

# Value chain assessment report for avocado, cattle, pepper and cassava in Dak Lak province of Central Highlands of Vietnam



RESEARCH  
PROGRAM ON  
Integrated Systems  
for the Humid  
Tropics

ILRI PROJECT REPORT

# Value chain assessment report for avocado, cattle, pepper and cassava in Dak Lak province, Central Highlands of Vietnam

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# Abbreviations

AI	Artificial insemination
CIAT	International Center for Tropical Agriculture
EXTRAPOLATE	<i>EX-ante</i> Tool for RAnking POLicy AITernatives
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Statistics Division of FAO
GSO	Vietnam General Statistics Office
GTZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i>
ILRI	International Livestock Research Institute
MARD	Ministry of Agriculture and Rural Development
USA	United States of America
USD	United States dollar
TNU	Tay Nguyen University
WASI	Western Central Highlands Agriculture and Forestry Science Institute
VND	Vietnamese dong
VPA	Vietnam Pepper Association

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# Executive summary

This technical report uses a participatory rapid appraisal approach and provides overview information about selected commodity value chain systems that are believed to have a high potential to improve rural livelihoods of smallholder farmers (especially poor) through income generation and value addition and contribute to overall socio-economic development of Dak Lak province in the Central Highlands of Vietnam. It examines some of the key production and marketing challenges that smallholders and other value chain actors are facing in the region under consideration. In particular, it reviews and draws the current value chain structure, analyses constraints and opportunities of selected commodities such as avocado, cattle, pepper and cassava value chains.

Based on the recent economic trends, the study finds that the set of commodities chosen have good prospects in expanding domestic and global markets. Most importantly, an efficient and effective engagement of (poor) smallholders in commodity value chains provides additional job opportunities and thus a good basis to generate additional income for them and other value chain actors engaged in production and marketing chain. In particular, initial findings of this research highlight that avocado and cattle beef have a good prospective in the emerging local markets due to rising consumer demand in the urban areas of Vietnam. Cassava and pepper also show economic significance in terms of bringing foreign currency into the country from exports. They are gaining attention as important industrial crops for the province and have good prospects in the global market.

Given that some research-for-development activities were carried out in the recent past in relation to the commodities selected in the region, this report picks out important and relevant issues and re-emphasizes interventions needed to strengthen existing production and marketing system. In this regard, key challenges that can be summarized in relation to avocado production include pest attacks and diseases, absence of innovative and improved management and agronomic practices and technologies, as well as an increasing number of cheap and low-quality avocado seedlings and losses occurring at post-harvest process. In the case of the beef cattle value chain, poor breeding, lack of livestock production knowledge among smallholders, feeding-related concerns and poor conditions of slaughterhouses and meat markets seem to be challenging issues that require special attention when designing appropriate interventions. The problems afflicting cassava and pepper production are also significant that include the limited and inappropriate use of input resources such as seeds (low-yielding seed varieties), fertilizers and other chemical products. It should also be highlighted that product diseases, cultivation happening in low-fertility soils, post-harvest losses are the ones that require further research at grassroots levels.

In addition, the prevailing institutional system and links from farm gate to market have multi-layer barriers which are common for all commodities mentioned and this leads to high transaction costs at each connection point. Challenges also exist in commodity markets and distribution channels, which are very vulnerable to external shocks. Finally, there is a lack of transparency, poor exchange of production and market information and underdeveloped linkages among actors that are part of commodity value chains. It is also key to note that these challenges particularly serve as barrier to ethnic minority groups from engaging both in production and marketing of the studied commodities.

The value chain assessment stresses that strengthening the role of community or village farmer groups would remain a key intervention needing initial seed money from the government and donor institutions. Innovative approaches and technologies are also needed to sustain these farmer groups' existence with the idea of moving towards collective

action, exchange of production and market information, and having strong bargaining power especially among its ethnic minority members. There should also be more intervention in relation to improving agricultural extension and advisory support services and upgrading the value chain system with proven recommendations coming out from public and international projects. It is also important that the programs and activities performed by government and international agencies remain market-oriented and demand-driven and also support programs that provide incentives for the active participation of ethnic minorities. The study also points out to previous value chain development interventions that have been successful in the recent past and to the importance of their transferability and scaling out to larger areas. It is clear that establishing value chain strategies is not sufficient in the absence of supportive policies that should promote inclusive growth and increase the competitiveness of commodities in the Central Highlands. Small-scale farmers require adaptive market institutions that have to be strengthened in terms of physical and financial resources. In summary, it is believed that different diversification strategies are needed: vertical diversification to improve quality of production through improved agricultural practices; processing and marketing development; and horizontal diversification to increase the range of end products available, which also satisfy consumer demand.

It is assumed and hoped that the suggested interventions will have an important role in facilitating inclusive development that targets poverty reduction, food security issues and the improvement of livelihoods for smallholders in particular and other value chain actors in general. However, it should also be highlighted that many research questions remain open for further investigation which will require additional funding. This will provide space for conducting follow-up and relevant agricultural research activities with the idea of validating the initial findings of this technical report and capture the full in-depth picture that is appropriate for the four commodity value chains selected in the studied region.

# Introduction

This study was undertaken within the framework of the Humidtropics CGIAR Research Program, which aims to help poor farm families in tropical Africa, Asia and Americas boost their income from integrated agricultural systems' intensification while preserving their land for future generations.

The objectives of the program are:

- Increased and more equitable income as a result of Humidtropics system interventions, earned by rural poor farm families, with special focus on rural women;
- Increased consumption of diversified and quality foods by the poor, especially among nutritionally vulnerable women and children;
- Increased total farm-level productivity in smallholder production systems;
- Minimized adverse environmental effects of production systems;
- Increased control over resources and participation in decision-making by women and other marginalized groups; and
- Improved capacity to innovate within integrated systems by actors at household, community and landscape levels.

The Central Highlands of Vietnam is well known as a coffee producing and exporting region with many smallholders (especially ethnic minority groups) engaged in agricultural activities related to coffee production and marketing. The region is regarded as coffee capital of Vietnam. However, the decline in coffee prices in global markets in recent years has forced agricultural diversification towards other commodities which have good prospects both in local and global markets. However, this process is slow because of poorly developed value chains for potentially prospective commodities. Because of this coffee still remains one of the important commodities for smallholders. Since this commodity has already been extensively studied in the region (Ha and Shively 2008; Hoang et al. 2013), this study focused on four other important commodities which have socio-economic significance within the existing agricultural system Dak Lak province of the Central Highlands.

Dak Lak is one of five provinces of the Central Highlands with beautiful landscape. It has eight agro-ecological zones which can be distinguished from each other by soil type, rainfall pattern and altitude. It is one of the largest provinces of Vietnam. In general, it is well connected by road and by air to the cities of the central and southern part of the country which provide good opportunities for transportation of agricultural products. However, infrastructural deficiencies are noticeable further away from urban centres.

Agricultural production is limited because of unfavourable soils and long dry seasons (Khanh et al. 2006). About 45% of the surface area is forestry land and about 40% is under agricultural production in the province. Deforestation is becoming a big problem and is caused by shifting farming for annual and perennial crops, as well as enlargement of coffee production areas (Meyfroidt et al. 2013). It should also be noted that 76% of the population lives and works in rural areas and is highly dependent on rural sector for its livelihood. Dak Lak province has a population of diverse ethnic groups; 65% are Kinh, the majority ethnic group in Vietnam.

In general, the most important agricultural commodities in Dak Lak besides coffee include rice, maize, cassava, pepper and rubber (Khanh et al. 2015). In recent years, Dak Lak also became popular for its avocado fruits in the country which has also caught the attention of both public and international research institutions.

This study has chosen avocado because of its high market potential and high nutritional value; it could thus contribute to supplementing both urban and rural people's poor-quality diet. Considering that avocado trees are linked to coffee plantations, which demand avocado tree shade to grow, it was considered as a potential agricultural commodity that could be put in the portfolio of smallholders in the coffee-dominated farming systems in Dak Lak. Another commodity chosen for study was pepper, which is gaining a reputation as a vital export cash crop in Vietnam. The other important industrial crop selected was cassava. It was previously regarded as the main staple food of poor people, but is currently gaining attention as a cash crop with good market prospects for its end products. It is becoming particularly popular in the booming animal feed, industrial starch and ethanol markets. The development of cassava value chain may therefore create additional opportunities for all value chain actors. Besides agricultural cash crops, animal husbandry is also becoming increasingly significant in Dak Lak province. In this regard, pigs and cattle are the main livestock commodities. Considering that the pig value chain has already been studied (Lapar et al. 2014), cattle was chosen because of its potential to take advantage of the rising demand for beef in urban centres of Vietnam. There are good prospects for smallholders to produce fatter animals and obtain better prices, and thus shift away from grazing to stall-feeding production systems, taking into account current land-related challenges.

In conclusion, it should be noted that the overall objective of this study is to present the key findings of a rapid market appraisal in relation to these commodities and outline the current situation, identify constraints and issues that are predominant in the value chains starting from farm gates to distribution channels and end markets. The findings of this report are hoped to serve as a basis for designing agricultural development activities and further research on business-oriented agrofood value chains in the Central Highlands.

# Methodology

The value chain rapid appraisal approach is a snapshot that quickly introduces the strengths and weaknesses of the value chain and provides an initial set of entry points to resolve issues, and assess opportunities, emerging from growing markets. A key challenge is to gather information and data that reflects the complexities, deficiencies and opportunities that exist within the system in which the studied value chains operate. The LINK methodology developed by Lundy et al. (2014) at the International Center for Tropical Agriculture (CIAT) is a useful participatory methodological tool, which helps to comprehend the current structure of the market chain and key business models within it (for its application in the case of northwest Vietnam, see Karimov et al. 2016). This method allows collecting background information essential before research actually moves to field-related activities, including primary data collection through surveys. The strength of the LINK method is the fact that it takes into account some of the essential difficulties that may come up in gathering and synthesising the information collected in an accurate and optimal way.

In the current study, the value chain assessment research activity started with a stakeholder meeting which was organized by the International Livestock Research Institute (ILRI) in cooperation with Tay Nguyen University (TNU). The stakeholders involved in the selected value chains were invited to a two-day workshop to learn about the objectives of the research, identify and analyse potential entry points to improve the livelihood of rural households through sustainable agricultural systems in the Dak Lak province of the Central Highlands of Vietnam. The workshop was held in Buon Ma Thuot city, the capital city of Dak Lak province in November 2014. The participants invited included farmers, traders, representatives from enterprises, extension staff and researchers from TNU and Western Central Highlands Agriculture and Forestry Science Institute (WASI).

The specific objectives of the workshop were to:

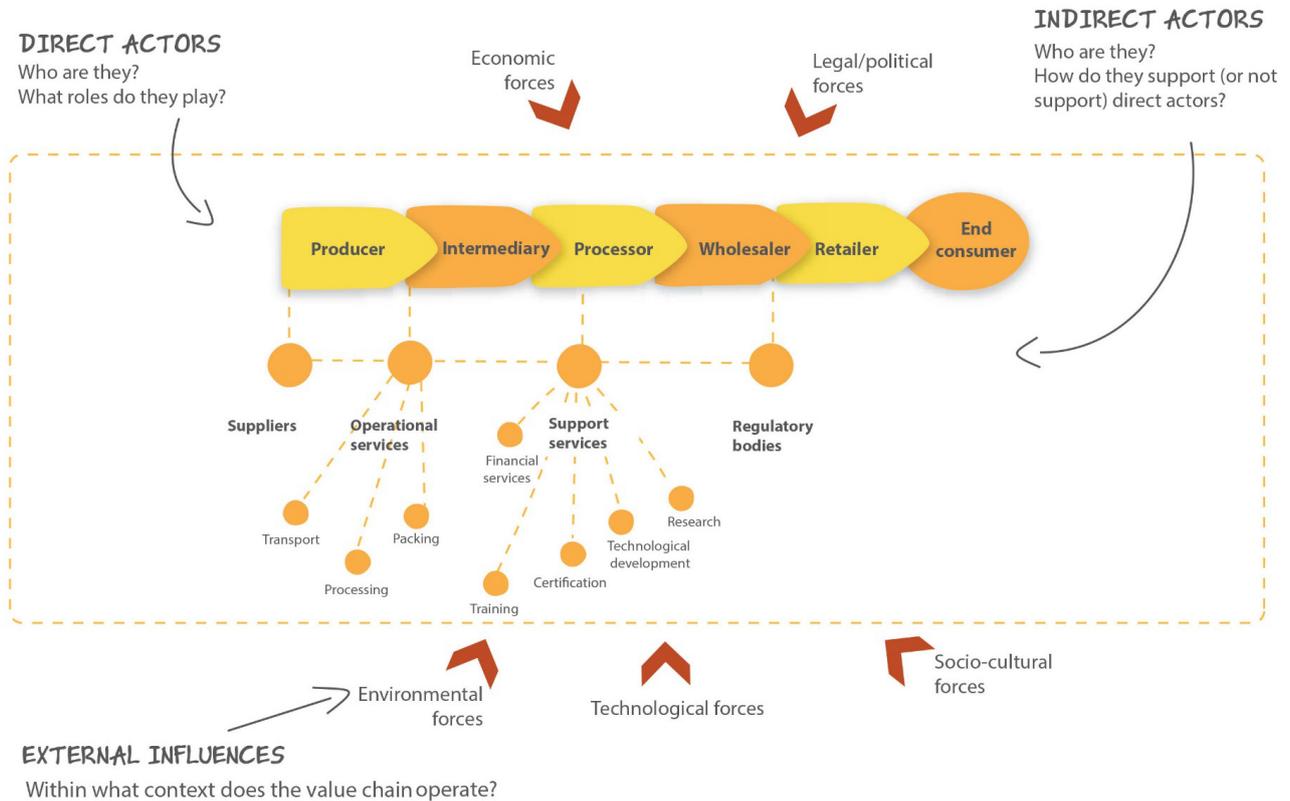
- Gain information to characterize the value chains selected and the key business models within the value chains and to come up with entry points for possible marketing interventions; and
- Develop the capacity of local researchers, extension workers, producers and agro-enterprises to use value chain approaches and build successful business models.

The workshop was considered as a real participatory platform and participants took an active part in identifying actors involved in the four products' value chains, analysing their constraints, forecasting expected outcomes and proposing potential entry points to improve the livelihoods of poor households through the development of sustainable agricultural systems. In the workshop, participants were assembled into five groups. Four of the groups were in charge of analysing the four value chains selected: beef cattle, avocado, pepper and cassava. The fifth group was responsible for analysing the policy environment affecting each of the four value chains. In order to avoid possible biases, each group contained representatives of different segments in the value chains: small producers, companies, traders, processors and researchers.

The key activity of the workshop on the first day was to describe the existing value chain using a mapping approach (see Figure 1) that helps to see the flow of the commodity from one actor to another. In this particular case it was interesting to observe the commodity flow from the farm gate to the end market that raised awareness of how the

particular value chain functioned. This exercise was modified to take into account each stakeholder's opinion based on his or her experience. This created an opportunity for multi-stakeholder debates. When the whole picture was drawn, it was easy to discuss the constraints and opportunities, and propose interventions based on the discussion held among different stakeholders.

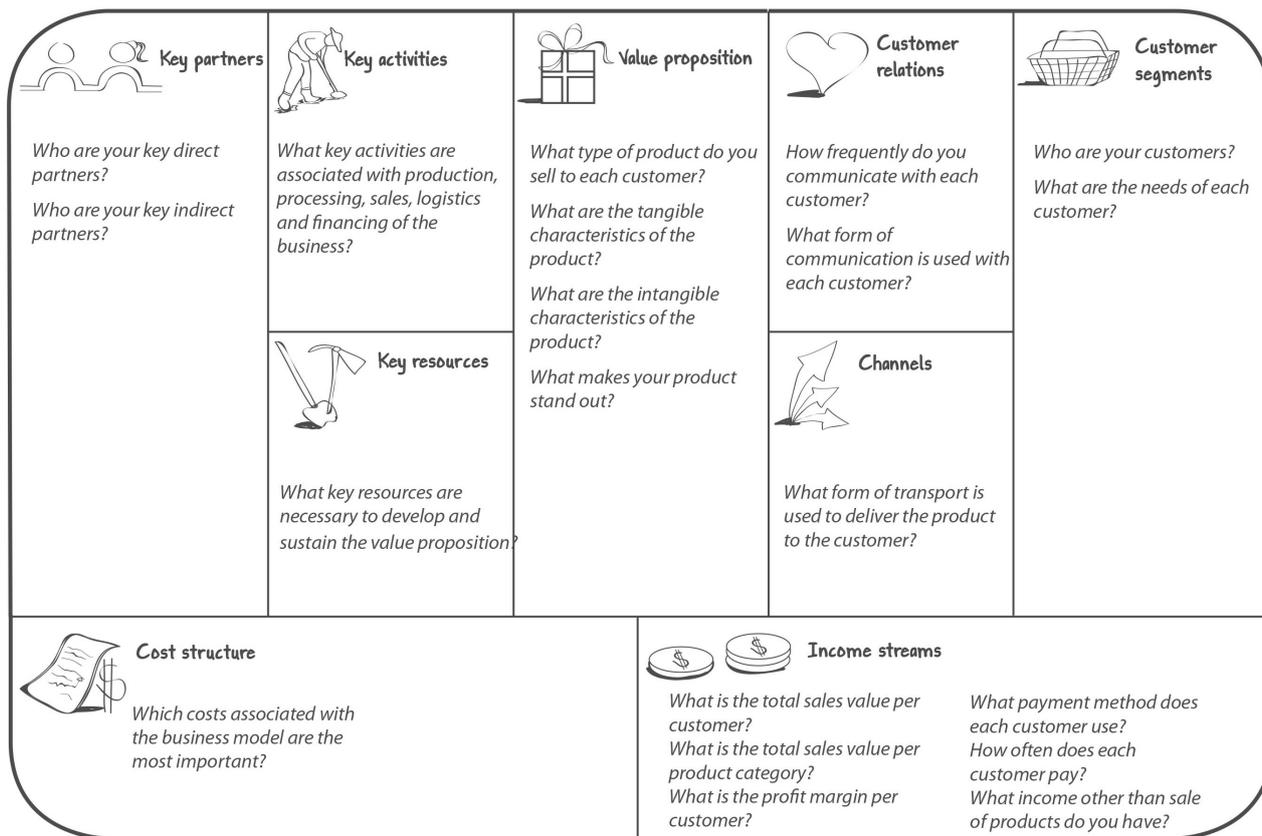
Figure 1. Value chain mapping tool.



Source: Adapted from Lundy et al. (2012).

On the second day, the participants were given a chance to identify successful business models within the chosen value chains. After selecting particular business models of interest, the business model canvas was sketched (see Figure 2 and Lundy et al. 2014). The business model canvas of a particular actor in the value chain of each commodity helped establish a grounded dialogue among smallholders, and development and private sector actors. It provided a rough idea about an enterprise's business model by highlighting the links and challenges faced by the business regarding its suppliers and customers. The business model canvas was used to discuss upgrading strategies and innovations needed to improve the prevailing business relationships and linkages among actors.

Figure 2. Business model canvas tool.



Source: Adapted from Lundy et al. (2012).

The information gathered during the workshop was documented and supplemented with secondary data and reviews of existing literature related to the commodities investigated. Information obtained from site visits in Dak Lak province during 2014 and 2015 under the Humidtropics CGIAR Research Program (CRP) was also used in this report. The value chain maps constructed were discussed further with researchers from local research institutions and extension officers during the EXTRAPOLATE (EX-ante Tool for RAnking POLicy AITernatives) meeting organized in Buon Ma Thuot city of Dak Lak province in 2014.

# Mapping of avocado value chains

## Background

While avocado's popularity is increasing in Vietnam, it is still not a highly market-oriented commodity in the country. Up to recent years it was grown as a shelter tree in coffee plantations to provide summer shade and at the same time to block severe wind. In a liquid form it was consumed as a cold beverage which was prepared in small coffee shops during the hot summer days (Dzung et al. 2011). Avocado's nutritious content is rich with a high concentration of proteins and healthy oils. In recent years, avocado has also been promoted as a good diet food for weight control. Its popularity in the cosmetic industry is increasing because of its property to rapidly penetrate skin (Bose and Mitra 1996) and is used to produce sunscreen which is organic in nature.

Avocado was brought and introduced by the French in Lam Dong province in the 1940s (Nguyen and Vo 1999). Despite its long history in Vietnam, its production and consumption was limited for decades. In recent years, its reputation in the country boomed because of increasing consumers' awareness about the health benefits of avocado consumption. In this regard, initial demand came from urban consumers who have higher income in comparison to rural consumers. At the same time, it was observed that government health-related programs also started promoting the consumption of avocados in rural (especially remote) areas. This has increased some of rural inhabitants' knowledge about avocado fruit which in turn increased the demand for avocado. Avocado is now considered by the state as one of the seven most important fruit crops in the country due to its high nutritive value and because of its good economic potential both in local and global markets. Increasing demand in Europe, the USA and Australia has awakened smallholders to boost avocado production considering that Vietnam is one of few countries in the world that has a suitable climatic condition for its growth. Particularly, coffee producers realized that avocado production can be as profitable as coffee and can provide multiple benefits. Given that avocados were already present within coffee plantations, avocado production boom came mainly from the Central Highlands where coffee was grown by smallholders as a predominant cash crop.

The avocado tree grows well in high altitude areas that have a longer rainy season and humidity. Avocado trees grown in Dak Lak is considered one of the best quality avocados and the number of trees harvested per year reaches around 400,000 (Becker et al. 2009). While we could not get exact data about the area under avocado trees, it is estimated by stakeholders of the value chain workshop to be around 6000 ha with an annual production of 300,000 t. The avocado season starts from May and continues until October and high season is usually observed during the summer time. According to the report commissioned by *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GTZ) and prepared by Fresh Studio Innovations Asia Ltd (2006), the avocado sector generates about USD 7 million every season in Dak Lak province. However, it is also true that post-harvest losses reach around 40% (Becker et al. 2009).

Avocado is mainly grown by Kinh ethnic group at commercial scale. Considering the high returns and ease of production providing good opportunities for ethnic minorities, it is slowly becoming popular among them. However, this is happening among coffee producing ethnic minority groups who are moving from subsistence to commercialized production.

In Dak Lak there are basically four avocado varieties that can be distinguished from each other by oil content, taste, shape, colour, skin surface and nutrition content. 'Mo' and 'Sap' avocado varieties have higher oil content and thus better fruit taste in comparison to 'Nuoc' variety which is rich in water but not in oil content. The fourth variety is called 'Booth' which is highly sought-after by Vietnamese people and thus demand for this variety is high in local markets. It originates from the USA and has thick skin and the highest oil content in comparison to other avocado varieties. Another big advantage it has is it can be stored more than ten days after harvesting, which allows delays quality deterioration. It is also harvested during the off-peak season in October and November, thus providing better chances of getting premium market prices.

In the past, the project entitled 'Development of an avocado value chain in Dak Lak province' was conducted by the GTZ-MPI Small and Medium Enterprise Development Program. The project aimed at establishing an avocado value chain and addressed issues related to heterogeneity of supply, and unprofessional production and handling that were leading to high losses and low profits for value chain actors. It has created a new avocado brand called 'DAKADO' which takes its name from Dak Lak and Avocado. The quality of 'DAKADO' was as good as that of the 'Booth' variety and its market price was also 25–50% higher than the price for other available varieties on the market (Becker et al. 2009). This project conducted interventions that targeted improving product quality, chain and market development and professionalizing the avocado seedling sector.

Considering Vietnam's comparative advantage in the production of avocado, there is now a need for further research to study the avocado value chain in the Central Highlands with the purpose of establishing strong connections between smallholder producers and end markets.

## Value chain actors, flow of product and linkages

### a. Value chain actors and their roles

#### Input providers and agricultural support

Since avocado is grown adjacent to coffee plantations, it benefits from input resources used for coffee cultivation. However, smallholders do not plan any agronomic activities which only target avocado, and thus input utilization for avocado is very limited. The seedlings are the most important input used in its production. That is why producers engaged in seedling production are essential actors to those smallholders specializing in avocado production. These seedling producers operate both with private and public funds. Seedling producers also provide some extension services at cost, including field trials if needed. However, despite the availability of professional seedling providers, practice shows that smallholders use seedlings from their own avocado orchards to reduce production costs. Stakeholders during the workshop reported that fertilizer and labour used for avocado production is minimal. Agricultural support can be obtained from local extension officers but that is also very minimal. In recent years, there have been established state programs related to avocado production and consumption. The objective was to promote avocado production in remote areas so as to allow smallholders (especially ethnic minority groups) to benefit from this side-production to coffee, and also to include avocado in peoples' daily diets.

#### Farmers

Until recently, smallholders grew avocado not because of economic returns they obtain from the sale of this fruit. The vast majority of farmers (about 70–80%) have taken advantage of growing avocado because it has provided summer shade and a wind block for their coffee plantations. That is why actually it is coffee farmers (because of their successful experience in coffee value chain) who put a lot of effort to commercialize avocado because they realize that proper functioning value chain brings high returns to them and other actors. Recent trends also show that avocado is becoming essential in smallholders' farm production diversification plans. Stakeholders reported that because of high market price, sometimes coffee producers make more profit not from growing coffee in their fields but from avocado which is grown adjacent to their coffee plants.

Avocado is also in competition with pepper because both can be used as a wind break wall for coffee plantations. Avocado orchards are usually small with only 5–10 trees, but dedicated orchards as large as 0.5 ha have been observed. Chemical fertilizers are rarely used and trees benefit from inputs used for coffee plants. Recent price increases for avocado have induced farmers to establish organized farming which require input usage in recommended amounts. As mentioned above, farmers are aware that avocado seedlings are the most important input resources used in production. Survival rates of avocado seedlings depend on several factors and only good quality seedlings provide fruits, while others remain bare trees. The average life span of an avocado tree is 30 to 40 years and the first fruits can be collected already from the third year. During 10 to 12 years each tree can produce about 100–150 kg of avocado in a good production year. Production volumes usually start falling after the twentieth year.

Farmers sell most of the harvested avocado to collectors (who are also sometimes coffee collectors) and keep only a small amount for home consumption or keep it for bartering for rice. Avocados are collected when they are still green, which helps them survive when transported and stored before reaching final consumers. The harvesting of avocado is done manually and usually is the task of collectors who come to purchase avocados from the fields. If volume of avocado production is small, farmers themselves act as collectors and manually harvest it from trees.

## Collectors

Collectors are key players in the avocado chain. Since farmers do not have their own hired labour to collect avocados, they rely on collectors who bring their own hired labour during the harvesting period. Usually farm gate negotiations are spontaneous and agreements include the price of avocado together with collection and transportation services. Collectors are mainly local traders living in the neighbourhood; some travel from nearby districts and there are also some large-scale collectors from Buon Ma Thuot city. Harvesting and post-harvest activities are handled manually, which sometimes severely damages the condition of the fruit. The traditional way of handling includes collecting avocados from the ground, placing them in bamboo baskets, and transporting them on motorbikes to wholesalers. Grading and sorting at this stage does not happen unless there is a specific requirement that is reflected by the selling price.

Avocado collectors are active players in the main season; they also purchase and sell other commodities such as coffee, cashew nuts, pepper and other tropical fruits during avocado off-season. There are also some farmers who only work as avocado collectors during the main season, but this is a temporary business for them, giving them an additional opportunity to earn extra cash.

Principally, collectors use two types of payment methods: direct and deposit payments. With the first method, the collector pays the farmer directly during the harvest season depending on the agreement reached, which can be payment for the production of a whole tree or based on the cost per kilogram of avocado. Farmers prefer selling the whole tree because it is easier for them; in this case they do not need to collect the fruits from the trees and take advantage of the sale of large volumes without worrying too much about quality deterioration. With the deposit payment method, farmers themselves collect the avocados from the trees and sell the fruit at the farm gate based on the market price they receive from other farmers or from collectors. The deposit payment only occurs between farmers and collectors who have established a long-term relationship of trust. This is advantageous for the farmer because it provides access to extra cash during the growing season. It is also beneficial to collectors because they secure the purchase of good-quality avocado before the harvesting season begins. This kind of relationship seems to be common in Vietnam because we have also observed it in the case of value chain activities in northwest Vietnam (see Karimov et al. 2016).

## Traders and wholesalers

Traders usually run small- to medium-scale businesses and operate within Dak Lak province. They are collectors themselves but they operate at larger scale than collectors. They work with several small-scale collectors located in villages. They also collaborate with farmers directly only if the volume they are purchasing is large. Hence, they are important both to farmers and collectors because they can arrange long-distance transportation, which allow Dak Lak

avocados to reach consumers located far away from their original destination. Traders can deal with up to 50 different collectors and purchases occur on the spot without any written contracts. They have good business relationship with collectors because of repeated business transactions. It is very important that they have access to a stable supply during the main season so that they are able to cover their transportation and transaction costs and make a profit. Traders are key partners of provincial wholesalers (who are also traders but at larger scale) because of their insider knowledge about areas growing avocado and the volumes they can expect from this knowhow.

While traders compete with each other to get high quality products and necessary amounts of harvested avocados, they also cooperate to reduce the prices they offer to collectors. If a collector gets a lower price than initially expected, he or she does not bother to sort and grade the avocado based on quality, shape and size. In this case, traders spend a considerable amount of time sorting and grading, which usually involves family members, relatives and neighbours. They are in contact with local box and plastic bag sellers (usually the business occurs in small shops). Boxes and plastic bags are used for packing the avocados during the harvesting season. Usually, traders do not have storage facilities and sometimes they use their home as a storage place or rent a place to store for short period of time. When traders reach their limits in terms of volume, they contact wholesalers about availability of the product and negotiate the selling price on the spot; the price is determined by the market signals they receive at that time.

For avocado shipments, long-distance public busses are used. Traders negotiate with bus drivers who agree to transport packed avocados to selling points (usually the trader has a partner in the final destination to pick up the boxes from the bus). It reduces the cost of transportation. However, well established traders rent private trucks which can carry up to a tonne of avocados every time. High quality avocados such as 'Sap' and 'Booth' are highly demanded in cities, such as Hanoi and Ho Chi Minh City, while all other types are mainly sold locally (in village and commune open markets and small shops) and also sometimes within Dak Lak province.

Wholesalers from other provinces are engaged in trading activities in Dak Lak province. These are business entrepreneurs who also trade in other agricultural products. They do grading and sorting after purchasing the product from local traders. Since the maturity of avocados vary, this is a necessary step before they are sold to retailers who are picky customers. One of the challenges is to distinguish avocado varieties from each other because in general they all look the same but differ in taste and content. In the avocado value chain, wholesalers suffer the highest damage because by the time avocados reach them, spoiling rates increase to 20 or even 30%.

## Retailers

Retailers' demand for avocado is derived from the demand they receive from urban consumers and profit they receive from selling it. Because of low consumption until recent past, the avocado was not a popular tropical fruit in Vietnamese markets and supermarkets. That is why retailers had no interest in getting involved in the avocado business. However, this has changed due to rising income in cities, the government's promotion of avocados, farmers' interest in increasing production of avocados and traders' efforts to supply them to large cities. In this regard, the retailers' role is also very important in introducing avocados to urban consumers. They are the actors that manage shops, supermarkets, restaurants or café bars. They are engaged in two types of markets depending on the volume of avocados they purchase from wholesalers. Smaller- to medium-scale retailers purchase avocados in wholesale markets. Large-scale avocado retailers have written, and sometimes (oral) contracts with wholesalers, and agree on variety, volume and transaction time. It should be noted that demand from urban consumers is not only increasing in cities like Ho Chi Minh and Hanoi, but also in Haiphong, Nha Trang and Quang Nay. In this process, improved rural infrastructure has also played a key role in facilitating the delivery of Dak Lak avocados to distant markets.

## b. Flow of product, information and payment linkages

In order to understand the flow of the product and linkages among value chain actors, it is important to identify the marketing channels along the avocado value chain. Considering that Dak Lak avocados have started being distributed to farther-away destinations, it is also key to consider the market channels through which they pass along the way. In

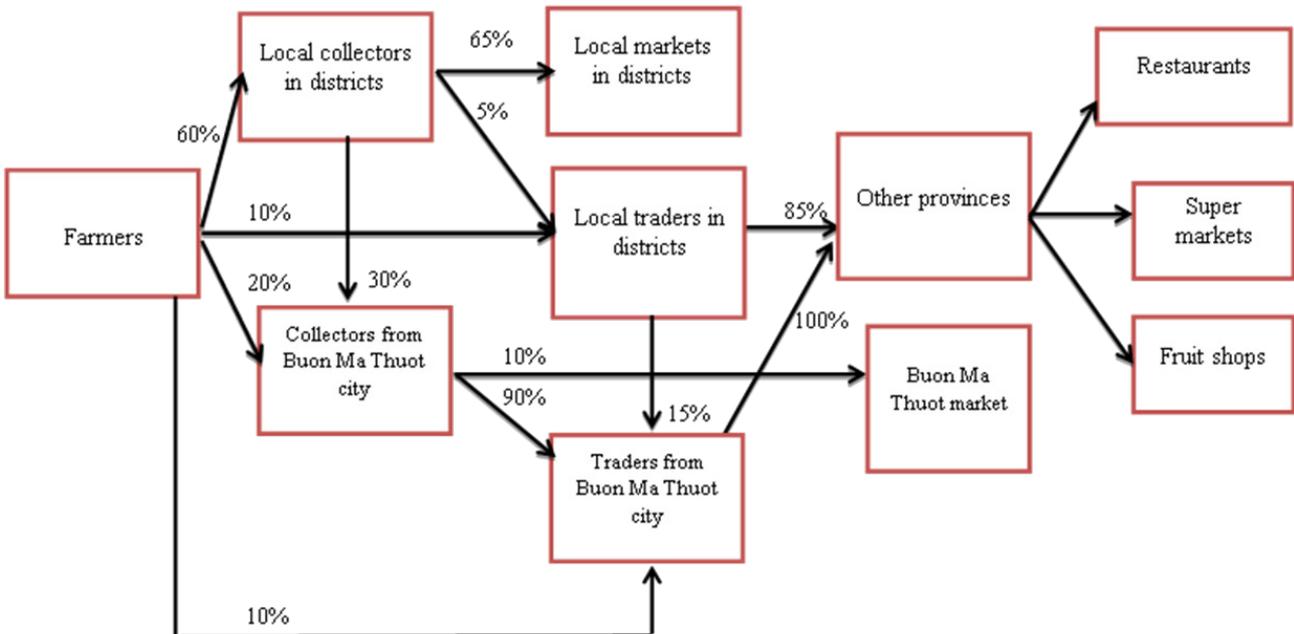
this regard, it can be said that avocados leave Dak Lak essentially in two ways: the first one is with the help of district traders and the other is with the involvement of wholesalers from Buon Ma Thuot and other provinces located nearby.

Farmers sell avocados through four channels simultaneously. A large volume is sold (up to 60% of total avocado production) to district collectors who actively engage with smallholders during the agricultural season. In this channel, advance payment is also made by a very small number of farmers. In this case, farmers take cash prior to the sale of avocados from collectors and promise to deliver an agreed volume of avocados during the harvesting season. Usually, collectors are price setters and they receive price signals from large traders who in turn receive them from wholesalers. As mentioned earlier, collectors cover the costs of collection and transportation and this is reflected in the final farm-gate price. Farmers have little bargaining power and it seems that these arrangements offered by collectors meet their minimum expectations, and they are relatively happy with the returns they make.

In a previous avocado value chain report by Fresh Studio Innovations Asia Ltd (2006), Buon Ma Thuot collectors (traders) played a key role. However, over the years, collectors from other districts of Dak Lak have emerged and have become competitors to Buon Ma Thuot collectors. Currently, Buon Ma Thuot collectors are able to secure only around 20% of avocados. There is always competition between district collectors and Buon Ma Thuot collectors to get higher quality avocados for cheaper prices where possible.

Another 20% of the production is sold to traders from Buon Ma Thuot and also to collectors coming from other districts. In general, farmers strongly prefer working closely with district collectors because they pay on the spot and in cash. Usually, they do not bother grading and sorting the avocados. As mentioned, price information comes from collectors and sometimes from local media sources such as radios or it is also shared at village and commune meetings. Local collectors in districts are only the actors that deliver products to district markets. In total, about 40% of avocados are sold within Dak Lak province and the rest is sold to other provinces, including Ho Chi Minh City and Hanoi.

Figure 3. Avocado value chains in Dak Lak.



## Constraints and challenges

- Smallholders do not have the necessary knowledge about improved management practices and their decisions on agronomic practices are only based on their limited experience. This is especially true for ethnic minority groups involved in coffee production. Since they lack needed skills in avocado production, they do not take advantage from this commodity.
- Farmers complain that avocado production is not as simple as it seems. A number of avocado trees grow well during their life span but they do not produce fruits during fruit bearing stage which is a big concern.
- Extension and advisory services and agricultural support is limited to coffee production except a short-term government program that advocates for avocado production and consumption in rural areas. Knowledge sharing among smallholders is minimal possibly due to competition in the market.
- While Dak Lak avocados are considered the best in Vietnam, their quality is deteriorating year on year because of low quality seedlings. Smallholders struggle to make reliable market plans on expected returns from avocado production because of market uncertainty and volatile prices.
- Most avocado varieties are grown once a year and because of increasing urban consumption and thus demand for avocados is higher than supply which is especially noticeable during the off-season.
- A lack of investment and poor access to agricultural credit are the main obstacles to increasing productivity and production by introducing new varieties, and applying enhanced technologies and innovations.
- Farmers are highly dependent on collectors due to their distance from markets. This allows collectors to manipulate prices and there is no mechanism that could control the fairness of prices offered by collectors.
- Smallholders use traditional methods of harvesting avocados, which damage the quality of fruits in the process. That is why harvested avocados do not survive over long distances which reduce their market price.
- Avocados are currently consumed while they are fresh. There are only limited technologies which can increase the variety of avocado-based products (besides beverages) that could add value to the fruit.

## Interventions

- Considering that avocado trees will continue to be grown together with coffee, it would be key to introduce technologies, agronomic practices and research-proven innovations that suit multi-crop orchards.
- Extension officers should be trained to provide demand-driven support especially in the area of improved management practices and post-harvest handling. Government programs are needed to further disseminate the importance of health and nutritious benefits of avocados to consumers, especially to those located in remote areas. In this regard, programs that specifically target ethnic minority groups would be essential.
- Testing new higher quality and tastier avocado varieties is essential to increase productivity of avocado trees and their attractiveness both to producers and consumers. Research should be undertaken towards developing new varieties that can bear fruit in a relatively short period of time.
- Agricultural investments and micro-credit programs are required to develop the avocado processing industry both at small- and large-scales, which will boost avocado consumption and add value to the final consumer product. Investments should be made especially in remote areas where ethnic minority populations live.
- Off-season shortages can be solved by establishing private and public storage facilities with the capacity to hold avocados for longer periods of time, especially in avocado scarce periods. Efforts should also be made towards growing avocado varieties that can bear fruit in avocado-off seasons.
- Market research should also concentrate on investigating future expansion of avocado sales to foreign markets.

# Business model canvas

## Business model of Trinh Muoi Avocado Company

Trinh Muoi Company Ltd, established in March 2011, is the leading company in producing and trading avocados in Dak Lak. The avocado varieties of the company are registered intellectual property. The company is engaged in a wide range of activities including:

- The production and supply of seedlings of high-quality avocado varieties;
- The provision of technical guidelines for farmers; and
- Trading in avocado fruits.

The company deals with a portfolio of many fruit retailers in far-away Hanoi, which means specific communication channels have to be used to manage these customer relationships (Table 1). The company's business model is nonetheless also based on engagement with smallholder farmers as it makes sure it can help address some of their needs (Table 2).

Table 1. Trinh Muoi Avocado Company's customers-oriented business model

Partners	Activities	Value proposition	Customer relationship	Customers
60 avocado farmers in Krong Nang, Ea H'leo, Buon Ho, Krong Buk, Krong Pak, Ea Kar districts  Transport services  VietcomBank	Produce and sell high quality avocado seedlings  Provide technical consultancy related to avocado production and storage  Collect and trade avocado fruits	Reliable supply of high quality avocados  Clean products with no chemical content  Price competition  Trinh Muoi avocado trademark	Advertisement on TV and newspapers  Telephone contacts  Regular exchange of information on supply quantity, selling price, quality, product specifications  Daily transaction  Prices are set on the basis of harvest season, fruit specification (types, size, colour...)  Direct cash payment or bank transfer  Sign supply contracts with customers	Traders in Hanoi (80%)  Wholesalers in Buon Ma Thuot (15%)  Other customers (5%)
	<b>Resources</b> <b>Assets:</b> Office Storehouse <b>Personal:</b> Two contract workers Hired seasonal workers (5–10 persons) <b>Financial:</b> VND <sup>1</sup> 3 billion <b>Social assets:</b> Certificate of new avocado variety Trademark of 'Trinh Muoi avocado' Good relationship with friends and research organizations		<b>Channels</b> Keep avocados in the storehouse for one day before delivering to markets Packing: 100 kg/basket Use bus services to transport avocados to Hanoi Estimated loss during transportation: 2% Transport cost VND 350,000/basket to Hanoi plus VND 150,000/basket from Hanoi bus station to fruit shops in Hanoi	
<b>Cost structure</b> <b>Production cost</b> Avocado purchase Salary for regular workers: VND 4,000,000/month per person Payment for seasonal workers: VND 250,000–300,000/day Buying baskets: VND 50,000/basket Transport cost from storehouse to local bus station: VND 150,000 per 500 kg Tax Building office		<b>Revenue stream</b> Total sales volume: 130 t/year Average profit of VND 500,000 per 100 kg Total profit of VND 650 million per season Price: January–April: VND 50,000/kg; May–July: VND 30,000–35,000/kg; August–October: VND 65,000–70,000/kg		

1. On 15 March 2016, USD 1 = VND 22,222.22.

Table 2. Trinh Muoi Avocado Company's suppliers-oriented business model

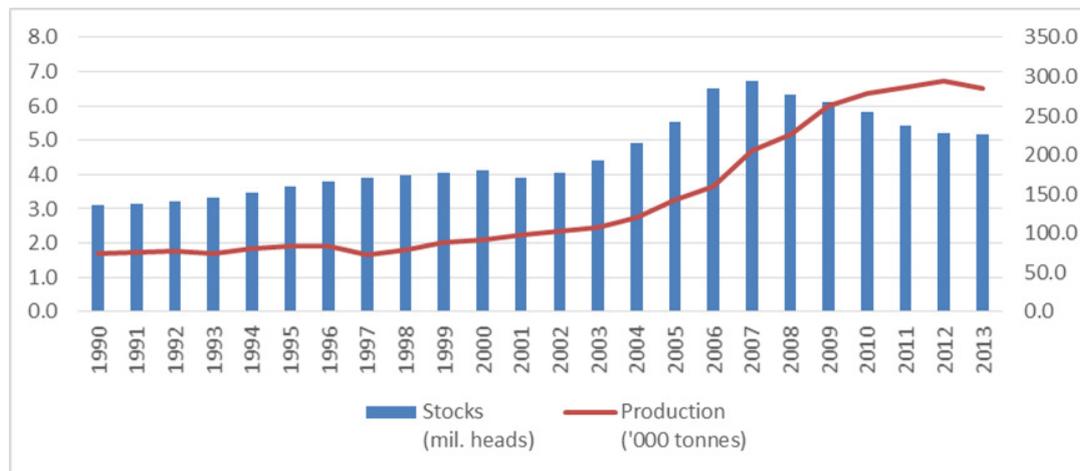
Partners	Activities	Value proposition	Supplier relationship	Suppliers
60 avocado farmers in Krong Nang, Ea H'leo, Buôn Ho, Krong Buk, Krong Pak, Ea Kar districts  Transport services  VietcomBank	Produce and sell high quality avocado seedlings  Provide technical consultancy related to avocado production and storage  Collect and trade avocado fruits	Stable demand  Competitive price  Good attitude  Provide consultancy on avocado production  Offer advance payment	Regular exchange of information on supply, demand, price, quality, product specifications with farmers  Telephone contacts  Handling method: the company purchases avocado from farmers by either payment (per kg or pay a fee for the whole tree) or via a deposit system (a payment several months before harvesting)	Mainly farmers  Their needs:  Stable price  Establishment of processing factories in the area to secure stable demand  Visits to successful farms to learn experience  Credit support
	<b>Resources</b> <b>Assets:</b>  Office  Storehouse  <b>Personal:</b>  Two contract workers  Hired seasonal workers (5–10 persons)  <b>Financial:</b>  VND 3 billion  <b>Social assets:</b>  Certificate of new avocado variety  Trademark of 'Trinh Muoi avocado'  Good relationship with friends and research organizations		<b>Channels</b>  The company hires workers to harvest and transport avocados from farms to its storehouse	
<b>Cost structure</b>		<b>Revenue stream</b>		
<b>Production cost</b>  Avocado purchase Salary for regular workers: VND 4,000,000/month per person Payment for seasonal workers: VND 250,000–300,000/day Buying baskets: VND 50,000/basket Transport cost from storehouse to local bus station: VND 150,000 per 500 kg Tax Building office		Total sales volume: 130 t/year Average profit of VND 500,000/100 kg Total profit of VND 650 million per season Price: January–April: VND 50,000/kg; May–July: VND 30,000–35,000/kg; August–October: VND 65,000–70,000/kg		

# Mapping of cattle value chains

## Background

More than half the population of Vietnam live in rural neighbourhoods, and most participate in small-scale animal production. Beef cattle production is gaining significance in Vietnam because of increasing consumption in urban (Parsons et al. 2013) and semi-urban areas especially due to increasing incomes, living standards and an expanding tourism industry. As seen from Figure 4, cattle stocks reached their peak in 2006 and 2007 with 6.5 and 6.7 million heads, respectively. However, numbers have fallen subsequently down to 5.2 million in 2013. One of the reasons for this slowdown was a decrease in the area under pasture. Despite the government's attempt to enlarge the size of livestock farmers, the boost in beef production has come from those smallholders who had access to communal land for grazing (Perkins 2002; Hall et al. 2007) which was also partly in the hands of ethnic minority people located in remote areas. Although government policy aimed to sharply increase the number of cattle herds to reduce imports, this was not sustainable in many regions because of unsuitability of local conditions for raising cattle herd. It led to an overall decrease in their numbers (Tra 2011) in many parts of Vietnam which have created further opportunities for beef exporting partner countries.

Figure 4. Cattle stocks and beef production in Vietnam (1990–2013).



Source: FAOSTAT (2015).

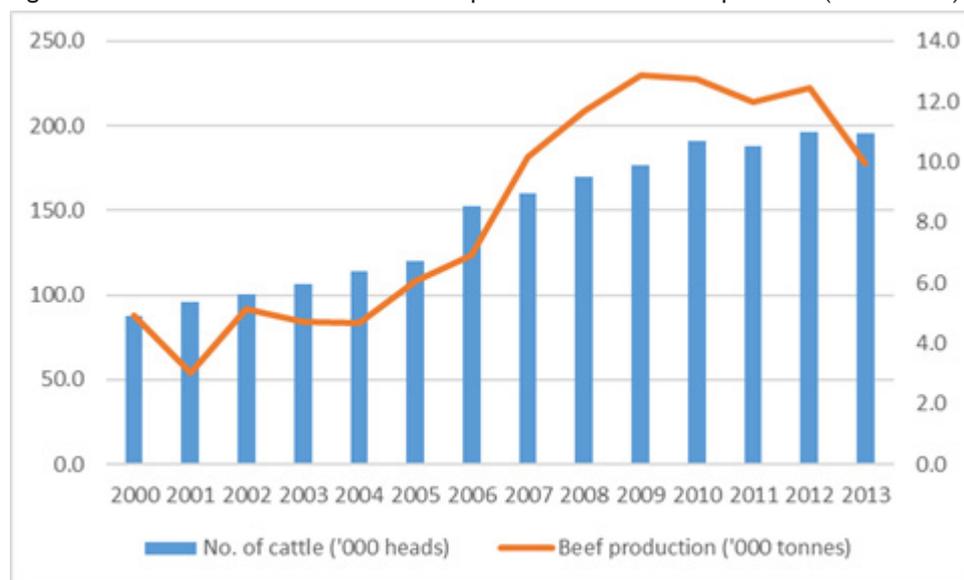
Vietnam's yearly beef imports amount to 300,000 t, and this is not enough to cover meat deficit in the country and also acts as a signal to boost domestic beef production. There is significant demand by urban supermarkets, and local and foreign owned restaurants, for domestic beef and because of the short supply they import frozen beef in large volumes (Perkins 2002). However, it should be noted that local beef producers cannot compete with imported frozen beef because the price of the latter is lower and the quality is higher. Considering this fact, the Vietnamese government has introduced a quota policy and increased taxes on imported frozen beef in the years of 2008 and 2009. However, this is a short-term strategy and future plans definitely target boosting domestic beef cattle industry in the country.

Beef cattle production in Vietnam is dispersed throughout the country but a significant amount is produced in the Central Highlands. According to the Ministry of Agricultural and Rural Development (MARD), about 662,754 beef cattle were raised in the Central Highlands, accounting for about 50% of the total cattle herd in the country.

In the past, cattle production in the province was only undertaken at subsistence level (for self-consumption) due to the dominance of pig production, requiring a much easier production process, and consumer preferences (as pork is three times cheaper than beef products). Farmers kept cattle for draught power and also raised them as a way of saving money and used them as a last resort if they needed immediate cash. In this system, links between livestock producers and markets were marginal (Khanh et al. 2010) or non-existent. Currently, beef cattle are one of the products for which local government is interested in developing a market-oriented value chain for both smallholders and large farmers. The market orientation gives incentives to farmers to increase the productivity of beef cattle. In this system, market information on the type of product demanded is needed for the efficient operation of the value chain.

Currently, beef cattle production in the province is targeted mainly at local markets in Dak Lak. Previously, cattle beef were also sold in markets in Ho Chi Minh City and Da Lat. However, because of increasing demand in the city itself, Buon Ma Thuot has become the main local market absorbing all the supply. As can be seen from Figure 5, the number of cattle in the province started to increase in 2001 and reached its peak in 2012. While beef production also shows an increasing trend since 2001, it has fallen in 2013 to the amount observed in 2007.

Figure 5. Number of cattle heads and beef production in Dak Lak province (2000–2013).



Source: GSO (2014).

To take advantage of the increasing demand for beef, the transformation of the existing smallholder cattle production should be a priority. This requires technology interventions, an improvement of market linkages and a more active participation of the private sector. This beef cattle value chain assessment evaluates the current situation of the value chain and the constraints in determining feasible interventions to the sustainable intensification of cattle production through commercial linkages with the rest of the value chain.

## Value chain actors, flow of product and linkages

### a. Value chain actors and their roles

#### Input providers and agricultural support

The main inputs to beef cattle production include feed, veterinary drugs and breeding animals. There are basically two types of feeding practices that exist in the locality. The first is feeding on grazing land without providing any

supplementary feed. This is mostly practiced in remote communes where grazing land is available. This is an essential activity of ethnic minorities who are poor and do not have access to the emerging beef value chain in the area. The availability of pasturelands are also reducing and many smallholders lack the skills to raise cattle in a different environment which is a big concern.

There has been a shift to feeding cattle with farm-grown fodder and farm-mixed concentrate, incorporating maize, rice bran, cassava meal and fish meal. In the past, there have been several projects promoting this practice in the region. For instance, the Forages for Smallholders project (2000–2002) introduced small farmers in Ea Kar district with a wide range of forage varieties for cattle raising. The Livelihood and Livestock Systems project (2003–2005) in the same district developed new and improved feeding systems. Both projects were implemented by CIAT in close collaboration with local research institutes (TNU and WASI), and with the support from district extension centres located in the area. In these projects, smallholders were provided fodder varieties in the first season and the objective was for farmers to grow them in the subsequent seasons. There have also been programs in which poor ethnic minority groups were provided credit via a 'credit through traders' scheme (for details see Khanh et al. 2010) in cooperation with Social Bank which helped resource-constrained farmers to get involved in cattle fattening.

Regarding the breeding of beef cattle, farmers use two methods such as artificial insemination (AI) and natural mating. AI services are supported by district extension centres and the semen purchased in Ho Chi Minh City is stored at the centres. Despite the known advantages of AI (enhanced genetic progress, control of venereal diseases, lower price), many farmers still follow the natural way of inseminating their cows. The government program 'Cattle Herd Improvement' was established by MARD to support the traditional way of mating through the allocation of high-quality exotic and crossbred bulls. The objective of the program was to mass produce crossbreds with a higher body weight from crossing the native Yellow cow with high-quality bulls (Red Sindhi, Sahiwal and Red Brahman bulls). For example, Ea Kar district had 50 such bulls which were allocated to remote communes. Each owner of the bull provided mating services to other farmers for a fee that ranged between USD 50 and USD 200. Nevertheless, not all crossbreeding programs have been successful in the past due to financial constraints. It is also a fact that extension services have low capacity on breeding, especially at commune level where the bulk of activities should be happening. Veterinary services are the responsibility of public and private service providers. Veterinary drugs can be purchased in specialized shops, which receive support from the government and can be found in each district. There are also private veterinary shops in communes run by private veterinary professionals or business men who employ veterinary professionals.

## Producers

Farmers operate under three cattle production systems in Dak Lak province:

1. Extensive cow–calf production. Native cows and Laisind or local bulls are grazed in natural grassland. Very limited supplement is given. This production is decreasing due to dramatically reducing grasslands. In this system, whenever there is a need for cash, cattle are sold immediately. Smallholders who operate under this type of production system keep cattle to produce calves.
2. Intensive cow–calf production. In this system, grazing happens in or near the farm for a short period of time. The cattle are kept in closed stables for the rest of the time. Grasses are the main type of feed and are cut by producers. Producers also supplement feeding with home-made concentrates. The farmer in this system is interested in fattening and producing his or her own calf. In some occasions weaned calves are sold to other farmers. Cattle types are usually crossbred cows and Laisind bulls.
3. Intensive cattle fattening. In this system, crossbred cows and Laisind bulls are kept in stables. The animals are fed a mixture of grasses and concentrates. Farmers engage in shorter or longer fattening activities depending on the age of the cattle. Usually, the older fattened cattle are sold to slaughterhouses and the meat finds its way to local markets. Beef from younger cattle are sold to urban markets.

Producers themselves can be classified into four groups: small farmers, large farmers (trang trại), large commercialized cattle companies and farmers' clubs grouping several smallholders.

- i. Small farmers: Beef cattle are mainly produced by small farmers. About 30% of households in villages that keep cattle supply about 90% of total beef production in the province. The production scale varies from 1 to 30 heads per household. However, on average farmers have 2–5 heads of cattle of mixed ages fed together on the farm. Native Yellow cattle with small body size and 'Laisind' (crossbreed of Yellow and Red Sindhi) cattle are the two main types raised by smallholders. Farmers who have young cattle (1–2 years old) sell these through local collectors in the end of the dry season and during holidays.

Farmers have low negotiation capacity, which makes them price takers. Their capacity to correctly predict the lean meat performance of their cattle is also poor. Whenever farmers decide to sell their cattle, collectors and traders consider acquaintance and geographical proximity to determine a suitable price (Ha *et al.* 2014). In land-scarce areas, smallholders use pens to keep their animals. Luthi *et al.* (2006) reported that the tendency towards keeping animals in pens had encouraged farmers to grow their own feed. This has caused emerging new cattle management systems and farmers have been able to keep Laisind cattle and have successfully used AI. This has created a good opportunity for local traders who started looking for markets that demand higher-quality animals.

- ii. Large farmers or 'Trang trai': According to the criteria set by MARD, a 'trang trai' has to raise at least 50 heads of cattle. However, there are few cattle 'trang trai' in Dak Lak due to lack of grazing land and capital resources.
- iii. Production companies: In Dak Lak, there exist only two state companies specializing in cattle production which play a role as breeding farms. These companies produce and supply improved calves to farmers in the region, but the number of calves produced is still limited. In addition, they supply a small amount of fattened beef cattle to markets.
- iv. Farmers' clubs contain around 20 to 30 small farmers within a village or cluster of nearby villages. The clubs are self-regulated and self-managed organizations. They are developed to facilitate production and trading activities of their farmer members through organizing training, field visits to exchange experience and arranging sales contracts with large traders located in urban areas.

## Collectors

Transactions between farmers and collectors (small traders) are spontaneous and the price of the live cattle is agreed on the spot. It is usually based on visual estimations of the animal's weight by collectors. Most of the clients are local farmers of the same village or nearby villages and payments are mainly made in cash and on spot. The main season for cattle trading is from August to February. During this period consumer demand for beef increases and reaches its peak at the time of the lunar New Year. After February, the number of cattle sold is reduced considerably. There are 15 to 20 collectors in each district collecting cattle from almost 95% of small-scale producers. The main problem with collectors is their limited capital. Their main activities include visiting villages, purchasing cattle or calves from farmers, transporting the cattle to district towns and selling directly to large traders or local slaughterhouses without keeping cattle at home. On average, each collector can trade between one to three animals every day.

## Traders

The number of large traders varies among districts, ranging from one to five. Traders are not only local residents but might also come from outside districts. They often purchase cattle from collectors or directly from farmers. In most cases, they have their own animal-holding grounds to keep cattle for a few days until they have sufficient numbers of animals to transport to Buon Ma Thuot.

## Slaughterhouses

It should be noted that both collectors and traders perform more than one function: collecting and slaughtering, or slaughtering and retailing in the existing chains. Slaughterhouses in the region can be classified into small- and large-scale.

- i. Small slaughterhouses are mainly located in the districts. Each slaughterhouse can slaughter between one to five heads of cattle per day depending on market demand. The slaughtered meat is supplied to retailers in traditional covered or open markets in district towns and only a small part is sold in village markets where demand is usually low. General conditions of slaughterhouses are poor: they have poor waste treatment systems and are located in residential quarters.
- ii. Large slaughterhouses are mainly located in Buon Ma Thuot city with an average slaughter capacity of 10 to 15 cattle per day. These slaughterhouses were built following standards on environmental and veterinary safety required by the government. Beef meat is mainly distributed to traditional markets in the city and a small portion also goes to supermarkets.

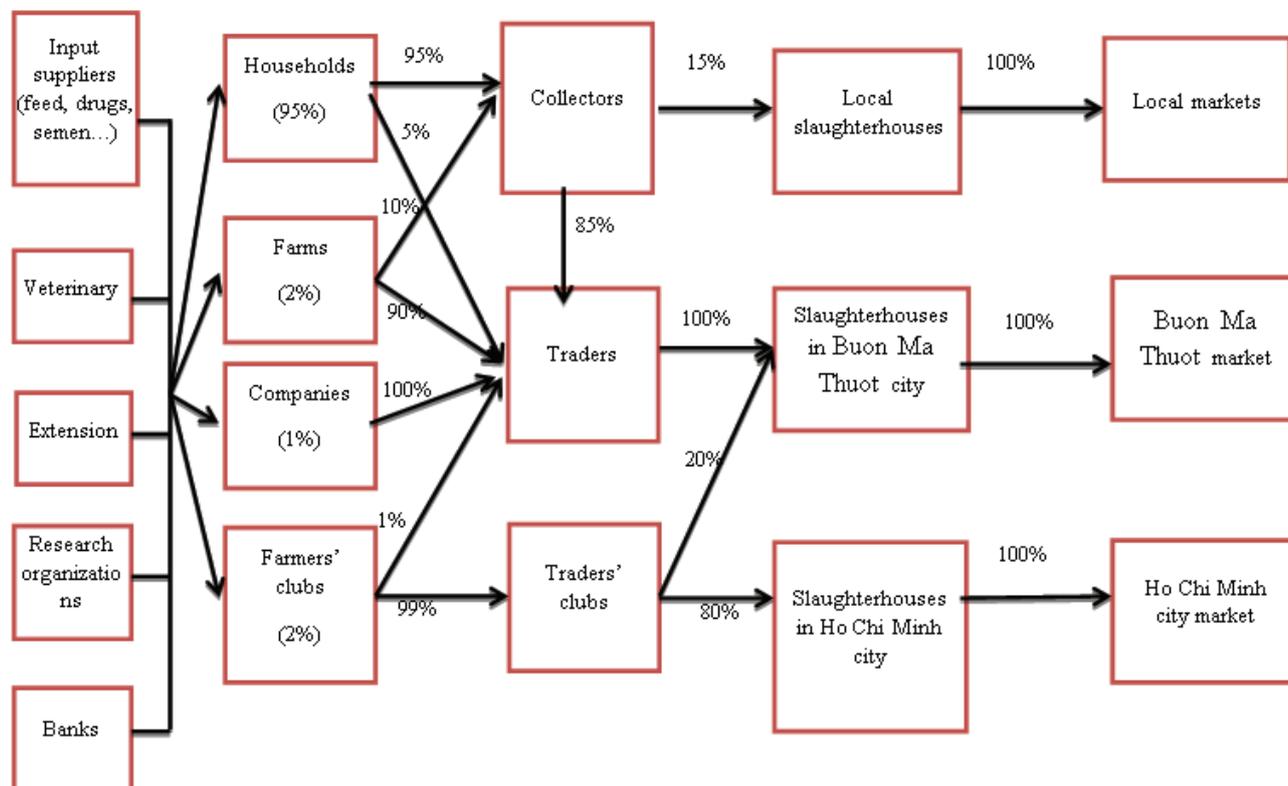
## Retailers and outlets

In urban areas, most retailers and sales outlets sell both beef and pork, there are not the many selling points that specialize only in beef. The picture is similar in rural areas but the selling volume of pork and chicken is much higher than that of beef. This can be explained by the higher beef prices. No difference in the price per kilogram of lean meat is seen among cattle breeds sold in markets. Cattle are rarely sold as breeding cattle, with the exception of some government cattle projects at certain times. As mentioned, cattle are bought according to buyers' evaluation of lean meat performance, sex and age (Tra et al. 2010). The strong demand from city markets has changed farmers' perception about cattle production. Currently, more and more farmers tend to produce quality cattle beef to meet the growing demand arising from urban areas.

## b. Flow of product, information and payment linkages

Figure 6 depicts the flow of cattle from primary production to consumption. Basically, there are three main channels for trading cattle distinguished on the basis of destination markets. The first channel targets local markets and engages local collectors who purchase live cattle from farmers and then transport and sell them to local slaughterhouses. The main source of live cattle for this channel is from small-scale farmers. It is estimated that 95% of all the cattle raised by small-scale households are distributed by this channel.

Figure 6. Beef cattle value chains in Dak Lak.



The second channel focuses on urban consumers in Buon Ma Thuot city. Approximately 90% of cattle raised by large-scale farms and 100% of the animals from companies in the area supply this market through the network of traders and slaughterhouses in Buon Ma Thuot.

The last channel is solely organized by farmers' clubs that supply beef to outside markets, especially to Ho Chi Minh City. Farmers in clubs raise cattle and then sell 99% of the animals to the traders also organized in clubs. These traders transport live cattle to slaughterhouses located in Ho Chi Minh City for slaughter.

Transactions between sellers and buyers along the value chain usually occur on a basis of trust, without any written contractual agreements. Different destination markets set up different requirements on cattle quality. In general, urban markets in the second and third trading channels have stricter quality requirements than the first channel. For instance, markets in Buon Ma Thuot and Ho Chi Minh City accept young and heavy weighing cattle. Rural markets can do with the local Yellow cattle breed that usually has a small body size and low body weight. This can help explain why smallholders find it difficult to enter urban markets with their native Yellow cattle beef production.

## Constraints and challenges

- Shortage of feed is a major problem. Natural pasturelands are declining as a result of increased areas devoted to intensive agriculture. That is why farmers search for other sources of feed for their cattle. Feed alternatives come from growing forages in their home gardens and using crop residues like rice straw and corncobs. These sources feature strong seasonality in supply, especially in the dry season. Besides, land that can be devoted to planting forages is also limited. The extension and intensification of cattle production in the small mixed farms is severely restricted by forage availability and capital.
- Farmers (especially ethnic minorities) have limited access to feeding and management technologies, which do not allow them to engage actively in livestock production and marketing.

- Cattle disease and parasites are potential production constraints that jeopardize those producers who depend highly on livestock production for their livelihoods.
- Smallholders in remote areas have difficulty in finding bulls for mating.
- Most smallholders raise the local breed of Yellow cattle with poor reproductive performance and a low meat yield when slaughtered. There are not enough cattle available that meet the requirements of city markets which require large body, good condition and young cattle.
- Farmers are usually price takers and have low bargaining power in negotiations, which does not allow them to estimate their product's market price accurately.

## Interventions

- Scaling up farm-grown fodder production is a feasible solution to solve the problem of feed shortage. For example, in 2000, CIAT in collaboration with local partners, including TNU, National Institute of Animal Science and local extension offices, introduced the Forages for Smallholders project in three villages in Ea Kar district of Dak Lak province. The project introduced a range of promising forage varieties which were rapidly adopted by smallholder farmers. As of 2010, the average fodder area per farm reached 1309 m<sup>2</sup> compared with just 100–200 m<sup>2</sup> in the first few years of the project, which ensured sufficient feed for beef cattle year round (Stür et al. 2013). As a result, within only three years, cattle population in the district tripled. This example shows that the introduction of farm-grown fodder has a substantial and positive influence on the development of beef cattle production. Efforts to strengthen this practice should be increased with additional funding.
- It is important that local breeds are replaced with crossbreeds to improve cattle body weight and beef productivity. Introducing a breed improvement program is a necessary step to increase farmers' awareness about breed quality.
- Assisting farmers to shift from extensive to intensive cow–calf production seems to offer good potential to boost livestock production.
- Farmers' clubs should be granted legal status so that they have the right to apply to loans and get recognized support. Improving the capacity of leaders and members of clubs in operational planning related to feed production, calf production, fattening and marketing would likely make a relevant contribution to livestock development.
- Finding new ways of introducing a micro-credit system is important. This will also require private investment from collectors, traders and slaughterhouses. Cattle beef farmers should benefit from workshops describing the emerging trends and markets in urban areas.
- Quality and hygiene conditions of slaughterhouses must be improved. Slaughterhouses should be built in non-residential areas.
- Developing a legal basis for contract farming between value chain actors is still needed as business relationships between farmers and collectors, as well as traders, are still informal in nature.
- Vaccination programs should be put in place so as to prevent possible diseases. Awareness campaigns should be conducted to let farmers know about their availability.
- Research should move towards increasing the attention of farmers with regards to manure management and reducing environmental pollution arising from manure mismanagement in the villages.

## Business model canvas

### Business model of the cattle farmers' club in Ea Kmut, Ea Kar

#### Club background

Farmers' club establishment is one of the policies of the Vietnamese government to increase relationships and cooperation among small-scale households involved in production and marketing. This policy has been implemented by different social organizations such as the farmers' union, women's union, youth union and extension offices. Farmers' clubs are currently present in almost all provinces in the country. Depending on their internal capacity and other institutional conditions, some are working efficiently while others are not. Farmers' clubs are voluntary organizations which are established and operate based on specific principles. A farmers' club usually starts with a group of farmers in a village who have the same interest and would like to benefit from group support. The members of the club nominate a person as the group leader who contacts the extension office, farmers' union or women's union to help with preparing documents required by the commune's People Committee. After considering the validity of the request, the commune's People Committee grants permission to establish the club. Farmers' clubs are open to everyone who is interested and accepts the club's regulations and rules. Club membership is voluntary and members can always drop out if they feel any discomfort. In Ea Kar district, there are currently five cattle farmers' clubs. The clubs aim to organize small-scale cattle farmers together so that they all join forces and resources to improve cattle production of each farmer with the purpose of improving their living conditions. The main activities of farmers' clubs are:

- Arranging regular meetings to discuss and exchange experiences between club members;
- Organizing micro-credit funds within the club to finance the needs of members;
- Contacting different partners (extension, projects, researchers) to organize training, building production models on cattle and forage production;
- Organizing frequent field visits to study successful models within the clubs; and
- Supplying calves and buying fattened cattle of club member households.

#### Club business model characteristics

Unlike the majority of other farmers' clubs in the province which deal with traders' clubs for marketing, the Ea Kmut cattle farmers' club organizes the sale of cattle to independent slaughterhouses and large traders within the district and in Buon Ma Thuot (Table 3). To make sure it can deliver a stable supply of high-quality beef despite the small number of its members, the club also buys animals from non-member farmers. The attention the club puts on ensuring the good health of the animals it puts on sale makes it a supplier of choice for traders who are increasingly making sure they can also prove the meat they are distributing has passed all necessary veterinary checks. Going the extra mile on food safety is likely to be a good selling point in the customers-oriented business model given the consumer wariness developed by multiple food safety scandals.

The business model of the Ea Kmut cattle farmers' club is interesting in that it is geared to respond to the needs of its members: 40 smallholder farmers (Table 4). The club provides feed and calves to increase its members' productivity. It also ensures the veterinary follow-up of the animals from the vaccination of the calves to the veterinary authorization to trade the finished live animals. Given the poor knowledge of the farmers to conduct cattle sales themselves in a profitable way, the club buys the animals depending on the live weight rather than on an estimation of the carcass weight.

Table 3. Farmers clubs' customers-oriented business model

Partners	Activities	Value proposition	Customer relationship	Customers
Cattle farmers	Production:	Ensure stable supply with high quality of beef cattle to city slaughterhouses	Face to face meetings when needed	Slaughterhouses in Buon Ma Thuot city and Ea Kar town
Extension office	Plant forage for cattle production			Large traders in Ea Kar and Buon Ma Thuot
Veterinary office	Produce high quality calves for breeding and fattening	Provide veterinary permission for transporting cattle	Daily telephone calls to inform slaughterhouses of supplying amount	Requirements of customers:
Banks	Fatten cattle and supply high quality cattle for the beef market			Slaughterhouses in Buon Ma Thuot require high quality cattle (body size, situation score, and age) and supply frequency of every two days
Ea Kar Cattle Association	Supply AI and veterinary services inside and outside the club			Large traders require high quality cattle with quarantine seal of veterinary offices
CLVLP (a CIAT project helping develop cattle farmers' clubs and forage production)	Trading			
	Supply high quality calves to the club's members for fattening			
	Buy and transport fattened cattle to city markets			
	Transfer technologies to the club's members			
	Provide micro-credit to the club's members to develop cattle production			
	Resources		Channel	
	Human resources		Farm for keeping cattle, calves before selling	
	40 households		Transport adult cattle to slaughterhouses or large traders' farms	
	1 technical and 1 veterinary expert		Transport calves to farmers' farms	
	3 traders			
	Infrastructure			
	Cattle houses in 40 households			
	Farms for keeping cattle, calves before selling			
	Feed storage houses			
	Trucks for transporting cattle			
	Finance			
	Club fee for social activities			
	Micro-credit fund for cattle production and trading			
	Cattle from club's members			
	Social assets			
	Trademark of 'Ea Kar cattle'			
	Close relationship with researchers at TNU			

<p><b>Cost structure</b></p> <p><b>Production</b></p> <p>Calf cost: VND 15,000,000/head</p> <p>Forage planting and management: VND 12,000,000/ha</p> <p>Veterinary: VND 40,000/head</p> <p>Concentrate feed: VND 3,600,000/head</p> <p><b>Trading</b></p> <p>Main costs are for buying calves, transporting and keeping cattle before sale</p>	<p><b>Revenue streams</b></p> <p>Total selling value in a year: VND 25,125,000,000</p> <p>From cattle production: VND 9,000,000,000</p> <p>From cattle trading: VND 16,125,000,000</p> <p><b>Payment method:</b></p> <p>Payment by cash</p> <p>Payment at sale</p>
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Table 4. Farmers clubs' suppliers-oriented business model

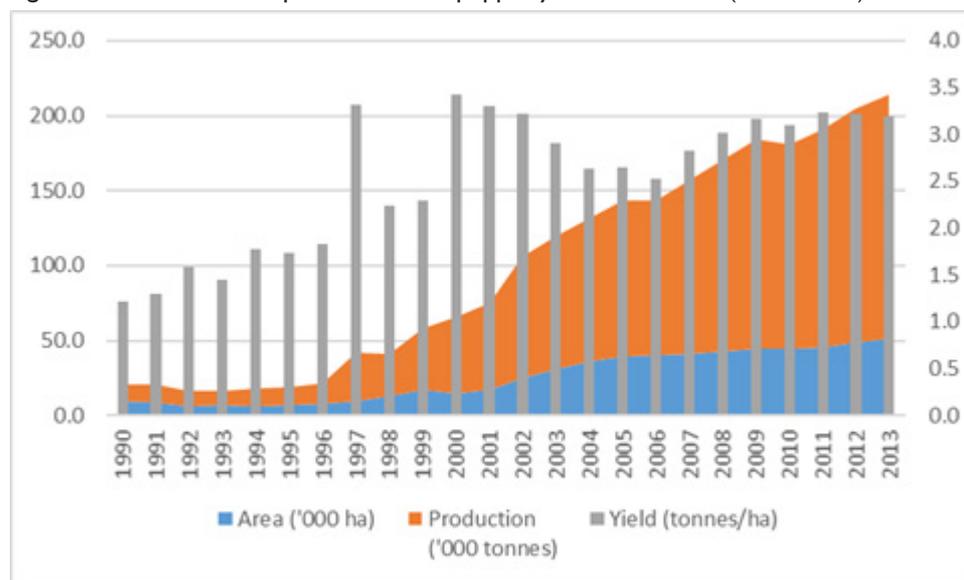
Partners	Activities	Value proposition	Supplier relationship	Suppliers
<p>Cattle farmers</p> <p>Extension office</p> <p>Veterinary office</p> <p>Banks</p> <p>Ea Kar Cattle Association</p> <p>CLVLP (a CIAT project helping develop cattle farmers' clubs and forage production)</p>	<p>Production:</p> <p>Plant forage for cattle production</p> <p>Produce high quality calves for breeding and fattening</p> <p>Fatten cattle and supply high quality cattle for the beef market</p> <p>Supply AI and veterinary services inside and outside the club</p> <p>Trading</p> <p>Supply high quality calves to the club's members for fattening</p> <p>Buy and transport fattened cattle to city markets</p> <p>Transfer technologies to the club's members</p> <p>Provide micro-credit to the club's members to develop cattle production</p>	<p>Reliable supply of high quality calves for fattening</p> <p>Vaccinate calves before selling to farmers with one month guarantee</p> <p>Buy adult beef cattle based on live weight rather than carcass estimation</p> <p>Provide forage planting materials and guidelines for grass management</p>	<p>Face-to-face meetings with farmers in the club monthly</p> <p>Telephone calls</p> <p>Field visits</p>	<p>Around 100 non-member farmers and 40 member farmers</p> <p>Requirements of cattle farmers</p> <p>High quality calves for fattening</p> <p>Cattle protection from diseases</p> <p>Technical and capital support</p> <p>Fair transactions</p> <p>Contract farming</p>
	<p>Resources</p> <p>Human resources</p> <p>40 households</p> <p>1 technical and 1 veterinary expert</p> <p>3 traders</p> <p>Infrastructure</p> <p>Cattle houses in 40 households</p> <p>Farms for keeping cattle, calves before selling</p> <p>Feed storage houses</p> <p>Trucks for transporting cattle</p> <p>Finance</p> <p>Club fee for social activities</p> <p>Micro-credit fund for cattle production and trading</p> <p>Cattle from club's members</p> <p>Social assets</p> <p>Trademark of 'Ea Kar cattle'</p> <p>Close relationship with researchers at TNU</p>		<p>Channel</p> <p>Farm for keeping adult cattle, calves before selling</p> <p>Transport calves to farmers' farms</p> <p>Weigh adult cattle at farm when buying</p>	

# Mapping of pepper value chains

## Background

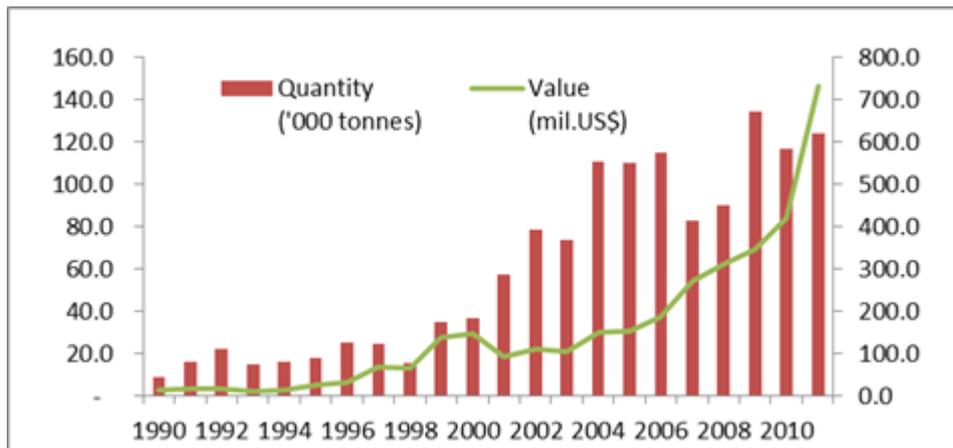
Black pepper is widely used as a spice all over the world. It is one important agricultural product of Vietnam together with rice, coffee, rubber, cashew, vegetables and tropical fruits. Over the years, pepper production in Vietnam has increased tremendously (Figure 7). Taking into account its importance to the domestic economy, the pepper plants were given land with a favourable climate and with good quality soil, which have boosted the country's pepper production and exports (Figure 8). Vietnam is one of the top pepper exporting countries in the world and in 2014 export earnings were reported to be one billion US dollars. In the early 1990s, exports were oriented to ASEAN countries but currently they have shifted to the USA, the European Union and Middle Eastern countries.

Figure 7. Harvested area, production and pepper yields in Vietnam (1990–1993).



Source: FAO (2015).

Figure 8. Export quantity and value of Vietnamese pepper (1990–2011).



Source: FAO (2015).

Pepper is grown in many parts of Vietnam but the bulk of it can be seen in the Central Highlands. Considering that black pepper needs a hot and humid tropical climate, the Central Highlands is one of the best places meeting this requirement. The harvesting period for Vietnamese pepper is from March until June. In Vietnam, pepper is grown mostly by smallholders. Because of the considerable benefits pepper production can bring, many farmers have moved to intensive pepper plantation systems and have made the necessary investments. Pepper production in the Central Highlands is mainly distributed in three provinces that include Gia Lai, Dak Lak and Dak Nong. Since about one-third of Dak Lak's area is basaltic rock, it is very suitable for pepper production. It is considered that pepper offers good potential of moving away from poverty and improving livelihoods of the rural population in the region. Dak Lak pepper producers have expanded pepper production considering the high returns received from it. Pepper expansion in some districts involved reducing areas under rubber, cashew and coffee, as well as cutting down forest trees. There was also a trend of growing pepper in the unsuitable lands and overutilization of chemical fertilizers that have negatively impacted sustainability of returns and led to environmental deterioration. This has further led to disease outbreaks, which resulted in a decrease in production in the lands where there was unplanned pepper cultivation. On the marketing side, there are still bottlenecks that do not allow the smooth linkage of farmers to well organized markets due to high transaction costs.

To plan appropriate interventions for the pepper sector in Dak Lak, it requires a good understanding of its value chain including stakeholders, linkages, constraints and opportunities for development. The next section provides a brief outline of the pepper value chain.

## Value chain actors, flow of product and linkages

### a. Value chain actors and their roles

#### Input providers and agricultural support

Pepper plants are normally grown from a stem or terminal cuttings and rarely from seeds. Farmers expand or create new plantations by cutting off stems from existing pepper trees. Private input dealers supply fertilizer and pesticides to farmers.

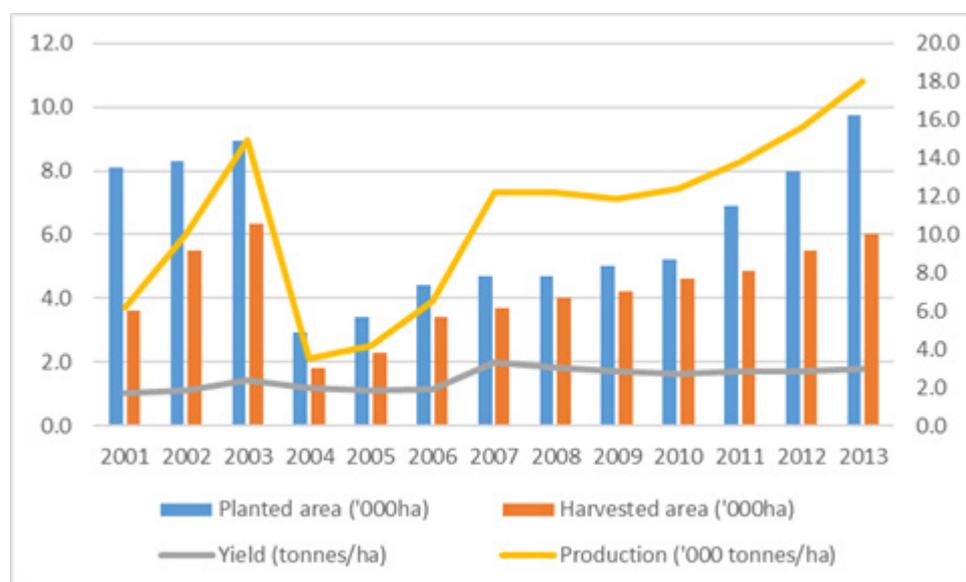
The Vietnam Pepper Association (VPA) is a non-governmental organization whose main mission is to organize and bring together enterprises, producers' organizations, traders, exporters and other actors of the pepper industry. Its objective is to empower the pepper industry for effective and stable development of pepper production, and for enhanced competitiveness of Vietnamese enterprises in the domestic and international pepper markets.

## Producers

- i. Small farmers produce 95% of total pepper production in the region. They do not store pepper for a long time but sell it within two to three months after harvest. This can be explained by the fact that farmers need immediate cash for survival. What is more, they do not have the facilities needed to store their harvested pepper. Farmer households that stock pepper for more more three months are often rich and middle-income households or have incomes from other agricultural and non-agricultural activities.
- ii. Large producers include private farms and state companies, which together produce only 5% of total pepper production in the region. These farms own storing facilities which enable them to stock pepper when pepper prices go down and sell pepper when prices go up again to make bigger profits.

Starting from 2004, the area under pepper cultivation has increased tremendously, which has also boosted pepper production in Dak Lak province (Figure 9). However, yields have remained the same over the years and it can be noticed that pepper production growth has mainly come from agricultural land expansion.

Figure 9. Pepper planted and harvested area, production and yields in Dak Lak (2001–2013).



Source: GSO (2014).

## Collectors

Collectors are businesses located in villages whose manager can travel to remote areas to collect pepper in small quantities. Their transaction with farmers in terms of volume can be from 10 kg to one tonne.

- i. Small collectors who have limited capital often go to villages to buy pepper and then sell to large collectors or traders in the local area.
- ii. Large collectors buy pepper from small collectors or directly from villagers and sell the produce to traders and business companies.

## Traders and wholesalers

Traders purchase pepper from both large and small collectors at negotiated prices, which are often spontaneous and do not reflect market prices. Their activity also includes cleaning and grading pepper according to requirements set by their buyers. They sell the pepper to wholesalers located in Buon Ma Thuot and export companies in Ho Chi Minh City. Wholesalers have storing facilities with a capacity of 10–15 t of pepper. Although wholesalers have the financial resources and storage facilities, only a few of them store large volumes at one time because of the uncertainty in the

markets. The wholesalers are equipped with transport means. They also have contracts with transportation companies that deliver collected pepper to processing and export companies.

Pepper processing involves sun drying until it reaches an appropriate moisture content. It is also cleaned of extraneous matter. Wholesalers' profit margin is higher if they sell sun-dried pepper and they can receive around VND 120–150 per kg of net profit which is USD 2 higher than for unprocessed pepper. Traders are also known to mix good quality pepper with bad quality pepper which they have purchased for cheaper prices. This malpractice is also commonly practiced by wholesalers, although not often reported.

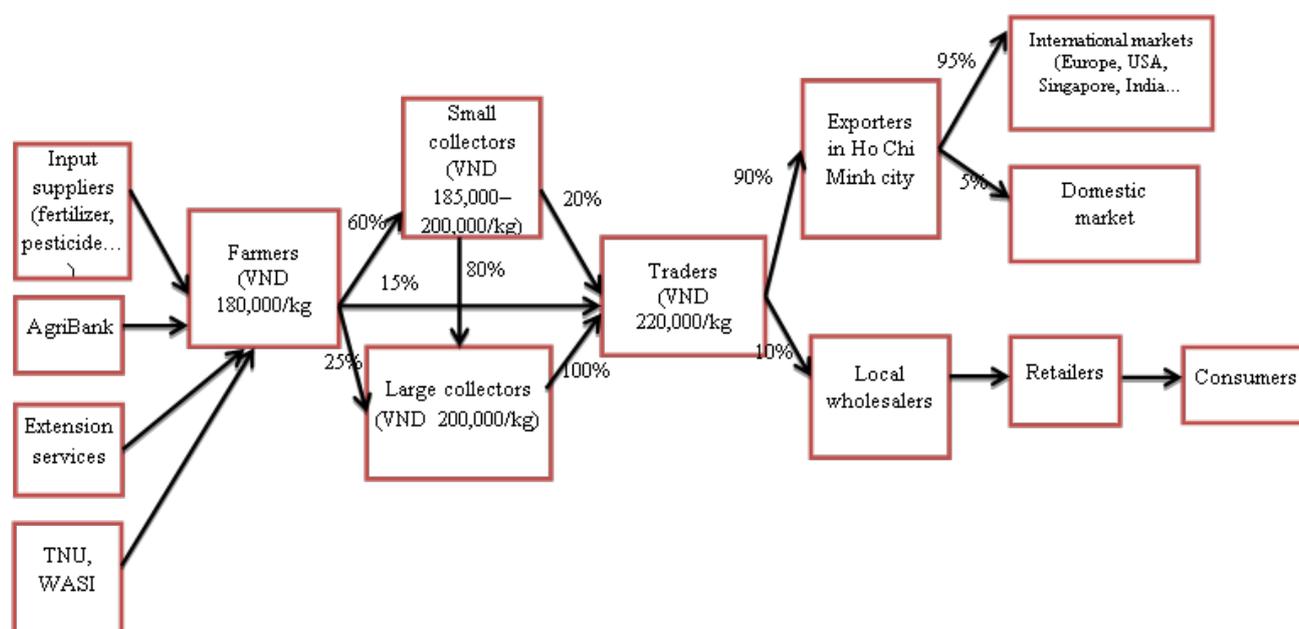
## Export companies

Export companies have contracts with wholesalers and their continuous transactions require a stable pepper supply during the season. Export companies are based in Ho Chi Minh City and export high quality pepper (95%) to global markets. The remaining 5% is usually low-to-medium quality pepper and sold in domestic markets. The Vietnamese pepper is exported in raw form. Its basic quality criteria are to have an agreed moisture content and to conform to a minimum accepted level of extraneous matter.

## b. Flow of product, information and payment linkages

Figure 10 displays the main flow of pepper from producers to end consumers along the value chain. Pepper growers do not often sell pepper directly to wholesaler agents or export enterprises but mainly to collectors (private traders). Accordingly, traders play a central role in the chain, linking production and market. They source pepper from a network of collectors located in villages, communes and then deliver it to local and export markets. Traders often rely on large collectors for a large and stable supply of pepper. The business is carried out on a basis of trust and long-term personal relationships; therefore in several cases traders offer advance payment to large collectors. To ensure an adequate supply, large collectors also establish their own network of small collectors who travel to small villages to buy pepper directly from farmers' yards or from village markets. Farmers have limited access to large collectors or traders despite higher selling prices because transportation to the city or town markets is difficult to find and their supply is often small and unreliable. It is estimated that around 60% of all the pepper produced by farmers is sold to small local collectors, 25% to large collectors, and just 15% to traders directly.

Figure 10. Pepper value chain in Dak Lak.



Pepper collected by traders then goes into two target market channels: local and export markets. Only 10% of the production is consumed locally within Dak Lak province, with the engagement of local actors including wholesalers, retailers and consumers. The bulk (90%) of the production is transported to export companies in Ho Chi Minh City where pepper is sorted based on quality. Later, around 95% of high-quality pepper is exported to international markets, while the remaining 5% is sold in the local markets.

## Constraints and challenges

- As mentioned above, the majority of pepper produced in Vietnam is sold to other countries. Because of this potential Vietnam has experienced the expansion of pepper cultivation and production. However, this trend has not taken into account foreign market uncertainties and possible economic downturns.
- Overutilization of input resources remains the main issue which increases production costs and has also a negative impact on the environment.
- While pepper diseases are recognized to be a major issue, disease-resistant varieties exist only in trial fields and are not widely used in farmers' fields.
- Some traditional cultivation techniques are improper, which impacts yields negatively and makes the pepper plants vulnerable to disease.
- Farmers' knowledge of new technologies, agronomic practices and research-proven innovations is limited.
- A lack of sufficient capital is a typical issue restricting farmers during the main production season.
- In recent years global pepper production has increased and has put downward pressure on pepper prices. This has negatively influenced Vietnamese smallholders by lowering profits they can get from sales due to volume reductions.

## Interventions

- It is clear that pepper production is only sustainable if new innovations and improved agronomic practices are introduced.
- It would be essential to reduce input costs of pepper production by developing agronomic guidelines based on field trials.
- A major shift should also be towards implementing measures designed to reduce post-harvest losses.
- A quota on the overall area under pepper cultivation should be implemented to avoid spontaneous expansion of pepper in lands which are not suitable for its growth.
- Research has to be geared towards investigating the causes of pepper diseases and trials of disease-resistant pepper varieties.
- Extension services should conduct training and develop good practice guidelines and manuals to help farmers improve their pepper plantation and fight against disease.
- Increasing cooperation among government private businesses, farmers and scientists to invest and transfer available knowledge and technologies will be essential.

# Business model canvas

## Business model of the Nam Nguyen Pepper Company

### Company background

Nam Nguyen Company Ltd was established on 28 February 2001. It is involved in processing and trading coffee and other agricultural products. In recent years, the company began purchasing, processing and exporting pepper. It has developed linkages with hundreds of traders and farmers to ensure a stable supply of pepper. Currently, the company is planning to carry out contract farming with farmer groups in Dak Lak to invest in the production and purchase of agricultural products. The plan is expected to promote the sustainability and stability of pepper production and export.

The business model of the Nam Nguyen Pepper Company is similar to other traditional market intermediary companies in Southeast Asia. The relationships with suppliers and customers are based on trust, long-term relationships and constant communication to share information. This traditional mode of doing business is complemented by formal contracts with both suppliers and customers. The outcome of this business model translates into specific value propositions: a stable supply of high quality pepper for customers (Table 5) and fair prices and technical expertise for farmers (Table 6).

Table 5. Nam Nguyen Pepper Company's customers-oriented business model

Partners	Activities	Value proposition	Customer relationship	Customers
Pepper farmers in Dak Lak, Dak Nong and Gia Lai	Buy pepper	High quality pepper for export	Every day communication through telephone	Export companies in Ho Chi Minh City
Traders	Clean, grade pepper	Stable supply for export company	Face to face meeting when needed	Supermarkets in Buon Ma Thuot (pepper powder)
Transporters	Check quality (mainly moisture content)	Transaction based on contractual agreements	Company website	Processing companies which produce pepper powder
Local government	Sell pepper to export companies	Channels	To discuss about quantity of pepper that they need, quality, price of pepper, and other criteria involved in the contract	
Banks		Transport pepper to export companies in Ho Chi Minh City		
		Transport payment based on signed contract		
	Resources			
	Physical			
	Office			
	Storehouse in Dak Lak			
	Facilities for quality checking			
	Human			
	Permanent workers			
	Seasonal workers			
	Financial			
	No data			
	Social			
	Close relationship with traders and export companies			

<b>Cost structure</b> <i>No data</i> + Buying pepper + Salary for workers + Tax + Transport, packing + Insurances, Advertisement	<b>Revenue stream</b> Sale volume: <i>no data</i> Payment method: Bank transfer Payment at sale
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Table 6. Nam Nguyen Pepper Company's suppliers-oriented business model

Partners	Activities	Value proposition	Supplier relationship	Suppliers
Pepper farmers in Dak Lak, Dak Nong and Gia Lai Traders Transporters Local government Banks	Buy pepper Clean, grade pepper Check quality, mainly moisture content Sell pepper to export companies	Buy stable amount Transaction based on contracts with traders and farmers Fair in buying and selling Technical support through experts	Inform about market conditions and buying amount Building the trust through fairness in buying and selling Telephone calls and face-to-face meetings <b>Channels</b> Buy pepper at farm and transport to company	Pepper farmers Expectations from farmers: + Buying stable amount + Appropriate price + Fair in balancing, measuring + Advance capital + Technical support
	<b>Resources</b> <b>Physical</b> Office Storehouse in Dak Lak Facilities for quality checking <b>Human</b> Permanent workers Seasonal workers Financial <i>No data</i> <b>Social</b> Close relationship with traders, export companies			
<b>Cost structure</b> <i>No data</i> + Buying pepper + Salary for workers + Tax + Transport + Packing + Insurances + Advertisement		<b>Revenue stream</b> Sale volume: <i>no data</i> Payment method: Bank transfer Pay when receiving the goods		

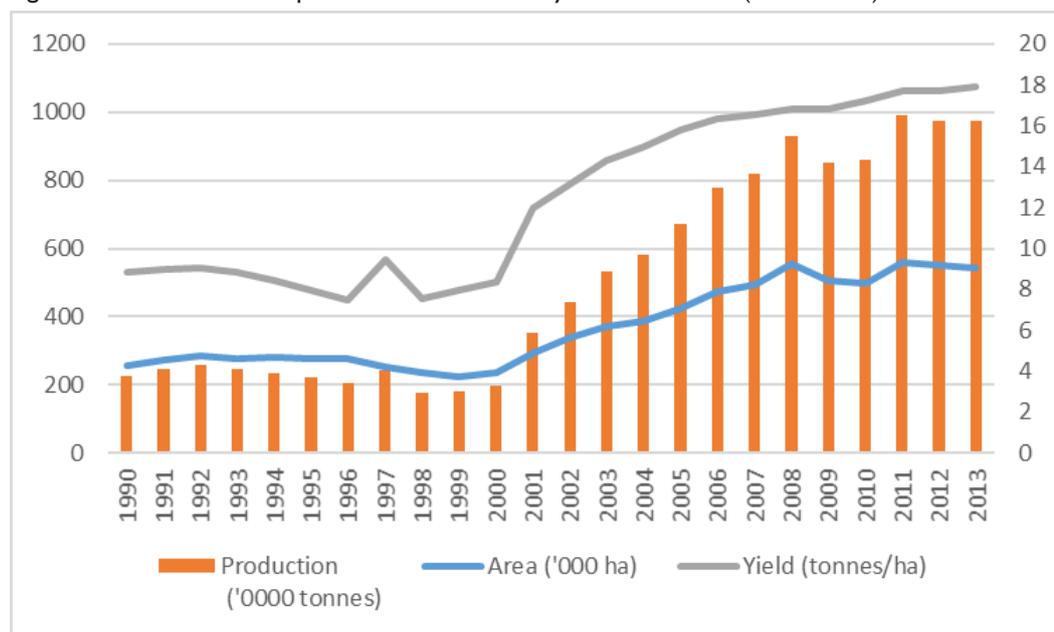
# Mapping of cassava value chains

## Background

Historically cassava has played an important role in the lives of Vietnamese people and during the times of food crisis it was used as a reserve food. Because of a rapidly developing agro-industrial sector, cassava has become one of the most significant industrial crops of Vietnam. In particular, its importance in the starch processing industry has gained a lot of attention. There is also rising demand from biofuel markets and the livestock feed industry. Currently, there are many cassava processing units, increasing the number of ethanol and industrial-scale starch processing factories in the country for which cassava is a key input. Its importance as an export product is also rising; cassava products are mainly exported to China and to a lesser extent to other ASEAN countries and eastern Europe.

Cassava is the only export-oriented crop that can be grown in marginal lands with limited investments. In 2013, the total cassava grown areas reached almost 600,000 ha (Figure 11) with a total fresh root production of 9.4 million tonnes, of which 30% was for domestic markets and the rest for export. In recent years, the government has raised concerns over increasing land area being converted to cassava but it is difficult to control this expansion because of huge numbers of smallholders with very small amounts of land involved.

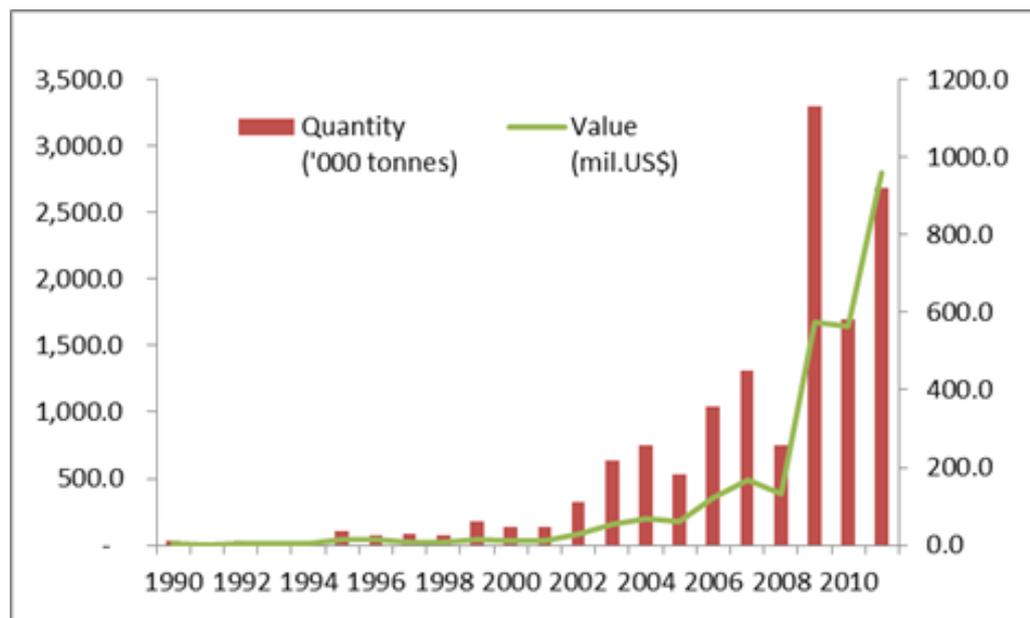
Figure 11. Harvested area, production and cassava yields in Vietnam (1990–2013).



Source: FAO (2015).

Vietnam is one of the 10 largest producers of cassava with yields of 17.7 t/ha. Vietnamese cassava exports have shown a strong growing trend (Figure 12).

Figure 12. Export quantity and value of cassava of Vietnam (1990–2011).



Source: FAO (2015).

Cassava is grown all over Vietnam but large volumes come from the South Central Coast and Central Highlands. The main cassava producing area in the Central Highlands is in Kon Tum, Gia Lai, Dak Lak and Dak Nong provinces. It should be noted that while rice is the main staple food for Dak Lak, during rice-scarce years maize and cassava are the main food crops consumed by poor people. The advantage of cassava is that it is suited to lands where coffee and pepper cannot be grown.

A review on the cassava value chain conducted in another province (Viet et al. 2015) suggests that the cassava value chain is highly complex and incorporates producers at different scales, traders that operate at multiple levels, and processors and export companies that have diverse objectives in engaging in cassava business. What is clear is a rising demand for cassava products, which is a good opportunity for smallholders to increase cassava productivity. This will eventually boost smallholders' household income. However, the environmental impact of production and processing should be carefully considered. It is important to strengthen the linkages between value chain actors. Research should also assess further the outstanding issues and opportunities within the chain.

## Value chain actors, linkages and flow of product

### a. Value chain actors and their roles

#### Input providers and agricultural support

Input provision and agricultural support for cassava production is the same as it is for other agricultural crops (Karimov et al. 2016). What can be added is that farmers often use cassava planting materials provided by DAKFORCAM (a cassava processing company in the region) and by extension centres located in the districts for the first planting season. They then self-produce planting materials for the following seasons.

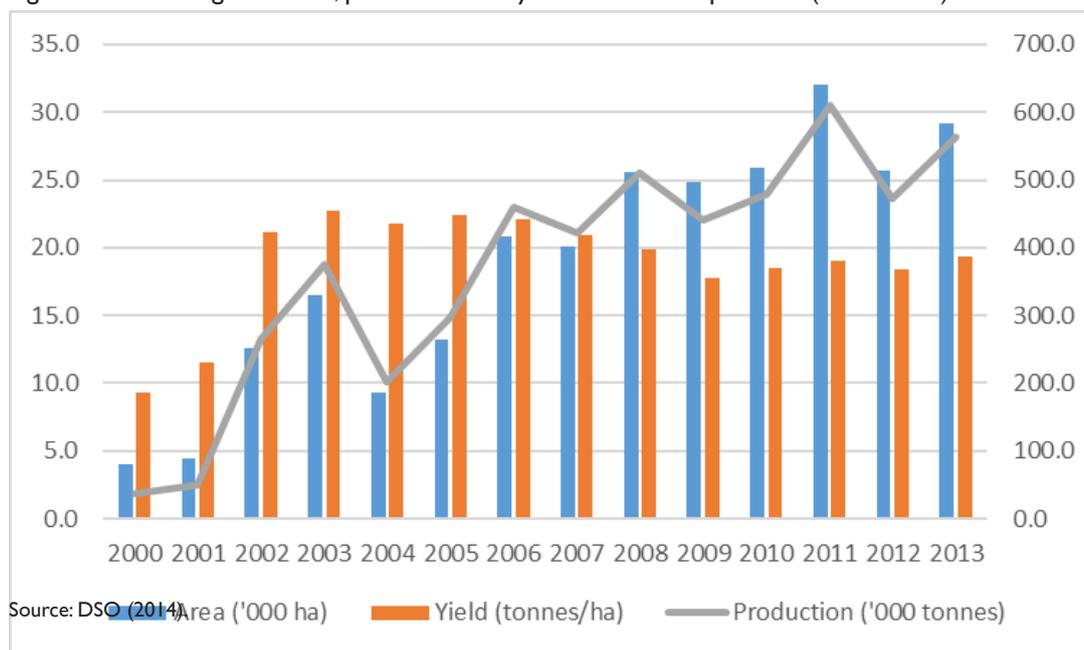
#### Producers

Cassava is mainly produced by smallholders on small pieces of land (mostly 0.25–0.5 ha). An insignificant proportion is produced on large-scale company-owned lands. It is key to note that high market demand for cassava helped remote ethnic minorities to move out from subsistence farming and grow it as a cash crop. Cassava is labour intensive, especially during the harvesting period, and requires 12 months of care before it is ready to be harvested. Cassava harvesting can be

delayed until market opportunities have improved. But usually the consequences of delaying harvest are severe because of disease. Cassava roots are sold directly at farm gates and sales also occur in nearby small village markets. Usually, the first buyers of cassava roots are collectors. Since it is not always possible to sell harvested cassava roots immediately, chipping and drying in the sun gives a chance to keep the crop for a longer period of time and even obtain higher prices. Fresh cassava roots have to be transported to starch factories for processing within 48 hours after harvesting. The buyers of dried cassava are quite varied, ranging from animal feed factories to export companies and ethanol factories. The ethanol factories dominate the market. Farmers have started using cassava roots as feed to fatten cattle, especially during the dry season. This has helped farmers take advantage of cassava production when market prices fall.

Figure 13 shows that cassava production has increased in Dak Lak because of tremendous increases in cassava grown areas. This clearly suggests that cassava producers should improve cassava productivity to sustain cassava production in the province.

Figure 13. Cassava grown area, production and yields in Dak Lak province (2000–2013).



## Traders

Small traders, mainly from the same or nearby villages as farmers, collect the cassava in villages. They have reliable information about production areas because of their long-term business within the area. They are market intermediaries between farmers and large traders. They use their own motorbikes to ship the cassava roots they have purchased to other buyers in the value chain. Farmers' access to capital is limited and they usually borrow from collectors. Large traders purchase cassava from small traders and sell to processing factories in cities. In a similar manner, as it was the case with farmers, traders also engage in chipping and drying to increase returns and avoid deterioration of cassava roots.

## Starch processing factories

There are five starch processing factories in Dak Lak and two of them belong to DAKFOCAM Company. The main problem they have is a shortage of cassava supply, especially during the cassava off-season. About 95% of the cassava starches produced are exported to Chinese markets. Processing factories play a key role in the cassava value chain but are highly dependent on Chinese markets, which are unstable and volatile.

## Cassava starch customers

Traders and Chinese companies are the main customers for cassava starch. Several markets have been explored in recent years, including South Korea and the Philippines. However, their market shares are still modest. Dried cassava chips are mostly sold for ethanol and animal feed production.

### b. Flow of product, information and payment linkages

Two channels are identified in the cassava chain based on the utilization of cassava:

- i. Fresh cassava roots
- ii. Dried cassava chips

About 50% of fresh cassava roots are either consumed or sold as fresh roots to produce cassava starch. The remaining 50% is chipped and dried for other industrial purposes, including animal feed and ethanol.

In the first channel, starch factories are the main players. They purchase cassava materials from various sources and are especially interested in engaging with large traders because of the big volumes they can get. Transactions often take place on farm, right after farmers harvest cassava. Traders are intermediaries connecting farmers with starch factories. In areas where transportation conditions are favourable and cassava supply is abundant, large traders access farmers directly to purchase and upload cassava to their own trucks and transport the roots to starch factories on the same day. On the contrary, in remote areas the collection of fresh cassava has to rely on a network of small traders with the main transport mode being motorbikes. It is estimated that farmers sell 55% of total cassava production to large traders and 33% to small traders. A small proportion (15%) is sold directly to starch factories. In starch factories, fresh cassava roots are processed into starch, which is mostly prepared for export (95%) and only a small proportion of starch is consumed domestically (5%). The by-product from starch processing (cassava bagasse) can be used as a raw material for animal feed production. An estimated 40% of cassava bagasse production is purchased by domestic animal feed companies, while 60% goes for export, mostly to the Chinese market.

In the second channel of dried cassava, farmers similarly sell fresh roots right after the harvest, 50% of which goes to large traders and 33% to smaller-scale traders. Farmers only keep 15% of total production on farm to produce dried chips that could be further milled into flour. The manual production of cassava chips involves peeling, washing, chipping and sun drying. The chips are thereafter milled to get flour for domestic human consumption (40%) and to sell to traders (60%). Farmers normally sell their cassava themselves and do not get engaged in farmer groups.

Figure 14. Fresh cassava chains in Dak Lak.

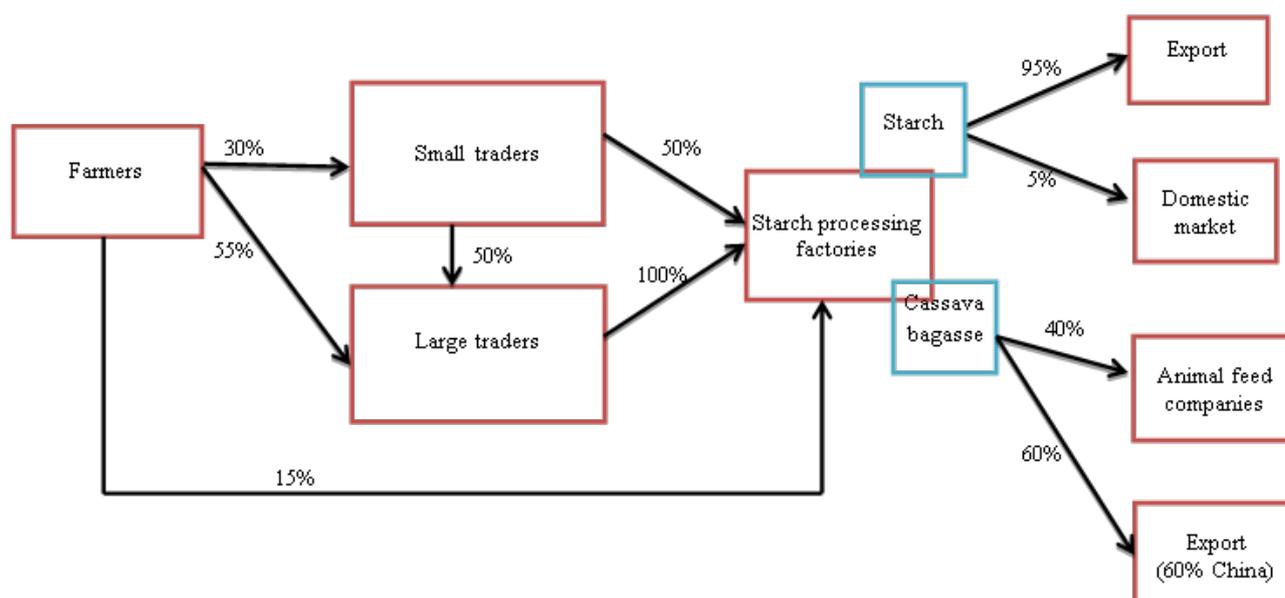
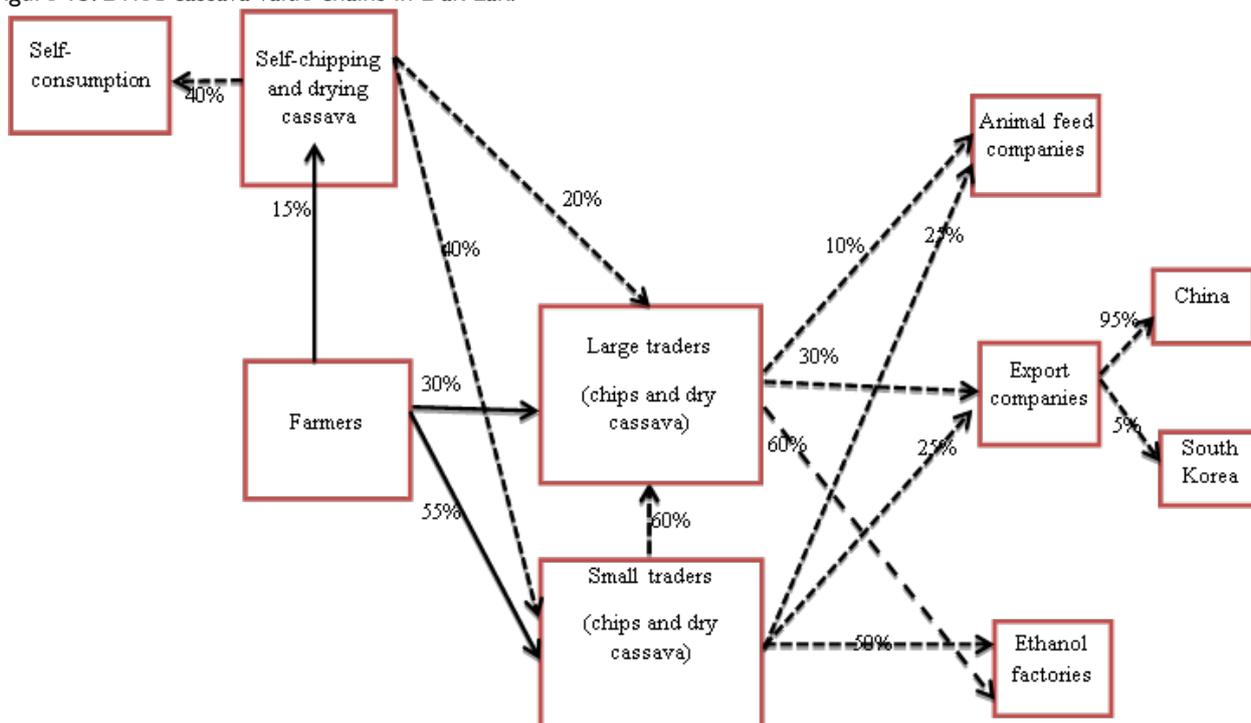


Figure 15. Dried cassava value chains in Dak Lak.



## Constraints and challenges

- Cassava is grown in sloppy lands that have impoverished soils. Continuous cultivation in such lands lead to soil nutrient depletion (i.e. soil erosion and soil fertility degradation) and as a consequence yield reductions.
- Farmers often harvest cassava in the dry season from December to April and start planting cassava in the rainy season. Consequently, cassava materials are in surplus in the dry season but scarce in the rainy season. Shortage of cassava root supply during the off-season is a big issue for industries dependent on cassava.
- Cassava roots are highly perishable and to avoid deterioration they need to be processed within two days after harvesting or sold immediately. Cassava processing involves cassava drying in the sun, which is a big challenge in rainy days. While other methods of drying are also known, farmers do not have access to these because of limited capital.
- Overall, market coordination is poor between value chain actors. This translates into input shortages faced by processing companies. Farmers' engagement with other actors is spontaneous and contract farming is only in its initial phase.
- The cassava sector highly depends on the Chinese market where most of the cassava products are exported. It has been observed that the Chinese market is very volatile and any fall in demand hits producers badly, especially those smallholders who are heavily engaged in cassava production. Besides, the Chinese market is competitive and Vietnamese companies are competing for this market with companies from other countries.

## Interventions

- New cassava varieties that have higher yields and can be grown in short period of time should be introduced and tested.
- Research should improve and disseminate agronomic practices that have a positive impact on soils. Cassava research and technology development should be fed into market expansion and diversification.
- Access to agricultural credit by smallholders should be made easier. Farmers could be encouraged to engage in contract farming with buyers. Better information sharing among farmers could be fostered through the establishment and improvement of farmer groups and cooperatives.

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- Farmers should also diversify their cassava products towards those that can be used in other sectors that add high value (e.g. cosmetic, bio-ethanol and pharmaceutical).
  - A diversification of export markets to reduce the dependence on the Chinese market would also help improve the quality of cassava products.
  - Research should also work on varieties and production practices targeting cassava for the animal feed industry; this would have consequential benefits to livestock producers.

## Business model canvas

### Business model of DAKFOCAM Cassava Company

#### Company background

DAKFOCAM is the trade name of the Dak Lak Agricultural Materials and Food Joint Stock Company, which was established in 2003. The company is involved in a wide range of activities including:

- Trade in food and other agricultural products
- Supply of fertilizers and other types of agricultural chemicals
- Supply of seeds and seedlings of agricultural crops
- Production of cassava starch for domestic markets and export

The company has two cassava starch processing factories, one in Ea Kar district and the other in Krong Bong district. After more than 10 years of operation, the company has been contributing significantly to the sustainable development of the cassava industry in Dak Lak through the creation of strong linkages between production and markets.

The business model of DAKFOCAM is based on contract farming with numerous smallholder farmers (Table 8). The contract provides farmers with an assurance on price and technical expertise to improve cassava quality and yields. For some contractors, the payment is made in cash upon delivery, which is always appreciated by smallholders. This special relationship with farmers enables DAKFOCAM to ensure a stable supply of large amounts of high quality cassava for its agro-industrial customers in China and South Korea. The company has also invested in trademarks for its products to develop customer trust in its products.

Table 7. DAKFOCAM Cassava Company's customers-oriented business model

<b>Partners</b>	<b>Activities</b>	<b>Value proposition</b>	<b>Customer relationship</b>	<b>Customers</b>
Cassava farmers in Ea Kar, Krong Bong and M'Drak districts Traders Input suppliers Transport service Local government Banks	Provide direct investment to farmers to grow cassava (cassava planting materials, fertilizers, technical support...) Provide investment to farmers through traders, farmer groups Purchase cassava roots Starch processing Trade starch and other products Other social activities	Stable supply of large amounts of high quality cassava  Meet customers' requirements on both quantity and quality  Trademarks of 'Elephant' and 'Horse' starch	Discussion information + Product quantity + Product quality + Price + Delivery and payment methods Communication through: + Telephone + Face to face + Email	China (regular and easy market)  South Korea: requires high quality of starch (colour, starch content...) with ISO 14000 standard  Philippines  Indonesia  Domestic food processing companies
	<b>Resources</b>  <b>Assets</b>  Office  2 starch processing factories in Ea Kar and Krong Bong districts  2 starch storehouses  2 living houses for workers  Trucks  Human resources  327 staff  3 staff with Masters degrees  Financial  Fixed capital: VND 500 million  Working capital: VND 230 million per month  Social assets  Strong linkage with traders in production areas  Close cooperation with local government and other organizations		<b>Channels</b>  Storage:  + 3 storehouses in Dak Lak  + Rent storehouses at border gates, sea ports  Distribution:  + Transport by trains, ships, trucks...  + 7 days to transport products to border gates, sea ports  + The company bears transport costs	

<b>Cost structure</b>		<b>Revenue stream</b>
Permanent payment:	Non- permanent payment:	Total income: VND 909 million in 2013
+ Salary for staff	+ Purchasing cassava	Selling price depends on season, customer types and socio-economic condition
+ Asset depreciation	+ Transport	Profit: VND 92 million after tax
+ Insurance	+ Selling products	Payment method
	+ Customer relation	+ Advance payment upon signing contracts: 70%
		+ Payment on delivery: 30%
		Payment frequency: 4 to 8 times per month

Table 8. DAKFOCAM Cassava Company's suppliers-oriented business model

Partners	Activities	Value proposition	Supplier relationship	Suppliers
Cassava farmers in Ea Kar, Krong Bong and M'Drak districts	Provide direct investment to farmers to plant cassava (cassava planting materials, fertilizers, technical supports...)	Stable demand	Direct contact	Individual farmers and farmer groups in districts (15%)
Traders		Contract farming with farmers, farmer groups	Indirect contact via traders	
Input suppliers	Provide investment to farmers through traders, farmer groups	Support capital, fertilizer, planting materials	Contract farming with farmers (total area of 7000 ha). The company provides fertilizers (5–6 million/ha), cash (3 million/ha), planting materials and technical support to farmers in advance. At harvest time, farmers have to sell cassava to the company and receive their income after deducting the above initial investment	Traders (80%)
Transport service	Purchase cassava roots			Other companies (5%)
Local government	Starch processing	Cover insurance		
Banks	Trade in starch and other products	Payment in cash at sale		Needs:
	Other social activities			+ Stable price
				+ Stable demand
				+ Diversified products
				+ High yield and disease-resistant varieties
				+ Technical supports
	<b>Resources</b>		<b>Channels</b>	
	Assets		- The company sets up a plan of cassava purchase at harvest time	
	Office		- Traders collect and deliver cassava materials to the factories by using their own means of transport	
	2 starch processing factories in Ea Kar and Krong Bong districts			
	2 starch storehouses			
	2 living houses for workers			
	Trucks			
	Human resources			
	327 staff			
	3 staff have Masters degrees			
	Financial			
	Fixed capital: VND 500 million			
	Working capital: VND 230 million per month			
	Social assets			
	Strong linkage with traders in areas			
	Close cooperation with local government and other organizations			

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