Tran and Vu 2016).

Rice Production Policy: to achieve food security and export targets, the Vietnamese government decided to maintain the agricultural area at around 4 million ha. To that end, it has allocated funds for paddy specialisation (USD22/ha/year) and normal paddy production (USD4.4/ha/year). The sector has also benefitted from huge investments in rural infrastructure, notably irrigation and roads, amounting to USD175.44 million in 2009 and around USD87.72 million since 2010. To encourage more investment from private enterprises, the Vietnamese government covers 20 percent of land rent and water costs in the first five years after basic construction. Water for agriculture is free in Vietnam. Individuals and households are exempted from agriculture water fees, at an annual cost to the state and provincial budgets of around USD280.704 million. Importantly, government supports are available for agricultural inputs and materials. During natural disasters and disease outbreaks, government covers 50 to 70 percent of the cost of farming materials. Plus, government also covers 70 percent of the cost of land reclamation and 100 percent of seed cost in the first year of rice farming, and 70 percent of seed cost to convert to paddy production from other crops. Rice farmers in Vietnam can obtain credit at preferential interest rates from the government. The annual interest rate for a loan to purchase inputs such as fertilisers and pesticides, not exceeding USD307.02/ha, is 4 percent. Farmers can also access long-term loans (24 months maximum) to buy agricultural equipment and machinery maximum.

Agricultural Trade Policy: The Vietnamese government will support 50 percent of the cost of agricultural advertising via mass media, 50 percent of the cost of trade fairs and exhibitions, and 100 percent of the cost of trade fair pavilions (construction and decoration). To enhance the quality of rice exports, certain standards have been set for Vietnamese export companies, including specialised storage capacity of 5,000 tonnes minimum and milling capacity of at least 10 tonnes/day. The government has set a preferential tariff of zero percent for all kinds of rice and tobacco imported from Cambodia and Laos. Most importantly, to control price volatility, the government has issued a floor price for rice at the farmgate and the export border. The minimum farmgate rice price for farmers is set based on paddy production costs, which vary by region, allowing a 30 percent profit margin for farmers. Similarly, the floor price for rice exports is set based on the average prices submitted by export companies.

Value Chain Development Policy: This policy intends to promote large-scale production and enterprise development, support farmer organisation and enhance agro-product export contracts. The government provides enterprises with one-time support for buying certified seeds (maximum 30 percent of the cost) and for three months storage (100 percent of the cost). Furthermore, enterprises are exempted from land use charge/rent for agro-processing factories, warehouses, and housing for agricultural workers. Policy also finances 50 percent of the cost of farmer training. However, the enterprise must have a contract with another enterprise to supply agriculture inputs or materials to farmers in the large field project.

Crop restructuring in Vietnam

The degradation of soil quality after years of intensive farming and overuse of chemical fertilisers and pesticides together with changing world and domestic demand for rice have pushed the Vietnamese government to prioritise the quality of rice over quantity. Shifting production from low value (low quality) rice varieties to high value aromatic or sticky rice is now a top priority. Even though high quality varieties yield less than low quality varieties, domestic and international market prices are significantly higher. Importantly, high quality rice

varieties require less chemical fertilisers and pesticides, which could reduce both production costs and environmental damage.

Tran and Nguyen (2015), in their article “Restructuring Crop Production in Vietnam”, point to the importance of restructuring crop production in the country after a long period of concentrating on quantity through intensive application of agrochemicals. Crop production on traditional rice land must be diversified so that farmers can earn more and improve their livelihoods. So far, certain policies have been enacted and implemented in spite of some implementation problems. These include policies that encourage farmers to grow and invest more in high value crops, and encourage collaborative linkages between production and consumption of agricultural products. As for crop restructuring, seven steering committees have been established to assist the minister with matters relating to coffee replanting, sustainable development, fruit production development in the southern region, sustainable tea development, restructuring paddy crops in the Mekong Delta, VietGAP, and rice restructuring. As a result, farmers in Cuu Long, Mekong Delta, have converted 87,310 ha of rice land to other crops and farmers in the northern part decided to plant subsidiary crops instead of rice on 10,000 ha. Their incomes have since increased and their livelihoods improved.

The interviews with Vietnamese policymakers consistently indicated the government’s strong intention to shift from low value to high value rice crops or other high value crops. In their view, growing only high yielding low value paddy cannot improve farmers’ livelihoods and has ruined the environment. They said that despite many supporting policies, farmers earn very small margins from rice farming while traders and exporters earn much higher profits. The farmgate price is too low for farmers to make a reasonable profit. Moreover, they admitted that even though Vietnam exports a huge amount of rice to the international market, the profit margin is small compared to other agricultural products. They observed that Vietnamese exporters have little bargaining power in the very competitive international rice market. The process of exporting rice is also complicated and costly. Some countries such as the Philippines require foreign export companies to bid for rice import quotas, which lowers the rice price to almost breakeven point.

In short, in interviews and discussions, Vietnamese policymakers and rice policy researchers consistently agreed that, given serious environmental degradation and new market pressures, ideally Vietnam should move away from intensive production of low value rice and diversify into high value paddy or other high value crops, or other agricultural products. However, all of them expressed concern about the prospects of shifting focus, as it could take several years to raise sufficient awareness among farmers. Also, policy implementation will require a lot of resources. Tran and Nguyen (2015) highlight a limitation of crop restructuring policies being inconsistent awareness of these policies among farmers. The fund to support policy implementation is not sufficient, especially for infrastructure and irrigation development. Moreover, the market for conversion crops is not stable, and cannot absorb large-scale production. Interestingly, one of the key informants, Dr Dang Kimsun, shared a similar observation, that it is sometimes difficult to change people’s (farmers) ideas and behaviours, especially when they have been doing things a certain way for a long time and the market and networks are already there. Therefore, changing the whole rice value chain so that production and markets can be shifted at the same time will take time and resources.

Annex 3: The new rice policy in Cambodia

The new rice policy was drafted in 2016 and should be launched in 2017. It embraces the key principles of participation, transparency, competitiveness and sustainability. The policy covers many aspects including production improvements through innovation and more benefit-cost analyses of investment projects, better understanding of demand and competition, strengthened coordination among stakeholders, creating the overall big picture and providing a clear vision so that the sector can move forward in a positive manner.

- **Establish a platform for information sharing and policy implementation monitoring:** Information about the rice sector is fragmented, incomplete, often unreliable, not widely disseminated, sporadically analysed and rarely discussed rigorously. This limits the opportunity of evidence-based policy decisions and causes overreaction to news that is sometimes poorly verified. The new rice policy requires the establishment of a formal participatory platform to share information and monitor policy implementation. It is called the Rice Policy Platform (RPP) and consists of government (MEF, MAFF, MOC) and private sector representatives and farmers. The RPP will promote dialogue between stakeholders on issues related to rice policy implementation. Overall, the aim is to establish a culture of dialogue and information sharing rather than confrontation.
- **Develop a shared vision based on high quality fragrant rice and higher value:** Cambodia needs a clear vision for the rice sector. Besides being the major source of food security for the country, rice in Cambodia can have a key role in exports and rural development. The vision therefore is to promote Cambodia to become a leading exporter of fragrant rice. This vision does not contradict the food security function of the rice sector. The new policy is narrower than the one formulated in 2010.
- **Gather market intelligence about customers and competitors:** Cambodia is often thought to have low competitiveness. This is largely the result of low productivity at farm level, weak supply chain management, scarce innovation, poor logistics, lack of branding, bottlenecks in the postharvest system and high energy costs. These factors underpin Cambodia's very small market share in global rice exports. Competitiveness requires strong knowledge of consumers' preferences. The new policy requires the establishment of a Rice Market Intelligence Unit at the Cambodia Rice Federation. The Unit would collect, analyse and document information on markets and competitors and ultimately distribute that information to stakeholders.
- **Increase productivity through adequately funded innovation systems:** Cambodia needs to strengthen its research, extension and education systems to promote innovation at all stages along the value chain. The sector needs a combination of land expansion, yield improvement and total factor productivity growth that creates income growth for farmers and other actors in the value chain. This requires innovation and determined effort by both public and private sectors through more efficient practices at different levels. Government must therefore recognise and reward innovative private sector actors that can contribute to the sector's overall performance.
- **Enhanced supply chain management of rice milling industry:** The key actors in the supply chain are millers, farmers and traders. Millers in Cambodia generally rely on traditional methods of supply chain management. They collect paddy from collectors, small traders, large traders and small mills that cannot assure the quality, timeliness and prices needed to meet international orders and quality standards. Contract farming in the rice sector is

basically absent. To strengthen the supply chain, the policy aims to establish a program to enhance the supply chain management of rice millers and farmers, support the formation of successful contract farming, benchmark supply chain performance and monitor progress, and build internal stringent requirements within the Cambodia Rice Federation for exporters and millers engaged in export business to have an evidence-based system.

- **Improve rice value chain infrastructure through cost-effective investments:** Value chain infrastructure includes irrigation and drainage systems, market places, warehouses, transport (roads, railways, waterways, ports), energy and postharvest systems. A lot of past investments, whether by the public or private sector, have been considered wasteful or ineffective – a grim result given the limited resources available for such investment. The new rice policy will include measures to ensure proper assessment of selected projects before investment, the conduct of detailed reviews and periodic maintenance post investment, and close cooperation with the private sector in any future investment to attain the highest benefit-cost ratio.
- **Develop a harmonised joint master plan and ensure that it is adequately funded:** There is a need for a harmonised action plan among different stakeholders. This is important to create an overall big picture, eliminate redundancy and align key stakeholders' activities. For example, the master plan could also include recommendations to focus on specific geographical areas, with clear targets for producing rice of a specific quality. If a specific province or area common to more than one province or area is found to have a comparative advantage in producing a specific rice variety, then the budget, services, logistics and other inputs should be allocated to that province or area to ensure the highest returns. This will make post-production activities more cost-effective.

Table A5: Source of extension services, advice and support accessed by farmers (%)

Type of practice, information or support	Source of extension service, advice and support											n
	Neighbour	Local authority	NGO	Friend	Local store	Rice trader	Prov Dept of Agri	Self-study	VN trader	Total		
Disease and pest control for rice	6.4	2.36	49.83	5.72	5.05	5.72	22.22	0	2.69	100	297	
Row planting	8.81	1.26	55.97	2.52	0	0	31.45	0	0	100	159	
Improved rice varieties	15.98	2.37	41.42	5.92	0	10.06	23.08	0	1.18	100	169	
Rice seed selection	21.29	1.61	42.97	3.61	0.4	6.83	21.29	0.4	1.61	100	249	
Chemical fertiliser application	6.02	0.67	55.52	4.68	3.68	7.69	18.39	0	3.34	100	299	
Composting/organic residue management	2.84	1.7	60.8	7.95	0	0.57	26.14	0	0	100	176	
Irrigation management	7.14	4.76	54.76	4.76	0	1.19	27.38	0	0	100	84	
Water management for rice	15.83	5.76	43.17	5.76	0	1.44	25.9	0	2.16	100	139	
Drying post-harvest	28.57	0	42.86	4.76	0	3.57	20.24	0	0	100	84	
Storage facilities	16.9	1.41	46.48	11.27	0	0	23.94	0	0	100	71	
Pest control post-harvest	22.78	2.53	44.3	10.13	0	1.27	18.99	0	0	100	79	
Advice on output prices	31.34	0.75	18.66	8.21	1.49	32.09	2.99	0	4.48	100	134	
Advice on input prices	27.43	0	31.86	8.85	1.77	21.24	2.65	0	6.19	100	113	
Collective marketing or group selling	30	10	50	10	0	0	0	0	0	100	10	
Information on where to sell	62.16	0	13.51	10.81	0	8.11	2.7	0	2.7	100	37	
Credit from local bank, MFI or savings group	2.38	0.48	96.2	0.48	0	0	0	0	0.48	100	421	
Total	12.97	1.63	54.46	5.08	1.23	6.03	16.86	0.04	1.71	100	2,521	

Source: Quantitative household survey for this research

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