CASSAVA VALUE CHAIN ANALYSIS
INCLUSIVE BUSINESS MODEL FOR PROMOTING SUSTAINABLE SMALLHOLDER CASSAVA PRODUCTION (IBC)

November 2015
ABOUT SNV

SNV Netherlands Development Organisation is a non-profit, international development organisation established in the Netherlands in 1965. SNV aims to alleviate poverty by enabling increased income and employment opportunities and increasing access to basic services. The organisation currently works in 38 countries in Africa, Asia, and Latin America. SNV provides capacity development services to local organisations in three sectors; Agriculture, Renewable Energy, and Water, Sanitation & Hygiene. SNV started its operation in Cambodia in 2005 and currently works in those sectors which have been prioritised and aligned with the Royal Government of Cambodia’s Development Plan.

SNV Cambodia, November 2015
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<tr>
<td>ACFTA</td>
<td>ASEAN-China Free Trade Area</td>
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<td>AFTA</td>
<td>ASEAN Free Trade Area</td>
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<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<td>CCC</td>
<td>Cassava Collecting Centre</td>
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<td>CEDEP</td>
<td>Cambodia Export Diversification and Expansion Program</td>
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<td>CIAT</td>
<td>International Centre for Tropical Agriculture</td>
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<td>CTIS</td>
<td>Cambodia Trade Integration Strategy</td>
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<td>FAO</td>
<td>United Nations Food and Agriculture Organization</td>
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<td>GDA</td>
<td>General Directorate of Agriculture</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit (German Development Organization)</td>
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<td>GMS</td>
<td>Greater Mekong Sub-region</td>
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<td>IBC</td>
<td>Inclusive Business for promoting sustainable Cassava smallholders project</td>
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<tr>
<td>KHR</td>
<td>Khmer Riel (Cambodian currency)</td>
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<td>MAFF</td>
<td>Ministry of Agriculture, Forestry and Fisheries</td>
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<td>MFI</td>
<td>Micro-Finance Institution</td>
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<td>MOC</td>
<td>Ministry of Commerce</td>
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<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities and Threats</td>
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<td>UNDP</td>
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Executive summary

In 2013, with financial support from the International Fund for Agriculture Development (IFAD); SNV in collaboration with CIAT, initiated the Inclusive Business Model (IBM) intervention to promote Sustainable Smallholder Cassava Production (IBC). The IBM project worked with smallholder farmers to improve their productivity through better production techniques and creating market linkages with cassava processors and traders/collectors, enabling a win-win situation for all stakeholders involved.

This report focuses on the cassava value chain of the targeted areas in Tboung Khmum province, where the IBM project was undertaken. The information herein was sourced from survey data and interviews conducted in the project targeted area (In February 2014), which forms the bulk of the report. Despite being project area focused, this study occasionally makes references to national cassava value chain aspects, particularly with regard to policy. The assumption is that the target area is representative of cassava value operations nationally.

This report examines challenges, opportunities and stakeholder interactions in the Cambodian cassava value chain. It also examines the policy environment and gender aspects in the value chain. By analysing the linkages and processes of the value chain, the study aims to contribute to an improved understanding of cassava stakeholder perspectives and inform strategies for further strengthening of the value chain, with knowledge potentially transferable to related value chains.

Cassava in Cambodia: An overview

More than 90% of all internationally traded cassava products come from the Greater Mekong Sub-region countries, primarily from Thailand and Vietnam, with more than 60% of all cassava produce imported by China. This impressive regional production of cassava is partially driven by increasing demand for cassava products and the declining export value of rubber, which is a common alternative cash crop in cassava growing areas.

Cassava is used for a wide array of products: as food for human consumption, starch for human food products, animal feed, starch and modified starches for industrial products, and for ethanol production for fuel. Therefore, the potential for stakeholders in the region to benefit from the cassava trade is immense: be it through processing and domestic sale or use, or through sale to neighbouring countries, including China, as a feedstock for processing. The cassava value chain is therefore very well positioned to harness the potential of engaging in linkages with smallholder farmers and including them in the value chains of processing and exporting enterprises.

In Cambodia, cassava is the second major cash crop after rice. According to MAFF (2013), Cambodia’s total area under cassava production expanded dramatically from
around 16,000 ha in 2000 to 361,584 ha in 2012 and 421,375 ha in 2013, accounting for 43% of the total cultivated area used for cash and industrial crops. Some of the key cassava producing areas in Cambodia can be found in provinces neighbouring with international borders such as Banteay Meanchey, Pailin, Oddar Meanchey, Kampong Cham and Tboung Khmum.

A number of factors are driving this increase in cassava production. These include: the rise of international cassava prices, new domestic processing facilities, the adoption of higher yielding cassava varieties, and the expansion into new production areas where soils are relatively fertile. This is evident in the more than doubling of the average yield to some 20 t per ha – one of the highest yields for fresh cassava root reported in the world. Only India and Thailand have reported comparatively higher average yields.

The Ministry of Commerce reports that Cambodia’s exports of cassava increased dramatically in the years leading up to and including 2011, despite the devastation the agriculture sector experienced in that year due to floods. Ministry Statistics show that Cambodia’s exports of dry and fresh cassava hit about 22,652 tonnes between January to September in 2014, compared to 11,656 tonnes in the same period in 2013. In 2013, Cambodia exported about 750,000 tonnes of fresh cassava roots (99% to Vietnam), and 1.27 million tonnes of dry chip (50% to Vietnam and 46% to Thailand).

However, yields differ markedly across Cambodia, which is why in the project area, the yield remains low - the average yield is around 18 t per ha. This is because cassava cultivation can have serious adverse impacts on soil quality, with sharp decreases in yield usually experienced after about three years of successive cultivation. Newly cultivated land will typically generate very high yields, encouraging farmers to repeat the practice year-on-year, only to find that average yields decline quickly.

The rapid expansion of Cambodia’s production of cassava presents an ideal opportunity for the sector to reduce its heavy reliance on informal export channels and fully integrate with the region. Cambodia’s increased production capacity has enabled a local processing sector to emerge, drawing on the many end-uses for cassava and favourable international prices. Potential processing activities include drying cassava, as well as the production of animal feed, starch, bio-fuel and alcohol – providing a strong basis on which to further develop value-added activities and exports.

**Value chain in project area**

Kampong Cham province was initially selected as the project site. Half way through the project however, the province was split into two, meaning the IBC target areas now fell within the new Tboung Khmum province. This area was chosen because it has the largest area of cassava cultivation in the country as well as a history of cultivation of the crop. In 2007, the province accounted for over 50% of the total cassava area in Cambodia (MAFF, 2008). It is also representative of the diverse
range of environments and management practices of the cassava-based cropping systems in Cambodia.

Cassava production in Tboung Khmum has been increasing with the expansion of the cultivated area but over the years productivity has remained more or less the same, with an average of 20 t/ha.

Three communes located in two districts of Tboung Khmum province were selected as target areas of the project. As part of the IBC, farmer groups from the selected communes worked with three cassava processing enterprises: Sun Ath, Song Heng and Ly Hong Leng.

The key stakeholders in the cassava value chain in the project area include: input suppliers, farmers/producers, traders and processors, final processors and exporters.

**Input suppliers:** There is no proper industry in Cambodia that produces farm inputs such as fertilizer and pesticides. This lead to a dependence on either high-cost imported products or illegal low-quality imported products.

Most local input suppliers are based in certain markets at the commune and district levels; or retail markets such as Soung municipal, Khnar and Kor markets with distances less than 10km from the targeted communes. There are 17 input suppliers located around the Tboung Khmum district that sell many kinds of fertilizer, herbicide, pesticide and animal feeds and veterinary products. About 60% percent of input suppliers also sell groceries.

Producers or clients buy products whenever they need to deal with specific issues, mainly diseases and pests. Most cassava producers don't apply much fertilizer but many use herbicide. Normally, producers don’t have information or clear instructions on how to apply inputs in their farms and often they get advice from suppliers or neighbouring producers.

Although 40% of input suppliers have experience in cassava production, they do not recognize pests and disease that require treatment and didn’t know where to find information about them (SNV Survey of input suppliers in Tboung Khmum). The remaining 60% don’t have experience in cassava production, thus their recommendations to farmers are abstract.

**Input distributors:** There are four main input distributors or wholesalers based in Suong municipality that supply their products to the commune and district markets and around the targeted area, including big farms. Their total annual sales of fertilizer amount to 2500 t of chemical fertilizer, natural fertilizer 200 t, 1800 boxes (12 bottles/box) liquid fertilizer, 1250 boxes of herbicide and 1150 boxes of pesticide.

The biggest distributor in the project area is called Lim Kong Heng. It has a turnover of around $125,000 and sells different kinds of fertilizers, pesticides and herbicides. Other distributors have turnovers of less than $25,000 and focus on a few inputs with some being very specific.
Financial institutions: Microfinance Institutes (MFIs), banks and moneylenders have played a role by providing financial support to producers, middlemen and processing enterprises in the target area. The bank of preference is ACLEDA Plc. But other financial institutions, including MFIs such as AMRET, Vision Fund, AMK and Prasac also operate in the targeted area.

Farmers/Producers: Based on our survey, about 66% of the farmers in Kampong Cham province have grown cassava for 5 to 10 years, while about 90% of the farmers in Pailin provinces have grown cassava for less than four years. Some farmers in Kampong Cham have grown cassava for 20 years.

In Kampong Cham province, farmers produced soybean, mung bean, and sesame while maize crop were mostly grown in Pailin province before planting cassava. Many farmers planted cassava as a mono-crop (54% of farmers in Kampong Cham and 96% of farmers in Pailin). Only a few farmers wish to grow cassava as a mixed crop (Aye, 2014).

Cassava collecting centres (CCCs): There are 10 cassava collecting centres within the project districts that collect on average 9260 metric t of fresh cassava annually and they mainly export it to Vietnam. About 40% of the centres were established in 2011, while the rest were set up in 2013. They have linkages with 780 farmers and small transporters.

In some cases, centres buy cassava from farmers at the production stage and the price is negotiated depending on the crop setting and health of the fresh roots. The CCCs will then be responsible for taking care of harvesting and selling the crop.

Traders: Traders, also known as middlemen, are people who have at least one truck (small or medium) and buy cassava directly from farmers at a plantation and sell it directly either to buyers in Vietnam, local processors, or to the CCC.

Each commune has between 20-40 middlemen. During harvesting season, they buy an average of 2000-3000 t of cassava. Although middlemen always carry a manual scale in their truck, they allow cassava owners to use their own scales in order to build trust.

Transporters: Transporters are key stakeholders in the value chain and sometimes dominate the marketing channels of the producers as they can bring the cassava to sell wherever the trader or middleman wants it. According to SNV research, they seem to prefer working for middlemen or buyers whose collection points are located in close vicinity of the production plantations. Most of the transporters provide their services to cassava production areas that middleman cannot access.

Cassava processing enterprises: Three local cassava processors are located in the vicinity of the target area and participated in the the project: Ly Hong Leng, Sun Ath and Song Heng.
**Final processors:** There are 15 processors located in Soung municipality that purchase wet starch from Ly Hong Leng for processing to produce granular starch and gelatinous starch. Most of the products are sold in Phnom Penh markets, with some selling to other provinces. The by-products from processing are supplied to the local market and used for desserts, flour and food dietary recipes.

**Vietnamese buyers:** Vietnamese traders and buyers are the key cassava market players in Cambodia, especially for cassava produced in the provinces near the Vietnamese border such as Kampong Cham, Kratie, Ratanakiri and Mondulkiri.

**Local buyers:** There are two kinds of products for local buyers: dry starch, and gelatinous starch and granular starch (sago). The dry starch is used for making foods and is processed into cakes, mainly in Phnom Penh. While granular and gelatinous starch are used for making sweets.

**Challenges Encountered**

**Policy:** There is no policy or framework specifically focused on cassava production, processing, and trading and market access. Although MAFF considers cassava as one of the main agro-industrial crops and the second most important crop after rice, it does not have a functional system to promote research on Cassava and link and infuse research to agricultural extension to benefit farmers.

**Access to information and markets:** According to farmers in the target areas, they do not experience many problems with market access because there are plenty traders and local processors operate in the project areas. The Vietnamese market absorbs a large chunk of cassava from the place either through the purchase of fresh tubers or semi-processed or processed products. With that in mind, accessing market information that should guide pricing policy is still required. Farmers, traders and processors always mention the price settled at the Vietnamese border as the reference point for negotiations. However, these prices are very fluid and can change within hours. Additionally, this information can also be distorted as there are no means to verify it. Consequently, the Cambodian cassava value chain is somewhat controlled by Vietnamese trade policies thus exposing the sub-sector to market risks.

**Technology:** Cambodia depends on foreign technology. Nearly all of the cassava processors and factories have joint ventures, in particular with companies from Thailand, Vietnam and Korea. Factory equipment is imported, in particular from Vietnam and Thailand. Second-hand equipment demands frequent maintenance and repair, and thus costly. Interviewed processors mentioned difficulties finding skilled labour, and thus employ skilled workers from Thailand and Vietnam. There is also lack of domestic experts to train local staff. (MOC, October 2010).

**Input suppliers:** their main challenge relates to delays in delivery of orders. Retailers often stock in advance before the start of the cropping season. If prices go down after this period, their profit margin is greatly reduced and sometimes even leads to loses.
Another challenge concerns the fact that the input supply is marred by cheap and illegal imports, making it difficult for some suppliers to compete fairly in the market.

**Producers:** The proper functioning of farmer groups is yet to be achieved. All project participants agreed that their cassava farmers’ group was not functioning well, as they do not meet often to talk about the issues of production and market linkages.

There is poor information and no knowledge exchange mechanisms. For example, farmers receive information on prices at the Vietnam border through a phone call without any means of verification. The display panel for group representation is not regularly updated, forcing farmers to check for themselves.

**Cassava collecting centres:** Transport and general logistics are the key challenge for CCCs and traders - they have no storage facilities and therefore need to pick up cassava and transport it to Vietnam on the same day but the price they pay farmers in the morning may have already dropped before they make the final sale in Vietnam in the afternoon.

**Cassava processing enterprises:** High costs of electricity and transportation in Cambodia make it hard for the enterprises to compete with their counterparts across the border in Vietnam. Another challenge is selling the final product (dry starch) as the price fluctuates and the both. A further challenge, is linked to the fact that processing enterprises cannot operate their processing plants the whole year round because cassava is a seasonal. Processing enterprises also need a lot of working capital to store dry starch after processing if they want to wait until the price of dry starch increases and is profitable.

Finally, most of the locally processed dry starch does not meet international standards and is therefore locked out from the international market

**Key conclusions and recommendations.**

- Cassava is the first major crop of farmers in the targeted area. Most of the farmers rely on cassava production to generate family income in spite of a decline in the production area due to intercropping with rubber, plus the expansion of municipal/urban area developments in the new province and some people migrating to other provinces.

- Cassava production demonstrates an opportunity for traders and local processors to run their businesses, with an abundance of cassava root available during the harvesting time, from November to March. However, the high seasonality of the crop also poses significant barriers to investment as processing is halted outside of harvesting time.

- The value chain is governed by Vietnamese traders. No other value chain actors in the target area influence the market price because all local traders and processing enterprise owners rely on Vietnamese middlemen to set the price. Farmers’ access to timely market (price) information is only possible with the use of mobile phone calls to middleman and collectors.
Some farmers cannot sell their cassava roots due to lack of transportation.

The middlemen and cassava collectors have more purchasing power than the local processing enterprise owners because they sell roots directly to Vietnamese traders and get cash payment immediately. Meanwhile, the local processors lack the storage capacity to be able to buy excess raw cassava for processing when needed (Raw cassava must be processed within 4 days) or to keep the dry starch they process for long-time storage to be sold when the price of dry starch goes up.

All cassava value chain actors, especially farmers, have very limited access to extension services on cassava production techniques and have limited understanding of pests and diseases. The cassava producers rely on input suppliers for basically unreliable information. The input suppliers normally recommend the use of pesticides without being well informed of proper uses themselves; in which case the farmers may lose income, time, and even their health. Farmers also lack the knowledge to increase cassava productivity especially through the appropriate fertilizer application.

Lobbying is needed for cassava export procedures with a reduced cost of export facilitation to help cassava exporters improve their competitiveness in international markets, and especially in China. Now the costs are too high, and not of value compared with selling to local traders.

Organized supply chains among local processors or collection centres should be further developed. Becoming more organized will facilitate inclusive business relationships, which will help guarantee product quality from producers to processors.

Processors should be assisted in setting up inclusive business plans, where the cost-benefits are calculated as well as planning for implementation.

More coordination and partnership among stakeholders to improve market information systems and improved service delivery is needed. This could be achieved by setting up a national level cassava export association for improved market information, market access/intermediation and working with policy-makers to improve cassava export policy.

Smallholder farmers should organize themselves for application of the inclusive business model and promote women to play active roles in leadership and management.

To address the issue of low productivity, extension services should be provided to improve farmers’ understanding of sustainable cassava production including planting techniques, fertilizer application, pest and disease management etc.

It is recommended to incorporate climate smart cassava production in the extension services. This would enable cassava farmers to reduce their vulnerability to climate variations (e.g. drought, flood, erratic rainfall, increase of
- Improved access to good quality inputs, such as cassava cutting stems/planting materials and fertilizer, will significantly contribute to improved productivity.

- Provide technical support on waste water management to cassava processors.

- Cassava processors should be assisted in certifying their facilities and products to increase the market value and accessibility of their end product.

- More research should be conducted on sustainable cassava production, especially pest and disease management, healthy planting materials, higher yield plant breeding and starch cassava varieties.

- **Finance:** Through collective action, financial institutions should be lobbied to improve access to finance and low interest rates for cassava value chain actors. Current high interest rates are a barrier for local processors to make a profit and supply cassava all year long.

- **Policy:** Policies regarding access to and interest on bank loans, factors of production (e.g. electricity) and export should be developed and revised to benefit the whole value chain, to enable local actors to compete effectively in the market. Direct market intervention is a priority for getting more people to invest in cassava processing plants as well as foreign direct investment (FDI) in order that value added to cassava production in particular does not rely on neighbouring countries.

- **Next steps:** The cassava value chain should be further developed with the assistance of a facilitator, who can coordinate among the actors and lobby for an improved enabling environment. The facilitator ought to work in different areas across the country to improve the competitiveness of the Cambodian value chain. All of these recommendations should be implemented in coordination with projects focused on increasing exports to China.
1. Introduction

Like in other countries in the Greater Mekong Sub-region (GMS), in Cambodia too agriculture is the mainstay of the majority of poor people in rural areas. Although rice remains the primary cash crop, cassava production has been receiving increasing attention.

More than 90% of all internationally traded cassava products come from the GMS countries, primarily from Thailand and Vietnam, with more than 60% of all cassava produce imported by China. This increase in production is partially driven by increasing demand for cassava products and the declining export value of rubber, which is a common alternative cash crop in cassava growing areas.

This report highlights challenges, opportunities and actor interaction in the Cambodian cassava value chain. It also examines the policy environment and gender aspects in the value chain. By analysing the linkages and processes of the value chain, the study aims to contribute to an improved understanding of cassava stakeholder perspectives and inform strategies for further strengthening of the value chain, with knowledge potentially transferable to related value chains.

Cassava is used for a wide array of products including: food for human consumption, starch for human food products, animal feed, starch and modified starches for industrial products, and ethanol production for fuel. The potential for stakeholders in the region to benefit from the cassava trade is immense: be it through processing and then for domestic sale or use; or for sale to neighbouring countries, including China, as a feedstock for processing. The cassava value chain is therefore very well positioned to harness the potential of engaging in linkages with smallholder farmers and including them in the value chains of these processing and exporting enterprises.

In Cambodia, cassava is mainly grown in provinces neighbouring with international borders such as Banteay Meanchey, Pailin, Oddar Meanchey, Kampong Cham and Tboung Khmum.

Despite this potential to improve livelihoods for smallholder farmers and local businesses, cassava yields in Cambodia remain low mainly due to poor production techniques and challenges of pests and diseases (MAFF 2014, International Center for Tropical Agriculture (CIAT)). The market structure is poor and often in the hands of traders and representatives of companies in neighbouring Thailand and Vietnam, exposing farmers and local traders and processors to higher risks because farmers cannot count on steady markets (prices fluctuate widely and information systems do not keep up with the changes). Additionally, farmers face challenges associated with seasonality, quantity and quality of cassava production and supply to local processors/traders.
In 2013, with financial support from the International Fund for Agriculture Development IFAD, SNV in collaboration with CIAT, initiated Inclusive Business Model intervention to promote Sustainable Smallholder Cassava Production (IBC). The IBC project worked with smallholder farmers to improve their productivity through better production techniques and creating market linkages with cassava processors and traders/collectors, enabling a win-win situation for all stakeholders involved.

In the process, the experience gained from inclusive value chain generated knowledge and lessons in best practices that can be used as models for market-based solutions for the poor. The cassava value chain was targeted for knowledge and best practice development, with benefits flowing to other value chains associated with cassava-based production systems, such as animal husbandry and feed systems, or upland crops for rotation with cassava. The project was expected to improve incomes and livelihoods of smallholder farmers and create a stable supply for processors in a more inclusive market.

Based on a preliminary assessment, Kampong Cham/Tboung Khmum province was found to be consistently a cassava producing area with production increasing from 2004 to 2012 with a potential production area of approximately 67,309ha and fresh cassava production was approximately 1.40 million tons in 2012 (Provincial Department of Agriculture of Kampong Cham, 2012). In 2013, the province had at least six medium and large processing enterprises that have a cassava processing capacity of 30-40 tonnes/hour. The province also has around 310 small processing enterprises. However, the number of small enterprises had drastically declined since the medium and large enterprises were established between 2012 and 2013. It is for that reason, the IBC implementing partners decided to select Kampong Cham province as the area for project implementation.

2. **Methodology**

2.1. **Objectives**

This report aims to:

- Map out the key actors and examine governance within the cassava value chain.
- Identify advantages and challenges resulting from the participation of stakeholders in the cassava value chain.
- Highlight areas for potential impact for value chain upgrade.

2.2. **Study approach**

2.2.1 Desk review
A desk review of IBC materials was conducted. These include: project documents, baseline survey, the inclusive business plan of Sun Ath and Ly Hong Leng enterprises, data from the Ministry of Agriculture, Forestry and Fisheries (MAFF), data from the Ministry of Commerce, and the Cambodia Trade Integration Strategy (CTIS) 2014-2018 (UNDP, January 2014).

2.2.2 Field survey

A field survey involving key stakeholders such as, farmers, cassava collection centre owners, traders, cassava collectors, and local processing companies/local processors and input suppliers was conducted.

The surveys were conducted in target areas in Tboung Khmum and Ponheakrek districts, Tboung Khmum Province. This includes 19 villages located in Srolob and Lngain commune, Tboung Khmum district and Kadoarchrum commune, Ponhear Krek district, Tboung Khmum Province.

A total of 60 farmers randomly sampled from the 19 villages, five cassava collector centre owners and two processing factories, eight input suppliers and four input distributors operating within the target area were interviewed in February 2014.

The interviews focused on production flows, marketing chains and associated costs. To verify the information collected, SNV met with local authorities in order to cross check information gathered from value chain actors.

2.3. Scope of the study

This report focuses on the targeted areas in Tboung Khmum province, where the inclusive business of cassava (IBC) project was undertaken. The information herein was sourced from survey data and interviews conducted in the project targeted area, which forms the bulk of the report. Despite being project area focused, this study makes references to national Cassava value chain aspects particularly on policy. The assumption is that the target area is representative of cassava value operations nationally.

3. Findings and analysis

3.1. Cassava value chain: Overview

3.1.1 Cassava production

In Cambodia, cassava is the second major cash crop after rice. According to MAFF (2013), Cambodia’s total area under cassava production expanded dramatically from around 16,000 ha in 2000 to 361,584ha in 2012 and 421,375 ha in 2013, accounting for 43% of the total cultivated area used for cash and industrial crops. Some of the key cassava producing areas in Cambodia can be found in Battambang and Kampong Cham provinces (see Appendix 1).
A number of factors are driving this increase in cassava production. These include: the rise of international cassava prices, new domestic processing facilities, the adoption of higher yielding cassava varieties, and the expansion into new production areas where soils are relatively fertile. This is evident in the more than doubling of the average yield to some 20t per ha – one of the highest yields for fresh cassava root reported in the world. Only India and Thailand have reported comparatively higher average yields.

However, yields differ markedly across Cambodia. Consequently, in the project area, the yield remains low - an average yield is around 18 tonnes per ha. This is because cassava cultivation can have serious adverse impacts on soil quality, with sharp decreases in yield usually experienced after about three years of successive cultivation. Newly cultivated land will typically generate very high yields, encouraging farmers to repeat the practice year-on-year, only to find that average yields decline quickly.

This highlights the critical need for farm extension services that can improve crop management practices through the use of natural fertilizers and crop rotation, for example (Royal Government of Cambodia, 2014).

### 3.1.2 Cassava processing

Fresh cassava root needs to be processed within four days after harvest. Processing of cassava can take place at the farm level or at more sophisticated processing plants, which can produce different products such as dry chips, wet starch, noodles, sago, and dry starch.

At the farm level, cassava leaves can be mixed with fibre residue from starch extraction as cheap alternatives for livestock feed. Tubers (roots) are normally chopped and air-dried and later sold to processing firms. Although the mechanization of on-farm cassava chipping would significantly lower seasonal labour costs, reduce waste (from spoilage) and increase farmers’ profits through value added activities, most farmers have limited or no access to on-farm technology.

Dry starch is one of the ways cassava can be processed. It is an advanced off-farm process that involves the rasping and pressing of root flesh. The “starch milk” produced as a result is then filtered and left to sediment. Excess water is then extracted from this product to make wet starch. Using flash driers, the wet starch is dried to produce dry starch. Fibre residue, a by-product of this process, can be then used as livestock feed or fertilizer.

By 2013, there were nine dry starch cassava modifying factories in Cambodia: six in Tboung Khmum province, two in Battambang and one in Kampong Thom province. In Tboung Khmum, the number has gone down to two due to increased competition and high production costs (in terms of energy) compared to processors across the border (see Appendix 3 for a list of cassava processing factories in Cambodia).
There are around 40 small and medium processor companies located in Pailin province that focus on cassava dry chip processing (silos), and there are also many small and medium processors to produce the dry chip cassava located in other provinces.¹

Usually cassava processing factories purchase fresh cassava roots at harvesting periods (November to April). The average maximum amount of fresh roots purchased is between 35-40 tonnes per day and the minimum amount is 10-20 tonnes per day. The total estimated national requirement of fresh cassava roots may be higher than 400,000 tonnes per year (Aye 2014).

There is a wide variety of value-added cassava products. Today, they include: dry chips, wet starch, noodles, sago, and dry starch. Dry starch and sago are mainly produced in Tboung Khmum province. While dry chips are being produced in Kampong Cham and Pailin provinces.

There are only two ethanol processing factories and they are both located in Phnom Penh: MPH, a Korean investment company, and SKD Company -a state-owned company. However, there is no information available about their sourcing of cassava.

3.1.3 Environment

Based on group discussions with farmers comparing the last 10 years, cassava yield is declining from year to year. The unmanaged monoculture of cassava and the lack of technical knowledge represents a risk for farmers and has a negative environmental impact, affecting soil fertility, and leading to the spread of pests and diseases. Furthermore, expansion of cassava production areas is often linked to deforestation.

Cassava processing produces large amounts of waste - fibre by-products and water extracted from “starch milk” - that can have negative impacts on the environment and human health if not disposed of properly. The smell from the waste affects the environment of the farming community living in the vicinity of processing plants. While the improper disposal of waste affects the aesthetic value of the surrounding environment. Unless these by-products are treated properly and prevented from leaking into the water system in the area, the water should not be used for drinking and/or cooking (Sarom, June 2014).

One way of tackling this issue is waste management and use of by-products for animal feed and fertilizer, which should be supported in order to value-add products along the value chain.

3.1.4 Demand

¹ Kampong Cham, Kratie, Mondulkiri, Ratanakiri, Stung Treng, Preah Vihear, Kampong Thom, Siem Reap, Banteay Meanchey, Oddar Meanchey, Pailin, Battambang, Pursat, Kampong Chhnang, Kampong Speu, Kampot and Preah Sihanouk
According to the value chain information unit of the Ministry of Commerce, approximately 20% to 30% of cassava starch produced in Cambodia is consumed locally, especially as animal feed (EMC, 2008). There is little processing capacity to value-add to the remaining locally produced starch, which is exported to Thailand or Vietnam.

China has become the principal buyer of cassava products in the world and the Chinese market demands around 25% of cassava production in the world. Since 2008, its share of the global demand for fresh/dried cassava has more than doubled from 37% of total imports to 84% in 2012 while the EU’s share has declined dramatically from 32% to less than 2% over the same period. (FAO 2013). In response to China’s demand for cassava, Cambodia and China signed an export deal in 2012, creating an immense direct market opportunity.

### 3.1.5 Export

The Ministry of Commerce reports that Cambodia’s exports of cassava increased dramatically in the years leading up to and including 2011, despite the devastation the agriculture sector experienced in that year due to floods. Ministry Statistics show that Cambodia’s exports of dry and fresh cassava hit about 22,652 tonnes between January to September in 2014, compared to 11,656 tonnes in the same period in 2013. In 2013, Cambodia exported about 750,000 tonnes of fresh cassava roots (99% to Vietnam), and 1.27 million tonnes of dry chip (50% to Vietnam and 46% to Thailand). Additionally, between 2008 and 2012, the export of fresh/dry cassava has been increasingly annually, while cassava starch has been declining (see Appendix 2).

As for the monetary value of formal exports, in 2011 total formal exports reached $5.3 million (Royal Government of Cambodia, 2014). It is however difficult to assess the exact value of Cambodia’s cassava exports as most of them are informally sold and unrecorded in cross-border trade with Vietnam or Thailand.

### Table 1: Cassava exports from Cambodia to other countries in 2013

<table>
<thead>
<tr>
<th>Cassava product</th>
<th>China</th>
<th>Thailand</th>
<th>Vietnam</th>
<th>Slovakia</th>
<th>France</th>
<th>Korea</th>
<th>Sweden</th>
<th>Total (T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava sliced (t)</td>
<td>55,202</td>
<td>581,230</td>
<td>633,210</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,269,653</td>
</tr>
<tr>
<td>Fresh Cassava (t)</td>
<td>-</td>
<td>9,000</td>
<td>741,450</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>750,450</td>
</tr>
<tr>
<td>Tapioca Starch (t)</td>
<td>1,705</td>
<td>-</td>
<td>-</td>
<td>11,850</td>
<td>7,925</td>
<td>17</td>
<td>-</td>
<td>21,497</td>
</tr>
</tbody>
</table>

Source: GDA 2013
3.1.6. Policy

The government plans to promote cassava cultivation by adapting policies similar to the rice export policy already in place. To this effect, Cambodia and China signed a Protocol on the Exports of Cambodian Cassava to the Chinese Market in December 2010, under which China allowed Cambodia to export its standardized cassava chips to China.

A number of organizations in Cambodia, such as United Nations Development Programme (UNDP), Food and Agriculture Organization and The German Development Agency (GIZ), are working on the implementation of this protocol. They support small-scale farmers through financing and capacity building to improve the value chain and promote exports. The official launch of Cambodia Export Diversification and Expansion Programme (CEDEP II) on 20 February 2014 by UNDP and the Ministry of Commerce prioritized cassava as the second most important crop after rice for export product between 2014 and 2018. This project as well as the South-South China-Cambodia-UNDP Project (CCP II) have contributed to significant progress towards enabling direct linkages between the Chinese and Cambodian markets, however a proper government policy for the cassava sector have yet to be established.

National development strategy plan update 2014-2018

The National development strategy stipulated in the National development strategy plan 2014-2018 has raised the issue of productivity and diversification in the agriculture sector with agro-industry as one area for improvement. The strategy calls for inclusion of other crops, and in particular cassava.

According to the 2014-2018 plan, cassava is one of many Cambodian products, such as rice, corn, soy beans or fisheries, where production is expected to meet international standards. However, despite the targets outlined in the document, lack of clear policies and the slow implementation of those relating to the import of inputs, use, processing (waste management) and storage are still big stumbling blocks in the plan.

Cambodia Trade Integrated Strategy (CTIS) 2014-2018

The Cambodia Trade Integrated Strategy (CTIS) 2014-2018 is the latest revision on diagnosis of Cambodia’s export trade based on Cambodia Trade Integration Strategy 2007. The foundation study, Diagnostic Trade Integration Strategy (DTIS) was carried out in 2001. The diagnosis aimed to identify products and come up with a strategy to improve the country’s export competitiveness. According to the study, cassava was an important commodity for strengthening exports given the increase in its production and demand. It should also be stressed that cassava is a crop that can
generate job opportunities within the value chain from production, processing and end users.

**Priority Actions for cash crop production of Ministry of Agriculture, Forestry and Fisheries (MAFF) in 2013**
Based on the MAFF strategic plans of 2013, the government priority was to step up efforts to improve farmers knowledge and skills regarding farming techniques, encourage investment in agricultural produce processing, raise farm productivity and improve market access. These focus areas align well with the IBC model which also aims to promote the three action points through sustainable production, promoting local processing and strengthening market linkages among stakeholders.

### 3.1.7 Regional trade agreements

#### 3.1.6.1 Association of Southeast Asian Nations (ASEAN) Free Trade Area (AFTA)

The ASEAN Free Trade Area (AFTA) is a traders bloc agreement between ASEAN member states, such as Brunei, Cambodia, Thailand, Myanmar, Vietnam, Laos PDR, Indonesia, Malaysia, Philippines, Singapore that supports local manufacturing in all ASEAN countries. Cambodia signed the agreement in 1992.

The goal of the AFTA is to increase ASEAN's competitiveness as a production base in the world market through the elimination of tariffs and non-tariff barriers within ASEAN. To achieve this goal the Common Effective Preferential Tariff scheme was established.

AFTA certainly opens the door for the export of Cambodia’s agricultural produce but is also poses certain challenges. For example, if Cambodian produce doesn’t meet the required standards, it risks losing its market.

#### 3.1.6.2 ASEAN–China Free Trade Area (ACFTA)

The ASEAN–China Free Trade Area (ACFTA), also known as the China–ASEAN Free Trade Area, is a free trade area among the ASEAN member states and the People's Republic of China.

The impact of ACFTA will be felt by domestic enterprises as goods exchanged within the region will no longer attract tariffs/tax. Because production costs in other ASEAN countries are low compared to Cambodia, Cambodian goods cost more to produce and so production in Cambodia will be less competitive in the region once the tariff and tax regimes are lifted.
3.1.6.3 ASEAN and Regional Integration

The rapid expansion of Cambodia’s production of cassava presents an ideal opportunity for the sector to reduce its heavy reliance on informal export channels and fully integrate with the region. Cambodia’s increased production capacity has enabled a local processing sector to emerge, drawing on the many end-uses for cassava and favourable international prices. Potential processing activities include drying cassava, as well as the production of animal feed, starch, bio-fuel and alcohol – providing a strong basis on which to further develop value-added activities and exports.

While Cambodia should continue to pursue the development of processed cassava products, strong demand and government-to-government agreement with China provides an important opportunity for the sector to secure access to the world’s largest cassava importing market. To achieve this, cassava farmers, collectors, and processors need to change practices and improve their operating standards in order to meet the SPS (Sanitary and Phytosanitary) and quality requirements of the Chinese market.

3.2 Cassava value chain in Tboung Khmum province

3.2.1 Target area and production potential

Kampong Cham province was initially selected as the project site. Half way through the project however, the province was split into two, meaning the IBC target areas fell within the new Tboung Khmum province. This area was chosen because it has the largest area of cassava cultivation in the country as well as a history of cultivation of the crop. In 2007, the province accounted for over 50% of the total cassava area in Cambodia (MAFF, 2008). It is also representative of the diverse range of environments and management practices of the cassava-based cropping systems in Cambodia.

Three communes located in two districts of Tboung Khmum province were selected as target areas of the project.

14 villages from the Srolob commune, Tboung Khmum district and Candour Chum commune, Ponhear Krek district were selected to partner with Sun Ath Enterprise, which was located in their vicinity. This translates into 1,173 cassava farmers located in the 14 villages.

The third commune selected to participate in the project is located in Tboung Khmum district and consists of 10 villages with a total 1,410 families. Total population is 6,437 people, including 3,347 women. 147 families are female-headed households.

Based on 2012-2013 data from the Kampong Cham Provincial Department of Agriculture (PDA), cassava production area located in Ponhear Krek district is
7,159 ha and produced 143,180 t of cassava root (average yield 20t/ha). Tboung Khmum district has 4,703 ha that produced 112,872 t (average yield 24t/ha).

PDA planned to increase cassava production area in Tboung Khmum district up to 5,140ha in 2013-2014 but expects to get about 102,800t of cassava root which is low (average of 20t/ha). However the projection factors are due to the effects of an increase in pests and diseases.

In Ponheakrek district, cassava production area had declined with expected yield of 134,000 t because most of the cassava plantation is intercropped with rubber. When the rubber gets to a certain height, intercropping with cassava is not feasible.

### 3.2.2. Production techniques and cropping calendar

#### 3.2.2.1 Cassava production techniques

The knowledge of cassava production techniques among farmers varies but in most cases depends on their own experience. Some farmers use fertilizers while others do not - many farmers do not have experience on how to use the fertilizers and must rely on input suppliers for advice on what kind of pesticide to use when dealing with pests and diseases and which fertilizer is most suitable for cassava production. About 90% of producers are using herbicide and pesticide.

Some farmers have been using the same land for cassava production for more than five years under mono-cropping, despite declining soil fertility, which led to the decline in cassava yield in recent years.

According to data provided by PDA, the average cassava yield is 16-23 tonnes/ha. A project survey conducted in 2013 found that it amounted to 18 t/ha. Initially, farmers would get up to 30-40 t/ha on virgin lands, but over time yields started declining year after year. Fertiliser application and proper pest and disease management is expected to boost yields currently averaging 20 t/ha for the province. There is a dearth of information on cost and benefits of fertiliser use in cassava production. However, some efforts have been made in developing fertiliser recommendations especially by Cambodia Agricultural Research and Development Institute (CARDI).

In 2013, cassava producers recorded losses associated with the disease outbreak in Tboung Khmum. Almost all the production areas reported cases of pests and diseases. The most common pest is mealy bug and cassava witches broom (CWB) is the most common disease. This resulted in low yields and poor quality of cassava starch.

Land preparation for cassava production is mainly done by tractors, which are available in targeted areas. Farmers use a lot of labour for planting and harvesting. Meanwhile, labour shortages have seen costs rising from year to year.

#### 3.2.2.2 Planting materials
While there has been an increase in demand for planting materials among farmers there is limited access to good quality planting materials, which has the potential to affect cassava production in the future.

Some farmers reuse planting materials from the previous season. Others buy it from nearby provinces. Cassava planting material was also found in the areas served by big distributors. Some planting materials are also imported from Vietnam.

Farmers have limited knowledge about high yielding planting materials, and especially the varieties that meet market demand, making it difficult to select good varieties for planting. The reusing of planting materials by farmers is concerning as they may be infected with pests and disease.

Usually, farmers need planting materials in April (during the planting time) but by then considering that most farmers harvest between November and January, the long period between results in low quality of cuttings being kept well beyond the optimum storage time. Therefore, farmers who are harvesting cassava earlier must buy planting materials from alternatives sources.

The main challenges concerning planting materials include: lack of certification of the materials (there is no inspection of imported planting materials to ensure they are healthy) and the difficulty in controlling the spread of pest and disease. Furthermore, farmers do not recognize the different cassava varieties, hence some farmers grow more than five varieties together in the same plot.

3.2.2.3. Cropping calendar

There are two cropping seasons for cassava production in the target area: planting in March-April, depending on the amount of rainfall, and harvesting in December to March the following year (at least 8-10 months). The first cropping calendar reflects the conventional practice. Accordingly, cassava is generally a seasonal crop forcing processors to plan processing for only 5-6 months.

The second season calendar starts in November with harvesting in August. Based on the survey results conducted by SNV during the project, there are few farmers (less than 1%) producing during this second season because most of them use the same fields for producing rice. Based on the survey data from farmers and their neighbour perception in Angkor Chey and Lvear Thom village, the yields of second calendar cultivation were the same as the first season production.

Dry season production is also possible. However farmers may be forced to irrigate to secure their crop during the first few months after planting. Though cassava is drought resistant, germination requires adequate soil moisture. Production in both seasons is possible and will benefit farmers in terms of increased incomes while local processors can operate whole year round. However, there is a significant shortage of irrigation systems in Cambodia and significant infrastructure development in this area will be needed for sustainable dry season production to be possible.
3.2.2.6 Cassava yields in Kampong Cham and Tboung Khmum

Cassava production in Tboung Khmum has been increasing with the expansion of the cultivated area but over the years productivity has remained more or less the same, with an average of 20 t/ha (see table below for trend in cassava production in Tboung Khmum province between 2004 and 2012.)

Table 2: Cassava production trend in Tboung Khmum Province

<table>
<thead>
<tr>
<th>Year</th>
<th>Total production land (ha)</th>
<th>Total cassava product (t)</th>
<th>Average yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>12,736.00</td>
<td>286,498.00</td>
<td>22.50</td>
</tr>
<tr>
<td>2005</td>
<td>20,430.00</td>
<td>406,408.00</td>
<td>19.89</td>
</tr>
<tr>
<td>2006</td>
<td>20,280.00</td>
<td>365,040.00</td>
<td>18.00</td>
</tr>
<tr>
<td>2007</td>
<td>53,768.00</td>
<td>982,000.00</td>
<td>18.26</td>
</tr>
<tr>
<td>2008</td>
<td>63,200.00</td>
<td>1,200,000.00</td>
<td>18.99</td>
</tr>
<tr>
<td>2009</td>
<td>61,056.00</td>
<td>1,321,500.00</td>
<td>21.64</td>
</tr>
<tr>
<td>2010</td>
<td>60,672.00</td>
<td>1,317,325.00</td>
<td>21.71</td>
</tr>
<tr>
<td>2011</td>
<td>65,440.00</td>
<td>1,353,748.00</td>
<td>20.69</td>
</tr>
<tr>
<td>2012</td>
<td>67,309.00</td>
<td>1,433,090.00</td>
<td>21.29</td>
</tr>
</tbody>
</table>

Average yield (t/ha) 20.33

Sources: PDA-Kampong Cham 2013

3.2.3 Value chain mapping and stakeholder analysis

The key stakeholders in the cassava value chain in the project area include: input suppliers, farmers/producers, traders and processors, final processors and exporters. See the figure and table below for the relationships between them and their key characteristics.

Figure 1: Value Chain mapping in Tboung Khmum.
### 3.3.1 Input suppliers

There is no proper industry in Cambodia that produces farm inputs such as fertilizer and pesticides. This lead to a dependence on either high-cost imported products or illegal low-quality imported products.

Most local input suppliers are based in certain markets at the commune and district levels; or retail markets such as Soung municipal, Khnar and Kor markets with distances less than 10km from the targeted communes. There are 17 input suppliers located around the Tboung Khmum district that sell many kinds of fertilizer, herbicide, pesticide and animal feeds and veterinary products. About 60% percent of input suppliers also sell groceries.

Input suppliers can be considered retailers because they are not responsible for transportation logistics for their clients or after sale services. The input suppliers SNV spoke to for the purposes of this study indicated that they translated about half of the packaging labels and information of half of the products into Khmer. The other half of the products imported from Thailand and Vietnam remain without translation.

Suppliers keep their inputs in company depots located in Soung and Kampong Cham municipalities. The high season for selling those inputs is between April and October or seven months operation per year, especially within the cultivation season.
According to this study, input suppliers in the area established their businesses between 2008 and 2010 and only 20% are registered with Kampong Cham PDA. Their clients include producers from the nearby commune that use inputs in production of different crops such as rice, cassava, corn, and rubber.

The average turnover of input suppliers is $1875 per season (the cassava season of 8-10 months) from average sales as follows: chemical fertilizer 9 t, natural fertilizer 2.5 t, liquid fertilizer 108 bottles, herbicide 135 bottles, pesticide 100 bottles.

There are only few brand names of popular products such as Buffalo Head, Red Sunrise, Exm, High-Gro, Kor Khmer and many unofficial imported input products. Many input suppliers don’t invest in product knowledge to improve after sale services but simply focus on the most popular products.

Producers or clients buy products whenever they need to deal with specific issues, mainly diseases and pests. Most cassava producers don’t apply much fertilizer but many use herbicide. Normally, producers don’t have information or clear instructions on how to apply inputs in their farms and often they get advice from suppliers or neighbouring producers.

Although 40% of input suppliers have experience in cassava production, they do not recognize pests and disease that require treatment and didn’t know where to find information about them (SNV Survey of input suppliers in Tboung Khmum). The remaining 60% don’t have experience in cassava production, thus their recommendations to farmers are abstract.

Agriculture input supplier shops don’t play any role in supplying planting materials or cassava stems. The transporters import cassava planting materials from other farms and from Vietnam on their return journey from supplying cassava roots or dry chips. There are no specific cassava planting material suppliers, however, farmers often give orders to cassava transporters who supply Vietnam market and on their return journey they purchase cassava cuttings for them.

3.3.2 Input distributors/wholesalers

There are four main input distributors or wholesalers based in Suong municipality that supply their products to the commune and district markets and around the targeted area, including big farms. Their total annual sales of fertilizer amount to 2500 t of chemical fertilizer, natural fertilizer 200 t, 1800 boxes (12 bottles/box) liquid fertilizer, 1250 boxes of herbicide and 1150 boxes of pesticide.

The biggest distributor in the project area is called Lim Kong Heng. It has a turnover of around $125,000 and sells different kinds of fertilizers, pesticides and herbicides. Other distributors have turnovers of less than $25,000 and focus on a few inputs with some being very specific.

The demand for inputs corresponds with the cropping season from March to December. All the distributors are in direct contact with input importing companies
like Five-Star (a Vietnamese company), Chhay Tech (Buffalo Head), Kor Khmer and others.

Most of the input suppliers get information from users or farmers about which inputs are popular and good quality, and then they contact importing companies for their supply. Meanwhile the demand/preference of their clients is the main factor with regard to the choice of inputs they sell.

Many of the distributors established their businesses in 2005 and registered them in 2010 after receiving training on agriculture input management and a code of conduct was introduced by the PDA. The input importing companies provide other support such as providing gifts (motorbikes), additional promotions, organizing farmers’ meetings to promote inputs, and field tour services. Unfortunately, the input distributors also have no special training on pesticide and herbicide use besides the advice from the importing company and instructions on the packaging.

3.3.3 Financial institutions

Microfinance Institutes (MFIs), banks and moneylenders have played a role by providing financial support to producers, middlemen and processing enterprises in the target area. The bank of preference is ACLEDA Plc. But other financial institutions, including MFIs such as AMRET, Vision Fund, AMK and Prasac also operate in the targeted area.

About 60% of cassava collecting centre (CCC) owners get loans from ACLEDA bank Plc, 20% from MFIs and 20% their own capital. CCCs get short-term loans and working capital for purchasing cassava root from farmers with interest rates lower than 24%/year and offer collateral to secure payment.

The moneylenders are often input suppliers and middlemen at the village level. Based on the results of our study, 70% of cassava farmers get loans from an MFI operating in the targeted area. Most farmers use the loan for land preparation, purchasing inputs and labour costs for planting and harvesting. Interest rates can be high, more than 24%/year, and the payment scheme is mostly during the cassava harvesting season.

3.3.4 Farmers / producers

Based on our survey, about 66% of the farmers in Kampong Cham province have grown cassava for 5 to 10 years, while about 90% of the farmers in Pailin provinces have grown cassava for less than four years. Some farmers in Kampong Cham have grown cassava for 20 years.

In Kampong Cham province, farmers produced soybean, mung bean, and sesame while maize crop were mostly grown in Pailin province before planting cassava. Many farmers planted cassava as a mono-crop (54% of farmers in Kampong Cham and 96% of farmers in Pailin). Only a few farmers wish to grow cassava as a mixed crop (Aye, 2014).
The recent shift from maize to cassava production in Pailin was prompted by a strong demand for cassava with a significant increase in cassava farm gate prices at harvesting time for the cropping season 2010/11 (i.e. December 2010 to February 2011).

The price of cassava was very high compared to the previous year (2010) e.g. in Pailin and Battambang, the price was only about $27/tonne of fresh root or about $62/tonne of dried chip in 2010. In 2011, it shot up to $92/tonne of fresh root and $190/tonne of dried chip. This also explained the tremendous expansion of cassava production in 2011-12 countrywide, with more than eight million tonnes of production with cultivated land of about 400,000ha. Much of this improvement reflects the expansion into new production areas where soils are relatively fertile, combined with the adoption of new higher yielding varieties (Aye, 2014).

Farmers have experience in managing cassava farms with most of the information being adopted from their neighbours and/or passed down through the generations. Few of them have received any training about cassava production.

Currently, 80% of cassava farmers sell fresh root of cassava rather than the dry chip because they lack labour and wish to avoid the risk of poor quality (for example, if it gets rained on during the drying process (IBC Baseline survey, 2013). Additionally, farmers can get cash immediately after harvesting. However, some farmers with plantations far from home or with poor road access take risks to make dry chip. Farmers are interested in making dry chip because they can store it for long periods and can sell it when gate prices are higher.

Producers manage cassava production from land preparation to harvesting, including all production costs, labour and transportation arrangements. The average cultivation area is 1.8ha per household, maximum 5 ha, and minimum is only 0.5ha (baseline survey).

There are only three channels that farmers can sell their cassava through: 1) local middlemen or cassava collecting centres, 2) local cassava processing enterprises making dry and wet starch, or 3) export to Vietnam. Usually, farmers sell fresh root cassava individually, arrange their own transportation from plantation to cassava collecting centres, while traders normally collect directly from farmers who have dry chips.

According to the baseline survey results, among 111 household respondents in the targeted area, there were 576 people including 283 women (49%). The average household size was 5.18. Among 111 household respondents, 26 were female headed-households (23%). Only four households were identified as ID Poor I and II based on the poor identification report. Normally the low-income households are primarily those families who have limited production land from 0.3ha to 1ha. That land has been primarily used for cassava production.

The average household yearly revenue is 18,732,000KHR or $4,680. The main occupation of the interviewed farmers was agriculture - over 70% of their revenue
comes from agriculture, 17% from non-agriculture and 12% from special income like donations and extra jobs.

Of the agriculture revenue, 71% is generated from cassava production, 10% from rice production and 7% from livestock.

### 3.3.5 Cassava Collecting Centres (CCCs)

There are 10 cassava collecting centres within the project districts that collect on average 9260 metric t of fresh cassava annually and export it to Vietnam. About 40% of the centres were established in 2011, while the rest were set up in 2013. They have linkages with 780 farmers and small transporters.

In some cases, centres buy cassava from farmers at the production stage and the price is negotiated depending on the crop setting and health of the fresh roots. The CCCs will then be responsible for taking care of harvesting and selling the crop.

In order to encourage farmers to sell their cassava to them CCCs have upgraded their facilities. These include automatic scales, small dry ports for storing the cassava, offices, rest areas and loading machines. The business sites are located on the main roads near the cassava plantations which is an attractive solution for the farmers as otherwise they would have to pay a high price to transport their crop to a point of sale. In some places with large production areas there are three to four sites of this kind.

All the centres have at least two big trucks and sometimes rent these for loading cassava after purchase and then transport it to the Vietnamese border. The owners of CCCs seem to have good relationships with Vietnamese buyers and sometimes get advance payment to collect raw cassava from the target areas.

The CCCs are aware of the local processing enterprises but due to low prices and delays in payments (sometimes of two weeks), they prefer to sell cassava directly to Vietnam.

Although 60% of CCC owners have cassava production experience, most know little about cassava pest and disease. Some 20% of cassava CCCs offer advice to farmers on good agronomic practices, like changing the planting material and applying lime for acidic soils before planting. Most of them get their information from Vietnam. The other 80% do not offer advisory services to farmers and just check the quality of the cassava supplied, especially the starch content. In general, CCC owners do not offer services related to enhancing cassava productivity because they do not have access to any information about cassava production, or are solely focused on trading.

The CCC owners normally provide small incentives to farmers or transporters to secure supply. These range from soft drinks, pig head meat, wine, beer and small amounts of money from 2000KHR to 5000KHR per shipment ($0.50-1.25).
The CCC owners work independently from each other. Some CCCs have a few business sites in different communes, as cassava products are still in surplus in the targeted districts. The production period in the target area runs from October to April. Buyers are therefore forced to source outside the target area for supply during the remaining period.

### 3.3.6 Traders

Traders, also known as middlemen, are people who have at least one truck (small or medium) and buy cassava directly from farmers at a plantation and sell it directly either to buyers in Vietnam, local processors, or to the CCC.

Each commune has between 20-40 middlemen. During harvesting season, they buy an average of 2000-3000 t of cassava. Although middlemen always carry a manual scale in their truck, they allow cassava owners use their own scales in order to build trust.

Sometimes, traders help supply planting materials, which they import from Vietnam. This usually takes place between March and May.

Most traders have experience in cassava production because they are producers as well. Middlemen knew about the cassava pest and disease outbreaks in 2013-2014 but they did not know how to deal with them and what advice to offer to farmers.

### 3.3.7 Transporters

Transporters are key stakeholders in the value chain and sometimes dominate the marketing channels of the producers as they can bring the cassava to sell wherever the trader or middleman wants it. According to SNV research, they seem to prefer working for middlemen or buyers whose collection points are located in close vicinity of the production plantations as it allows them to make many trips. Most of the transporters provide their services to cassava production areas that middleman cannot access.

### 3.3.8 Cassava processing enterprises

Three local cassava processors are located in the vicinity of the target area and participated in the the project: Ly Hong Leng, Sun Ath and Song Heng (see table below).

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Year of start</th>
<th>Fresh root requirement (T)</th>
<th>Product</th>
</tr>
</thead>
</table>

Table 4: Cassava processors in Tboung Khmer
**Sun Ath: Dry starch processing enterprise**

The Sun Ath enterprise has the capacity to buy fresh root cassava daily from local farmers and middlemen. The enterprise bought around 80,000 t of fresh cassava in 2010 and 2011. However, the amount of cassava bought in 2012 declined to only 40,000 t. From 40,000 tonnes of fresh cassava root, the processors can produce about 10,000 t of dry starch.

Sun Ath has a large processing plant covering the whole production line. The process involves cleaning, chopping into small pieces, milling, and drying, in that order. The final product is dry starch.

According to the enterprise owner, starch processing by-products have multiple uses including animal feed, cells/skins used for compost material, fertilizer, and use as raw material for mushroom production.

As for environmental concerns, the company had no plans to improve the waste water treatment at its plant.

**Song Heng: Dry starch processing enterprise**

Song Heng is a medium cassava processing enterprise located in Keanroung Village, Sankat Vihear Loung, Soung municipality, Tboung Khmum province that can process 100 tonnes of fresh cassava root every 12 hours. The full capacity of the processing plant is 200 t per day and annual input is around 100,000 t of fresh cassava. The enterprise just upgraded its processing plant in 2012.

The enterprise collaborates with around 400 middlemen who collect the fresh root from the villages around the factory. This enterprise is already registered at the Ministry of Commerce as a business entity and at the Ministry of Industry as a processing enterprise.

Currently, Song Heng enterprise produces dry starch and supplies to local markets. Sometimes, the enterprise also sells wet starch when the price of dry starch goes down due to lower demand. The brand name of the enterprise's product is ‘Two Swans’ with blue colour.

In 2014, the enterprise upgraded the processing plant by bringing technology from Vietnam and China. In doing so, they increased their capacity up to 300 t per day and are getting a better ratio of processing from fresh cassava to dry starch.

<table>
<thead>
<tr>
<th></th>
<th>Location</th>
<th>Year</th>
<th>Input (t)</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun Ath</td>
<td>Touk Chey village, Kandalum commune, Ponhear Krek district, Tboung Khmum province</td>
<td>2008</td>
<td>80,000</td>
<td>Dry Starch</td>
</tr>
<tr>
<td>Ly H o n g Leng</td>
<td>Angkor Chey village, Srolob commune, Tboung Khmum district and province</td>
<td>2011</td>
<td>20,000</td>
<td>Wet starch</td>
</tr>
<tr>
<td>Song Heng</td>
<td>Kean Raung village, Sankat Vihear Loung, Soung Municipality, Tboung Khmum province</td>
<td>1998</td>
<td>100,000</td>
<td>Dry Starch</td>
</tr>
</tbody>
</table>

**Sun Ath**
- **Location**: Touk Chey village, Kandalum commune, Ponhear Krek district, Tboung Khmum province
- **Year**: 2008
- **Input**: 80,000 t
- **Product**: Dry Starch

**Ly Hong Leng**
- **Location**: Angkor Chey village, Srolob commune, Tboung Khmum district and province
- **Year**: 2011
- **Input**: 20,000 t
- **Product**: Wet starch

**Song Heng**
- **Location**: Kean Raung village, Sankat Vihear Loung, Soung Municipal, Tboung Khmum province
- **Year**: 1998
- **Input**: 100,000 t
- **Product**: Dry Starch
Song Heng plans to expand into other markets such as Malaysia, EU and Korea. Currently, Song Heng enterprise is in the process of applying for HACCP and GMP certificates in order to compete in the market and link their products to other countries after AFTA comes in force.

Ly Hong Leng: Wet starch / flour processing enterprise
Ly Hong Leng is located in Sralab commune, next to Ankorchey village, within the target area and has the capacity to process 6,000 t of fresh cassava for wet starch processing. As reported by the owner (in 2014), the business supplied around 10,000 t of wet starch to the Vietnamese market.

The active production period is four months from November-April (the season that has more raw materials needed for processing). The factory produces wet starch to sell locally at Soung municipality and sometimes it sells its product to Vietnam but in very small quantities.

There are three by-products from wet starch processing that can be used for animal feed, cell/skin used for compost material, fertilizer and use as raw material for mushroom production and liquid/water used as fertilizer.

Final processors
There are 15 processors located in Soung municipality that purchase wet starch from Ly Hong Leng for processing to produce granular starch and gelatinous starch. Most of the products are sold in Phnom Penh markets, with some selling to other provinces. The by-products from processing are supplied to the local market and used for desserts, flour and food dietary recipes.

Vietnamese buyers
Vietnamese traders and buyers are the key cassava market players in Cambodia, especially for cassava produced in the provinces near the Vietnamese border such as Kampong Cham, Kratie, Ratanakiri and Mondulkiri.

They gather the cassava product at Dar and Trapoeng Plung (Smach) international border gate in Tboung Khmum province (former Kampong Cham province) as well as other international border gates. Normally, Vietnamese traders buy both fresh and dry chip cassava whole year round. As a result, the prices fluctuate, sometimes daily.

Local buyers
There are two kinds of products for local buyers: dry starch, and gelatinous starch and granular starch (sago). The dry starch is used for making foods and is processed into cakes, mainly in Phnom Penh. While granular and gelatinous starch are used for making sweets.

3.4 Gender analysis of the cassava value chain in Tboung Khmum
According to interviews and focus groups conducted at the end of the project in 2015, women and men play equally important roles in the cassava production process. Most activities are implemented by both men and women while men are more likely to be responsible for the transportation of harvested cassava to selling points and women more likely to be involved in preparing planting materials; farmers reported that they generally share in the tasks and decision making processes in cassava production.

There are two key phases in cassava production including production and harvesting/selling. In the production phase, both women and men are often equally involved. When it comes to purchasing inputs for cassava production, usually, men have more understanding about agricultural inputs such as selecting planting materials or the type of fertilizer to purchase. Therefore, they usually take a lead in the purchase of fertilizers. Both men and women have participated in training for the project which has enabled women to learn more about what fertilizer to buy and how to choose appropriate planting materials.

Men are generally responsible for the heavy labour tasks and operation of tiller machines for ploughing. Women are not likely to operate these machines but may still be involved in other aspects of land preparation (raising mounds along the rows). According to participants in focus groups with IBC farmers, land preparation is hard work and requires everyone especially men and sons to work on the field. Women take more responsibility in cooking and taking care of their husbands at the field. Weeding, harvesting, and other agronomic activities are then performed by both gender equally. Through the project, both men and women have learned how to improve Cassava production by applying new techniques and technology. They expressed that new techniques in land preparation (raised rows), spacing, and inserting fertilizer into the soil rather than broadcasting were particularly important changes they have made.

The post-production phase involves harvest transportation and selling. Due to the fact that cassava is a bulky produce, transportation is often done by tiller/tractors, consequently, transportation is done by men who operate these tillers. However, the women may accompany the cassava to the selling point and participate in the negotiation process with the cassava collector or enterprise.

Women often play a very active role in the selling phase. According to Mr. Then, assistant at Huot CCC, “The women are clever in price negotiation – women are better than men in price negotiation. The men manage the transportation but often stand and observe in negotiation.” Also in borrowing the money from the collector, women are very active. For example when they go to borrow money from the collection center, women are often the lead in asking to borrow money and managing it. However, men are consulted before any spending decisions are made.

Challenges
In general the challenges identified by women cassava farmers were challenges faced by any farmer in this sector. These challenges include:
• Lack of finance to invest in fertilizer;
• More time and more labor needed for using pesticides and fertiliser;
• Cassava diseases and pest;
• Lack of knowledge for appropriate chemical application.

The most challenging issue women face in particular in the cassava production process is to balance their household responsibilities with their economic work. The women are responsible for caregiving in their households and find it challenging to participate in activities outside the household.

Another important challenge for women in the cassava sector is ensuring personal safety. This is especially important for younger women who work as wage labourers and might travel further away to other production plantations. One way of increasing safety would be for the owner of the plantation to provide joint transportation for his/her workers.

Table 5: Gender balance in cassava production in Tboung Khmum province

<table>
<thead>
<tr>
<th>Economic empowerment - equal opportunity to participate in, and benefit from, profitable economic activities.</th>
<th>Percentage</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of women who individually decide to grow cassava</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>% of both decision to grow cassava</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>% of women who individually negotiates the selling price with buyer</td>
<td>21.62</td>
<td>26 women</td>
</tr>
<tr>
<td>% of women who collectively with husbands negotiates the selling price with the buyer</td>
<td>50.45</td>
<td>56 respondents have both men and women making decisions</td>
</tr>
<tr>
<td>% of women that have a public role</td>
<td>0.90%</td>
<td>1 woman</td>
</tr>
<tr>
<td>% of men that have a public role</td>
<td>4.50%</td>
<td>5 men</td>
</tr>
<tr>
<td>More equitable workload balance and sharing of economic and social benefits between women &amp; men.</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Source: (SNV 2013)

Gender roles among other IBC value chain actors
The businesses involved in the IBC value chain (including input suppliers, cassava collection centers and cassava processing enterprises) are often run as family businesses with both women and men playing important roles. Women are especially involved in quality control and price negotiation.

For example with Huot CCC, his wife is often present at the collection points and they make decisions together. She comes in and takes charge of the purchasing process during peak harvesting season. According to the assistant of the collection
center Mr. Then, women are involved both at an administrative level (accounting, recording and checking the scale) and as wage workers (unloading cassava) although wage workers are usually 70% men during the busy season.

This was also true of the operations of the other collection center involved in the IBC project. Khech Kieng who works with her husband at Soy Thy CCC explained:

"I do not feel that people treat me and my husband differently. Both my husband and I are important in the business and I cannot distinguish any difference between me and my husband in interacting with our customers. Usually, we both help each other with the operation of the business. It is a busy work which require us to work and decide together of all business transaction." (Khech Kieng – Co-owner of Soy Thy CCC)

Leadership and decision making

According to FGD participants, men and women are both involved in the leadership roles such as in decision making process and participation in meeting and training courses. One woman participating in the FGD explained:

"I have learnt technical knowledge on how to grow cassava. I have shared what I have learnt with other farmers as well. As I am one of the group members and a vice leader of the group, I always participate in meetings such as this one where I can share and gain knowledge and information about agricultural productivity and techniques."

Mrs. Huong Soknang, 25 years old, vice leader of farmer group Lvea Touch Village

The strength of women in leadership involved in the cassava farmer groups created by the project is that they are good at price negotiation and production planning. While men’s strengths in leadership include mobilizing group members and other farmers because they don’t have as much work to do in the household. Also men find it much easier to travel for longer distances (FGD in Rorka Por Bram Muy).

FGD participants also discussed some of the challenges faced by women IBC farmer group leaders, “The most challenging thing we face as a group leader is the price negotiation with the factory because if we fail to negotiate the price with the factory, group members might not be happy.” (FGD in Rorka Por Bram Muy)

In Cambodia, it is mainly men who make the final decisions on family matters so it can be hard for women to make business decisions independently. Women participating in gender FGDs indicated that, “In general, both men and women have equal rights to decision making. However, we feel that men have more power in the
price negotiation process and women have more power in production plan.”(FGD in Chhouk Sandal, Rokar Por 5)

One woman described her role in decision making processes saying: “I think I have more rights on planting productivity as well as other decision making in my family. I can make decisions regarding expenditure and income generation. My husband respects me and follows what I guide him.” (Mrs Ieng Chheng, IBC member from Rorka Por Bram Muy village)

There may also be challenges arising from being responsible for decision making processes. For example, if the woman is the one to represent her household at the meetings where prices are negotiated with cassava processors, she is responsible for making the agreement. Sometimes upon returning from the meeting, the husband is unhappy if the price is too low which can cause conflict.

To improve women’s participation in decision-making processes, women would like to have more opportunities to increase their capacity and knowledge. If woman were more involved in the work that would normally be the husband’s work, they could more actively participate and as a result they will be able to include themselves in more of the decision making process. Then their husbands will recognize the importance of the participation of their wives. It is also important to provide gender training in the community to enable an increased understanding of the roles of men and women in the community and development. If husbands are educated on gender roles and are encouraged to recognize the importance of household labour, they may be willing to help more with the household work and enable women to have more time to attend training and be involved in economic activities outside the household.

Conclusion
It can be concluded that both men and women play strong roles across the cassava value chain. Although, farmers have indicated that both participation in production processes and decision making related to cassava are equal; traditional gender roles and women’s limited knowledge or capacity to travel far from home may create significant barriers to substantive contributions in these areas. However, as women participate more in training programs and gain more confidence in their abilities, it is expected that respect for their opinions will continue to increase. Women would also benefit from learning how to use postharvest equipment that could help ease the difficult labour required for harvesting cassava. Finally, providing both men and women with gender training may contribute to easing women’s household burden as attitudes towards traditional household gender roles slowly evolve.

4 Challenges encountered

4.1 National level

There is no policy or framework specifically focused on cassava production, processing, and trading and market access. Although MAFF considers cassava as
one of the main agro-industrial crops and the second most important crop after rice, it does not have a functional system to promote research on Cassava and link and infuse research to agricultural extension to benefit farmers.

Because of a variety of constraints ascribed to the lagging behind of government extension services, there is only a limited number of relevant interventions and these often spearheaded by NGOs. Consequently, the 2013-2014, cassava pest and disease outbreak lead to loss of crop and income - to farmers received no support in terms of management of these diseases. This exposed the lack of support systems for cassava value chains.

Apart from farmer support through service provision, strengthening cassava processing sector in Cambodia is seen as crucial - cassava processors are considered as small to medium enterprises (SMEs) in the processor category based on the classification of enterprise by the Ministry of Industry and Handicrafts (see table below).

Table 5: Enterprise categorization by the government

<table>
<thead>
<tr>
<th>Scale</th>
<th>Investment capital/properties (not including land) in USD</th>
<th>Number of employees (Person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro Enterprise</td>
<td>&lt; 50,000.00</td>
<td>Less than 10</td>
</tr>
<tr>
<td>Small Enterprise</td>
<td>50,000.00-250,000.00</td>
<td>10-50</td>
</tr>
<tr>
<td>Medium Enterprise</td>
<td>250,000.00-500,000.00</td>
<td>51-100</td>
</tr>
<tr>
<td>Large Enterprise</td>
<td>&gt; 500,000.00</td>
<td>&gt; 100</td>
</tr>
</tbody>
</table>

Source: MIH 2014

Over the last decade the Royal Government of Cambodia has introduced a number of laws designed to promote commerce in general. These include the financial sector law and the law to strengthen land rights and encourage the use of property for collateral, and amendments to the Law on Investment to encourage the purchase of productive capital.

The key objective of the Cambodian government is to improve the business climate through: an enhanced regulatory framework, promotion of innovation and technology, increased access to finance, strengthened and expanded support services, and the integration of SMEs into global value chains (Cambodia, 2013). Despite these objectives, several challenges remain and need to be addressed, including: a narrowly-based industrial structure, lack of auxiliary industries supporting the main industries, underdeveloped linkages between SMEs and large-scale enterprises, low productivity, the high cost of doing business, ineffective policy and institutional frameworks, and industry not being fully equipped to meet market demand as compared to neighbouring countries.
A number of surveys conducted by different organisations have identified a similar set of barriers impeding the development of Cambodian SMEs. These include a 2004 World Bank survey and reports by ADB and the Cambodian SME Sub-Committee, which have identified many of the same issues as specific to the development of Cambodian SMEs (see table below).
These barriers remain relevant to the cassava value chains in the project area. Moving forward, the way government policies are restructured and infrastructure put in place to promote local enterprise development will have a lot of influence on how the cassava subsector performs. In particular, the growth and expansion of SMEs should see better service delivery.

### 4.2 Access to markets and information

According to farmers in the target areas, they do not experience many problems with market access because there plenty traders and local processors operating in the project areas. The Vietnamese market absorbs a large chunk of cassava from the place either through the purchase of fresh tubers or semi-processed or processed products.

With that in mind, accessing market information that should guide pricing policy is still required. Farmers, traders and processors always mention the price settled at the Vietnamese border as the reference point for negotiations. However, these prices are very fluid and can change within hours. Additionally, this information can be distorted as there are no means to verify it. Consequently, the Cambodian cassava value chain is somewhat controlled by Vietnamese trade policies thus exposing the sub-sector to market risks.

Nationally, the expected opening of borders to ASEAN products in 2015 represents a significant challenge for local processors, who have not achieved the capacity required for meeting international standards. This disadvantage could be costly for Cambodian enterprises as the market may be flooded with cheap and tariff-free alternatives from neighbouring countries. Therefore, the demand and supply of cassava products in the local market are likely to be negatively affected.

---

Table 6: Barriers to business development

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Specific Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Regulatory and legal framework</td>
<td>- Company registration</td>
</tr>
<tr>
<td></td>
<td>- Licensing requirements</td>
</tr>
<tr>
<td></td>
<td>- Commercial legal framework</td>
</tr>
<tr>
<td></td>
<td>- Smuggling</td>
</tr>
<tr>
<td>2. Access to finance</td>
<td>- Collateral and land titling</td>
</tr>
<tr>
<td></td>
<td>- Leasing</td>
</tr>
<tr>
<td></td>
<td>- Lack of information on borrowers</td>
</tr>
<tr>
<td></td>
<td>- SME Accounting</td>
</tr>
<tr>
<td>3. SME support activities</td>
<td>- Business development services</td>
</tr>
<tr>
<td></td>
<td>- Access to markets</td>
</tr>
<tr>
<td></td>
<td>- Technology and human resource upgrading</td>
</tr>
<tr>
<td></td>
<td>- Improving linkages</td>
</tr>
</tbody>
</table>

Source: SME Sub-Committee 2005
Conducting market research pertaining to exports remains an issue as Cambodia’s trade reporting is quite patchy - the government shared trade data with the United Nations Statistics Department (Comtrade database) in 2004, and then again in 2008, while so-called mirror statistics (those reported by Cambodia’s trade partners to the United Nations Statistics Division) are only available until 2008. However, the two sources often differ, leading to different interpretations. At the same time, the informal exports of cassava are not taken into account, furtherer distorting available information.

4.2.1 Technology

Cambodia depends on foreign technology. Nearly all of the cassava processors and factories have joint ventures, in particular with companies from Thailand, Vietnam and Korea. Factory equipment is imported, in particular from Vietnam and Thailand. Second-hand equipment demands frequent maintenance and repair, and thus costly. Interviewed processors mentioned difficulties finding skilled labour, and thus employ skilled workers from Thailand and Vietnam. There is also lack of domestic experts to train local staff. (MOC, October 2010).

Chinese technology is also accessible in Cambodia, but the issue is the lack of skilled labour able to use it. For example Song Heng enterprise ordered a new processing plant, but could not find a local service provider to install it and was forced to hire a Vietnamese service provider. The owner of the factory is managing the processing plant by himself and has hired a technician from Vietnam because of the lack of skilled labour locally.

According to the value chain information unit of the Ministry of Commerce, approximately 20-30% of cassava starch produced in Cambodia is used for domestic consumption (dry and wet starch), in particular animal feed and dry chip is used for bio-ethanol and white wine. Due to the lack of capacity to further process these semi-finished products, the remaining starch and dry chip are exported mainly to Thailand and Vietnam. Currently, fresh root cassava exportation is estimated at around 8 million tonnes at harvest (MAFF 2013). The few local processors cannot buy all of this, and lack the international market access that would allow them to scale up their capacity.

The quality of starch of the interviewed processors is international standard. ISO 9001-2000 is a globally implemented standard for quality requirements (www.iso.org). The problems encountered in the cassava value chain – especially among the actors from input suppliers to exporters – is that actors are trying to compete instead of complementing each other.

What is needed is an inclusive business model bringing all stakeholders together, but this can only work under an enabling environment. Policy must create a good environment for all aspects of the value chain to thrive. It is important to mainstream and provide services in order to strengthen the supply chain, focused on local processors. Processors need to scale up the business end as well as cassava production, which will be declining in upcoming years.
## 4.3 Cassava value chain SWOT analysis

<table>
<thead>
<tr>
<th><strong>STRENGTHS</strong></th>
<th><strong>WEAKNESSES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava is second major crop after rice</td>
<td>Cassava needs a longer growing period to yield</td>
</tr>
<tr>
<td>Cassava cultivated areas expanding with increasing interest from smallholder farmers</td>
<td>Demands for heavy labour during harvesting and transportation (not women-friendly)</td>
</tr>
<tr>
<td>Cassava is adaptive to major/wide range of soils</td>
<td>Susceptible to pests and diseases; smallholder farmers have limited knowledge on management</td>
</tr>
<tr>
<td>Cassava is drought resilient</td>
<td>Few local processors</td>
</tr>
<tr>
<td>Harvesting periods can be delayed</td>
<td>High initial investment and long period before return on investment</td>
</tr>
<tr>
<td>Cassava products have multiple uses</td>
<td>Availability of good/clean planting materials is still poor</td>
</tr>
<tr>
<td>Less labour intensive than other crops</td>
<td>The quality of the product is low, due to low incentives for farmers to produce high starch level products.</td>
</tr>
<tr>
<td>Due to availability of labour and mechanization, women can benefit from / engage in cassava production</td>
<td>Limited research and development in cassava production</td>
</tr>
<tr>
<td>Cassava has potential to contribute to food security</td>
<td>Seasonality of crops allows processing only every six months</td>
</tr>
<tr>
<td>Increase in cassava production has led to increase in employment opportunities in the cassava value chain</td>
<td>Producers are not able to control the price of production</td>
</tr>
<tr>
<td>Agronomic practices allow monoculture or intercropping, potentially improving household food security and income</td>
<td>High exportation facilitation costs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>OPPORTUNITIES</strong></th>
<th><strong>THREATS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agronomic practices allow monoculture or intercropping, potentially improving household food security and income</td>
<td>High cost of inputs due to unavailability from local sources</td>
</tr>
<tr>
<td>Cassava is a high soil nutrient-demanding crop and may deplete the soil if not well-managed</td>
<td>Lack of trust among different actors in the cassava value chain</td>
</tr>
<tr>
<td>Agronomic practices allow monoculture or intercropping, potentially improving household food security and income</td>
<td>Poor waste water management at processors</td>
</tr>
<tr>
<td>Seasonality of crops allows processing only every six months</td>
<td>High interest rates and difficult access to financial facilities</td>
</tr>
<tr>
<td>Producers are not able to control the price of production</td>
<td>High exportation facilitation costs</td>
</tr>
<tr>
<td>High cost of inputs due to unavailability from local sources</td>
<td>Lack of trust among different actors in the cassava value chain</td>
</tr>
<tr>
<td>Lack of trust among different actors in the cassava value chain</td>
<td>Fractured information on production and processing in different locations</td>
</tr>
<tr>
<td>Producers are not able to control the price of production</td>
<td>Smallholder farmers still not organized</td>
</tr>
<tr>
<td>Challenges encountered by value chain actors</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>4.4 Challenges encountered by value chain actors</strong></td>
<td></td>
</tr>
<tr>
<td><strong>4.4.1 Input suppliers</strong></td>
<td></td>
</tr>
<tr>
<td>Input distributors do not experience many problems in their business. However, their main challenge relates to delays in delivery of orders. Retailers often stock in advance before the start of the cropping season. If prices go down after this period, their profit margin is greatly reduced and sometimes even leads to loses.</td>
<td></td>
</tr>
<tr>
<td>Another challenge concerns the fact that the input supply is marred by cheap and illegal imports, making it difficult for some suppliers to compete fairly in the market.</td>
<td></td>
</tr>
<tr>
<td>Often input suppliers have no experience in cassava production and this limits their advice to farmers as they often rely on information on the package (frequently in languages other than Khmer). For example, some suppliers ask farmers to bring empty containers of inputs they have used previously. There is limited information or training available to input suppliers and many products only have instructions in foreign languages. In the value chain, they are competing with each other in terms of price, but their technical advice to farmers is not relevant at the moment.</td>
<td></td>
</tr>
<tr>
<td><strong>4.4.2 Producers</strong></td>
<td></td>
</tr>
<tr>
<td>The proper functioning of farmer groups is yet to be achieved. All project participants agreed that their cassava farmers’ group was not functioning well, as they do not meet often to talk about the issues of production and market linkages.</td>
<td></td>
</tr>
</tbody>
</table>
There is poor information and no knowledge exchange mechanisms. For example, farmers receive information on prices at the Vietnam border through a phone call without any means of verification. The display panel for group representation is not regularly updated, forcing farmers to check for themselves.

Low productivity can be ascribed to poor technical support as well as pests and diseases. In 2012 for example, due to pest and disease outbreak, farmers harvested in a haste leading to low yields. During the sale period, farmers faced numerous challenges of low pricing. Middlemen and traders greatly influence cassava pricing, scaling machines are sometimes tampered with, while payments are delayed.

The high interest rate on loans is also a barrier to farmers. To pay back loans and reduce the amount of repayment (accruing from capital and interest), sometimes farmers are forced to harvest cassava earlier experiencing lower yields than would have been achieved when harvests at maturity.

4.4.3 Cassava collecting centres (CCCs) and traders

Transport and general logistics are the key challenge for CCCs and traders - they need to pick up cassava and transport it to Vietnam on the same day but the price they pay farmers in the morning may have already dropped before they make the final sale in Vietnam in the afternoon.

CCCs rely heavily on the Vietnamese market and often must verify prices to set purchasing prices with farmers during produce collection. They pay farmers 100% after delivery, requiring that they have access to financial resources at any given time. The high interest rates on loans are therefore a hindrance to their businesses.

The survival of their businesses is dependent on a reliable cassava supply, and low cassava production threatens their survival.

4.4.4 Cassava processing enterprises

The cost of cassava processing in Cambodia is quite high compared with neighboring countries where electricity and transportations costs are much cheaper. High production costs drive the prices of their processed products higher, making it hard for the Cambodian enterprises to compete with their counterparts across the border in Vietnam.

Another challenge is selling the final product (dry starch) as the price fluctuates and the price of both cassava roots and starch is reliant on prices in Vietnam and other neighbouring countries.

Another challenge is linked to the fact that processing enterprises cannot operate their processing plants the whole year round because cassava is a seasonal crop. The processors would prefer to buy and process fresh cassava year round but local producers currently only harvest cassava during one harvest season forcing processing plants to work only five months (November-March) of each year.
Processing enterprises need a lot of working capital to store dry starch after processing if they want to wait until the price of dry starch increases and is profitable.

Most of the locally processed dry starch does not meet international standards and is therefore locked out from the international market. One of the companies is in the process of applying for certification, which will increase market access. This process should be strongly supported by the government as part of the strategy to develop local industries. In effect, processors will have expanded markets and can compete with Thailand or Vietnam. Farmers can also enjoy stable pricing and a reliable market for their produce.

5. Conclusions

The study has set out the roles and interactions of the key stakeholders in the cassava value chain in the project area, including input suppliers, traders, collection centres, processing enterprises and farmer producers. The study has found that there is untapped potential of cassava in Tboung Khmum province, considering that productivity can be increased, and through more intense collaboration better conditions for all value chain players can be achieved.

The **key conclusions include:**

- Cassava is the first major crop of farmers in the targeted area. Most of the farmers rely on cassava production to generate family income in spite of a decline in the production area due to intercropping with rubber, plus the expansion of municipal/urban area developments in the new province and some people migrating to other provinces.

- Cassava production demonstrates an opportunity for traders and local processors to run their businesses, with an abundance of cassava root available during the harvesting time, from November to March. However, the high seasonality of the crop also poses significant barriers to investment as processing is halted outside of harvesting time.

- The value chain is governed by Vietnamese traders. No other value chain actors in the target area influence the market price because all local traders and processing enterprise owners rely on Vietnamese middlemen to set the price. Farmers’ access to timely market (price) information is only possible with the use of mobile phone calls to middleman and collectors. There are many middlemen and collectors in the target area.

- Some farmers cannot sell their cassava roots due to lack of transportation.

- The middlemen and cassava collectors have more purchasing power than the local processing enterprise owners because they sell roots directly to Vietnamese traders and get cash payment immediately. Meanwhile, the local
processors lack the capital to buy cassava and dry starch for long-time storage to be sold when the price of dry starch goes up.

- All cassava value chain actors, especially farmers, have very limited access to extension services on cassava production techniques and have limited understanding of pests and diseases. The cassava producers rely on input suppliers for basically unreliable information. The input suppliers normally recommend the use of pesticides, in which case the farmers may lose income, time, and even their health. Farmers also lack the knowledge to increase cassava productivity especially through the appropriate fertilizer application.

6. Recommendations

6.1 Markets and exports

- Lobbying is needed for cassava export procedures with a reduced cost of export facilitation to help cassava exporters improve their competitiveness in international markets, and especially in China. Now the costs are too high, and not of value compared with selling to local traders.

- Organized supply chains among local processors or collection centres should be further developed. Becoming more organized will facilitate inclusive business relationships, which will help guarantee product quality from producers to processors.

- Processors should be assisted in setting up inclusive business plans, where the cost-benefits are calculated as well as planning for implementation.

- More coordination and partnership among stakeholders to improve market information systems and improved service delivery. Set up a national level cassava export association for improved market information, market access/intermediation and working with policy-makers to improve cassava export policy.

- Smallholder farmers should organize themselves for application of the inclusive business model and promote women to play active roles in leadership and management.

6.2 Cassava production and processing

- To address the issue of low productivity, extension services should be provided to improve farmers’ understanding of sustainable cassava production including planting techniques, fertilizer application, pest and disease management etc.

- It is recommended to incorporate climate smart cassava production in the extension services. This would enable cassava farmers to reduce their vulnerability to climate variations (e.g. drought, flood, erratic rainfall, increase of
- Improved access to good quality inputs, such as cassava cutting stems/planting materials and fertilizer, will significantly contribute to improved productivity.

- Technical support on waste water management should be provided to cassava processors.

- Cassava processors should be assisted in certifying their facilities and products to increase the market value and accessibility of their end product.

- More research should be conducted on sustainable cassava production, especially pest and disease management, healthy planting materials, higher yield plant breeding and starch cassava varieties.

### 6.3 Access to finance

Through collective action, financial institutions should be lobbied to improve access to finance and low interest rates for cassava value chain actors. Current high interest rates are a barrier for local processors to make a profit and supply cassava all year long.

### 6.4 Policy

Policies regarding access to and interest on bank loans, factors of production (e.g. electricity) and export should be developed and revised to benefit the whole value chain, to enable local actors to compete effectively in the market. Direct market intervention is a priority for getting more people to invest in cassava processing plants as well as foreign direct investment (FDI) in order that value added to cassava production in particular does not rely on neighbouring countries.

### 6.5 Future interventions

The cassava value chain should be further developed with the assistance of a facilitator, who can coordinate among the actors and lobby for an improved enabling environment. The facilitator ought to work in different areas across the country to improve the competitiveness of the Cambodian value chain. All of these recommendations should be implemented in coordination with projects focused on increasing exports to China.
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Cambodia, R. g. (2013). Rectangular Strategy Phase III. Royal goverment of Cambodia.
FAO, R. (2013). Save and Grow Cassava. FAO.
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SNV. (2013). IBC Baseline survey. SNV.
## Appendix

### Appendix 1

### Cassava cultivation per province

<table>
<thead>
<tr>
<th>Province-City</th>
<th>Total area cultivated (ha)</th>
<th>Total area harvested (ha)</th>
<th>Total production (Ton)</th>
<th>Average yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battambang</td>
<td>57,064</td>
<td>56,413</td>
<td>2,003,801</td>
<td>35.5</td>
</tr>
<tr>
<td>Kampong Cham</td>
<td>67,427</td>
<td>45,996</td>
<td>970,558</td>
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<tr>
<td>Bantheay Meanchey</td>
<td>46,951</td>
<td>44,979</td>
<td>911,994</td>
<td>20.3</td>
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<tr>
<td>Kratie</td>
<td>33,136</td>
<td>33,136</td>
<td>737,625</td>
<td>22.3</td>
</tr>
<tr>
<td>Kampong Thom</td>
<td>29,270</td>
<td>29,270</td>
<td>420,883</td>
<td>14.4</td>
</tr>
<tr>
<td>Pailin</td>
<td>20,160</td>
<td>20,160</td>
<td>705,600</td>
<td>35.0</td>
</tr>
<tr>
<td>Stung Treng</td>
<td>16,840</td>
<td>16,840</td>
<td>303,120</td>
<td>18.0</td>
</tr>
<tr>
<td>Ratanakiri</td>
<td>14,577</td>
<td>14,577</td>
<td>322,005</td>
<td>22.1</td>
</tr>
<tr>
<td>Odor Meanchey</td>
<td>14,470</td>
<td>14,470</td>
<td>315,340</td>
<td>21.8</td>
</tr>
<tr>
<td>Svay Rieng</td>
<td>12,766</td>
<td>12,766</td>
<td>239,840</td>
<td>18.8</td>
</tr>
<tr>
<td>Siem Reap</td>
<td>10,265</td>
<td>10,265</td>
<td>154,929</td>
<td>15.1</td>
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<td>Preah Vihear</td>
<td>10,135</td>
<td>10,135</td>
<td>121,620</td>
<td>12.0</td>
</tr>
<tr>
<td>Mondulkiri</td>
<td>9,391</td>
<td>9,391</td>
<td>145,240</td>
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<tr>
<td>Kampong Speu</td>
<td>7,171</td>
<td>7,171</td>
<td>107,482</td>
<td>15.0</td>
</tr>
<tr>
<td>Prey Veng</td>
<td>3,977</td>
<td>3,977</td>
<td>44,809</td>
<td>11.3</td>
</tr>
<tr>
<td>Pursat</td>
<td>2,795</td>
<td>2,795</td>
<td>49,363</td>
<td>17.1</td>
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<tr>
<td>Kampong Chnnang</td>
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<td>1,854</td>
<td>13,080</td>
<td>7.1</td>
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<tr>
<td>Kampot</td>
<td>1,453</td>
<td>1,453</td>
<td>19,809</td>
<td>13.6</td>
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<tr>
<td>Takeo</td>
<td>937</td>
<td>937</td>
<td>8,433</td>
<td>9.0</td>
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<tr>
<td>Preah Shihanouk</td>
<td>560</td>
<td>560</td>
<td>8,400</td>
<td>15.0</td>
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<tr>
<td>Koh Kong</td>
<td>317</td>
<td>317</td>
<td>6,397</td>
<td>20.2</td>
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<tr>
<td>Kep</td>
<td>224</td>
<td>224</td>
<td>2,487</td>
<td>11.1</td>
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<tr>
<td>Kandal</td>
<td>57</td>
<td>57</td>
<td>372</td>
<td>6.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>361,797</strong></td>
<td><strong>337,743</strong></td>
<td><strong>7,613,187</strong></td>
<td><strong>23</strong></td>
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</table>

Source: MAFF (2013)
## Appendix 2

### Cambodia cassava export volumes

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
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<tbody>
<tr>
<td><strong>Fresh or Dried Cassava (HS 071410)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Volume (MT)</td>
<td>22,289.4</td>
<td>66,753.42</td>
<td>24,000.00</td>
<td>93,502.56</td>
<td>1,512,656.6</td>
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<tr>
<td>Value (USD)</td>
<td>493,178</td>
<td>941,258</td>
<td>420,125</td>
<td>2,253,374</td>
<td>8,010,993</td>
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<tr>
<td><strong>Cassava Starch (HS 110814)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Volume (MT)</td>
<td>10,285.5</td>
<td>31,280.24</td>
<td>13,722.93</td>
<td>15,721.5</td>
<td>16,635.00</td>
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<tr>
<td>Value (USD)</td>
<td>1,592,156</td>
<td>4,835,132</td>
<td>2,453,787</td>
<td>2,998,423</td>
<td>3,580,428</td>
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<tr>
<td><strong>Total Cassava exports (USD)</strong></td>
<td>2,085,334</td>
<td>5,776,390</td>
<td>2,873,912</td>
<td>5,251,797</td>
<td>11,591,421</td>
</tr>
</tbody>
</table>

Source: Commodity Trade Statistics Database, United Nations Statistics Division
## Appendix 3

### Cassava processing factories in Cambodia

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Date starting</th>
<th>Fresh root cassava requirement (T)</th>
<th>Comment</th>
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<tbody>
<tr>
<td>MH Bio Energy</td>
<td>Phnom Penh</td>
<td>2008</td>
<td>208,260.00</td>
<td>Bio-ethanol</td>
</tr>
<tr>
<td>TTY Agriculture Plants development</td>
<td>Tboung Khmum</td>
<td>2001</td>
<td>120,000.00</td>
<td>Starch</td>
</tr>
<tr>
<td>Dansung Energy</td>
<td>Battambang</td>
<td>2009</td>
<td>104,000.00</td>
<td>Bio-ethanol</td>
</tr>
<tr>
<td>Seav Fong</td>
<td>Tboung Khmum</td>
<td>2005</td>
<td>53,120.00</td>
<td>Starch</td>
</tr>
<tr>
<td>Sun Ath</td>
<td>Tboung Khmum</td>
<td>2008</td>
<td>50,000.00</td>
<td>Starch</td>
</tr>
<tr>
<td>SBM</td>
<td>Battambang</td>
<td>2008</td>
<td>32,000.00</td>
<td>Starch</td>
</tr>
<tr>
<td>Tay Meng</td>
<td>Pailin</td>
<td>N/A</td>
<td>45-60T/day</td>
<td>Starch</td>
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<tr>
<td>SKD Société Khmer de Distiller</td>
<td>Phnom Penh</td>
<td>2003</td>
<td>18,000.00</td>
<td>Distiller (wine)</td>
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<td>CP Group</td>
<td>Kandal</td>
<td>2001</td>
<td>8,000.00</td>
<td>Animal feed</td>
</tr>
<tr>
<td>Medivat</td>
<td>Phnom Penh</td>
<td>2005</td>
<td>100.00</td>
<td>Animal feed</td>
</tr>
<tr>
<td>Ly Hong Leng</td>
<td>Tboung Khmum</td>
<td>2011</td>
<td>20,000.00</td>
<td>Wet starch</td>
</tr>
<tr>
<td>Heng Hout</td>
<td>Tboung Khmum</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Song Heng</td>
<td>Tboung Khmum</td>
<td>1998</td>
<td>20,000.00</td>
<td>Starch</td>
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<td>Green feed</td>
<td>Tboung Khmum</td>
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<td>N/A</td>
<td>Animal feed</td>
</tr>
<tr>
<td>BETAGRO group</td>
<td>Phnom Penh</td>
<td>N/A</td>
<td>N/A</td>
<td>Animal feed</td>
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<td>Sichuan New Hope Agribusiness</td>
<td>Phnom Penh</td>
<td>2011</td>
<td>N/A</td>
<td>Animal feed</td>
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<td>Agrotech Vita</td>
<td>Phnom Penh</td>
<td>N/A</td>
<td>N/A</td>
<td>Animal feed</td>
</tr>
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</table>

Sources: Aye 2014, Sarom June 2014, and Internet search