Analysis of the Dak Lak Avocado Chain

Study commissioned by:

MPI-GTZ SME Development program

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Centre for Science and Technology Application (CSTA)
Western Agriculture Science Institute (WASI)
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Dak Lak Farmer Union
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1 Introduction

1.1 Study scope

This study was carried out within the framework of Small and Medium Enterprises Development Programme of GTZ and the Ministry of Planning and Investment (MPI). The focus of the SME programme is on improving the business environment for private sector development and to enhance the market position of SMEs in selected sectors, specifically in provinces outside the major growth centres[1] (GTZ, 2005).

Focus on avocado because of market potential, rural development and health

The SME program in Dak Lak is directed by the Local Economic Development committee (LED) of Dak Lak, which represents all major Vietnamese government stakeholders. Based on an earlier commission fruit and vegetables sector study[2] in Dak Lak, GTZ and the LED selected avocado as a product with:

- A lot of market potential
- A potentially attractive crop to stimulate rural development in Dak Lak and to diversify the coffee dominated agriculture sector in Dak Lak
- Potential for reducing qualitative malnutrition in Vietnam

GTZ-Vietnam requested Fresh Studio Innovations Asia to:

- Train and coach the local partners[3] in Dak Lak in conducting an avocado value chain analysis.
- Implement an avocado chain analysis
- Organise an action plan development workshop with major avocado sector stakeholders

The result of this work should assist GTZ and the LED to use the exercise's outcome to develop an action plan to help the Dak Lak avocado sector to strengthen its competitiveness.

1.2 Aims

The overall aim of the Avocado Chain Analysis (ACA) is:
To create a joint vision with the main avocado stakeholders and develop a market based intervention plan for a more competitive and successful avocado sector, which can create a win-win for all actors in the avocado value chain.

To achieve this aim Fresh Studio split up the work in the following four major work packages (WP):
WP1: Avocado sub-sector analysis
WP2: Training and preparation of the Dak Lak value chain analysis team
WP3: Implementation of the value chain analysis
WP4: Development of intervention action plan

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[1] See for more information: http://www.sme-gtz.org.vn/
[2] This study can be found at: http://www.sme-gtz.org.vn/
[3] Department of Science and Technology (DOSTE), WASI, Center for Science and Technology Application, Dak Lak Extension Center, Thay Nguyen University.

In this report we present back the results of WP1 and WP3. The results of the training workshop (WP2) and the action plan workshop are presented in separate reports.

1.2.1 Report structure

The report starts with explaining the approach, schedule and methodologies that were used in this study. In chapter 3 a brief of the world market for avocadoes is presented and for which purposes avocado can be used. This overview is based on secondary data sources and provides ideas of the potential for the avocado sector. Hereafter we present the results of the field work. An overview of the avocado sector in Vietnam is given after which the chapter zooms in on the Dak Lak avocado chain. Through the use of the chain map the structure is explained. This includes an overview of the most important chain actors and their functions. In the next chapter a detailed analysis is presented of each chain actor. This includes information about their characteristics, margins, main problems and their ideas about possible solutions. In Chapter 6, the results of the temperature measurements from the harvest to arrival at the final consumer are presented. We end the report with the major conclusions and recommendations on what can be done to stimulate the development of a true avocado ***value*** chain.

Figure 1 Avocado collector in Dak Lak Province

2 Methodologies

2.1 Methods

Market chain analysis

The main methodologies which we used were the market chain analysis approach and rapid diagnostic appraisal (RDA). The market chain approach was used to describe the numerous links that connect all the actors and transactions involved in the movement of avocado from the farm to the consumer (Lundy *et al.*, 2006). This approach forced the team to look at al steps and actors from planting the avocado tree to the final consumption of the product.

Rapid Diagnostic Appraisal

To be able to analyse what is happening in and around the avocado chain we used the RDA approach. RDA is member of the large family of different Participatory Rural Appraisal approaches. A well carried out RDA empowers people to analyse their own problems, develop their own solutions and implement them. RDA is a process and method that can be used to learn about the situation, conditions and perceptions of various actors in a market chain (*Figure 3*).

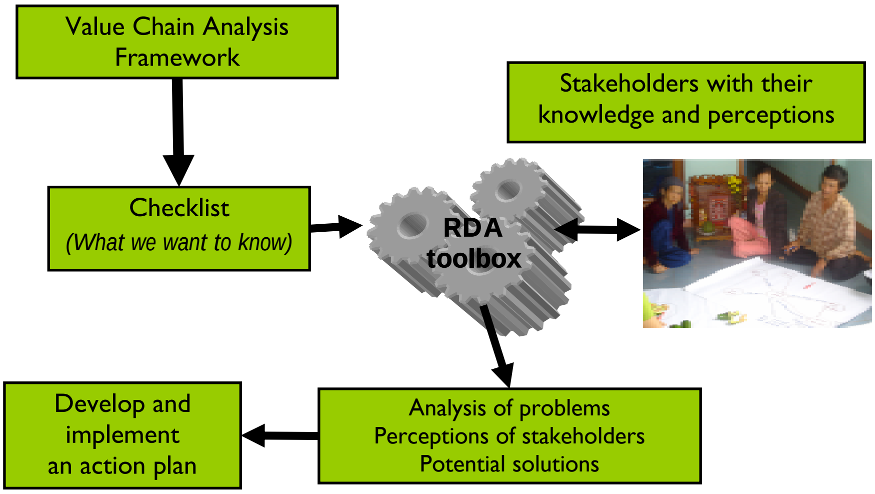
Let chain actors make the analysis themselves

The core principles of a RDA are:

- Role reversal: farmers/traders/consumers are the experts instead of the researchers
- Triangulation: RDA uses different methods, sources, disciplines and locations so that information can be crosschecked to get closer to the truth
- Optimal ignorance and appropriate imprecision: does not attempt to find out more than is needed. Often trends, scores and ranking are all that needed
- Direct contact: investigators are in the field during and experience every stage of the value chain
- Critical self-awareness and behaviour: Demands that the investigators question their own values, biases and embrace error
- Rapid, progressive learning: a RDA is flexible, exploratory, interactive and innovative.

Figure 2 Group discussion with district wholesalers about avocado quality

Figure 3 Approach used for the Avocado chain analysis



Use of RDA tools

The RDA toolbox contains all kind of tools, which can be used by the focus group facilitators, to stimulate actors to share their opinions and to analyse a certain issue. For example, a time line was used to analyse the history of avocado farming. Or pie charts were used to get insight in the various available avocado varieties. An overview of all the RDA tools which we used is presented in Annex 1.

Checklists

The most important step in the preparation of the fieldwork was to decide which information we wanted to collect, which tools we could use to obtain this information and a division of tasks among the AVA team members. The checklists which we used are presented in Annex 2.

CIAT Participatory Chain Analysis approach

Our approach can be best compared with the approach of Participatory Chain Analysis as described in the CIAT[4] field guide titled: "Increasing the Competitiveness of Market chains for Smallholder producers" by Lundy *et al.* (2006). The only main difference is that we also spent time to investigate additional topics, such as understanding the avocado farming systems, as so little information about is available about the avocado sector in Vietnam.

Post harvest measurements

In addition to the RDA, some additional work was done to get insight in how the quality of the avocado diminishes from the moment of harvest until delivery to a final consumer in HCMC. A data logger which measured temperature of the air and the avocado pulp was placed in a sample avocado basket[5] immediately after harvest. The data logger recorded the temperature every 30 minutes until it reached the final consumer in HCMC.

Estimate avocado sector size in Dak Lak

Based on the data which we collected with the RDA we made estimates of how big the avocado sector was. Figures for the number of farmers, collectors, wholesalers and traded volumes could be calculated based on several assumptions.

[4] International Centre for Tropical Agriculture
[5] Bamboo baskets are used for transportation, each basket containing 100 kg of avocadoes

Additional survey

These figures caused such a discussion within the team that we decided to implement a short formal survey among all wholesalers in the most important avocado production areas of Dak Lak Province.

Sector size estimate for policy makers

The reason to undertake these efforts to estimate more precisely how large the avocado sector in Dak Lak already is, was to provide evidence for the Dak Lak Provincial government that the avocado sector is already very important for a large number of people. This would justify public investments to professionalise the sector.

Survey among 98 avocado wholesalers

The survey was a short checklist of about ten open questions which resulted in information of traded volumes, sourcing of the avocadoes and the destinations of the avocadoes. This survey was held among all 98 wholesalers in Buan Ma Thuot and all other major avocado trading districts of Dak Lak.

2.2 Team

Multi-disciplinary team

The avocado value chain analysis was carried out by a team of the consulting company Fresh Studio Innovations Asia Ltd., the Dak Lak Department of Science and Technology (DOSTE), WASI, the Center for Science and Technology Application, Tay Nguyen University, and a farmer who is also chair of a district farmer union. In Table 1 an overview is given of the team who carried out the AVA.

Table 1 Avocado chain analysis team

Name	Organisation	*Gender*
Trinh Duc Minh	DOSTE	*Male*
Nghiem Thi Minh Thu	CSTA	*Female*
Huynh Ngoc Tu	CSTA	*Male*
Trần Đức Hiền	CSTA	*Male*
Nguyễn Văn Tám	Farmer Union	*Male*
Trần Thi Minh Hue	WASI	*Female*
Hoang Manh Cuong	WASI	*Male*
Đỗ Thị Bích Mỹ	CSTA	*Female*
Y Lem Niê	CSTA	*Male*
Lâm Thị Bích Lệ	Tay Nguyen Univesity	*Female*
Phan Thị Hoài Thương	Tay Nguyen Univesity	*Female*
Đào Hữu Hiền	WASI	*Male*
Duong Ngoc Duc	Dak Lak EAC	*Male*
Siebe van Wijk	Fresh Studio	*Male*
Cu Thu Le Thuy	Fresh Studio	*Female*
Pham van Hoi	Fresh Studio	*Male*
Medy Vilamor	Fresh Studio	*Female*
Cao Hong Luyen	Fresh Studio	*Female*
Tran Mai Huong	Fresh Studio	*Female*
Dao Thanh Huong	Fresh Studio	Female

2.3 Locations

Research locations

The RDA field work was carried out in the following locations:

- In Dak Lak Province:
  - Buon Ma Thuot city
  - Buon Ma Thuot district
  - Krong Ana district
  - Krong Pak district
  - Cu M'gar district
- Dak Lak → HCMC: Physically followed the avocado from farm to consumer
- Ho Chi Minh City
- Hanoi

4 main avocado districts in Dak Lak

Within Dak Lak we focused on the four main avocado producing districts and Buon Ma Thuot City, as Dak Lak's capital is the main trading hub from which the avocadoes are transported all over Vietnam.

Follow the avocado from field to consumer

To get insight in the deterioration of the quality of the avocado, the AVA team also followed a sample of avocadoes from the moment of harvesting until delivery to the final consumer in HCMC. This meant the team had to be awake and work for more than 24 consecutive hours.

HCMC research sites

In Ho Chi Minh City we visited the main wholesale markets, Tu Duc and Hoc Mon, METRO Cash & Carry, several retail markets, a fruit exporter, Sinh To café, SIAEP and HCMC agriculture university.

Hanoi

In Hanoi interviews were carried out by the Fresh Studio team with wholesalers in Long Bien market and the retailers coming to this market.

Additional survey in 8 Dak Lak districts

The additional survey among wholesalers was held in:

- Buon Ma Thuot city
- Cu M'gar district
- Krong Ana district
- Krong Buk district
- Krong Nan district
- Krong Pak district
- Ea Kar district
- Ea Hleo district

2.4 Schedule

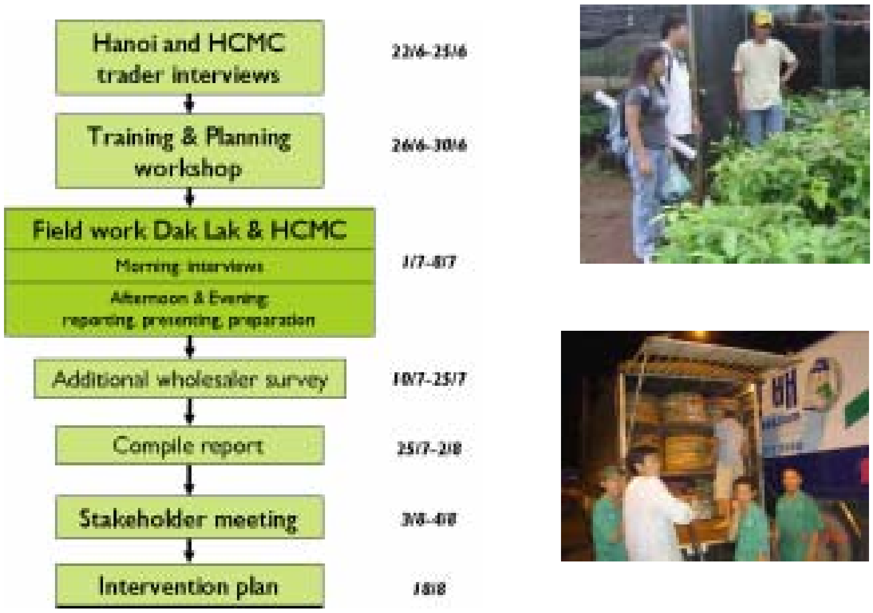
Preparations

The Fresh Studio team started with the preparations in mid June which included the interviews with avocado wholesalers and retailers in Hanoi. Before the training week in BMT, the Fresh Studio team travelled a few days earlier to HCMC to conduct interviews with wholesalers and retailers. During these interviews we also made appointments with various actors for the field work which would be carried out together with the team from Dak Lak during the first week in July.

Training

In Dak Lak the work started with a training and planning workshop of five days in which 22 participants joined. Hereafter the field work was implemented from the 1st until the 9th of July. On the 5th and 6th of July the team followed the avocado from the field in Dak Lak to HCMC.

Figure 2 Schedule of steps taken in the Avocado Chain Analysis



Field work schedule

In *Table 2* the schedule is presented which we followed during the field work. This schedule assured that all the collected information was documented immediately, shared and cross checked among the different subgroups. This triangulation of information was crucial and also maximised the learning effect of the team members. Each subgroup had a different focus every day, so by presenting this back to each other the full picture emerged for the whole team.

Table 2 Field work schedule

Time	***Activity***
7:30 – 11:30	*Fieldwork*
12:00 – 14:00	*Lunch Break*
14:00 – 16:00	*Each subgroup writes report of results*
16:00 – 17:00	*Each subgroup presents main results back to others groups*
17:00 – 19:00	*Dinner Break*
19:00 – 20:00	*Subgroups prepare next day*

After the RDA finished in HCMC, the local Dak Lak teams implemented the wholesaler survey, while the Fresh Studio team in Hanoi finalised all the daily activity reports and translated them into English.

These daily reports were analysed and summarised in fourteen results posters that were presented back during the stakeholder workshop in BMT.

2.5 Interviewed actors

Interviewed 224 persons

During the RDA the ACA team spoke with 126 actors in the avocado chain in various locations and interviewed an additional 98 wholesalers in Dak Lak province during a short survey (*Table 3*). This total of 224 people who shared their opinions and ideas about the avocado sector with us, within a relatively short time indicates the magnitude of the work upon which this report is based.

Table 3 Number of actors participating in focus group discussions and additional survey

126 persons during RDA and 98 traders during survey

Actors	*Dak Lak*	*HCMC*	*Hanoi*	*Total*
Farmers	33			33
Input providers	4			4
Research & extension	10	5		15
Collectors	10			10
Wholesalers	20 + 98[a)]	10	5	133
METRO		2		2
Exporter		2		2
Transporter	5			5
Retailers		13	2	15
"Sinh To Bo[6]*"* shops		1		1
Consumer		2	2	4
Total	82 + 98[a)]	35	9	224

[a)] Interviewed during the additional wholesaler survey

2.6 Gaps

Looking back…

Although we have spoken with a large number of actors, we still have identified some "actor-gaps". This means that we did not manage to have enough focus group discussions with the following actors:

To few discussions with consumers, fruit shake shops, bamboo basket producers

- The number of final avocado consumers with whom we have spoken was too limited. Instead we relied mostly on the opinion and experiences of avocado retailers, as they speak every day with large numbers of consumers.
- We also spoke with too few "Sinh To Bo" shops. As the main use of avocado in Vietnam is for avocado shakes, we would have liked to interview more "Sinh To Bo" shop owners.
- One of the business service providers to the avocado sectors are the producers of bamboo baskets which are used for the transport of the avocado. Another service provider who we did not speak were the sellers of second hand carton. The carton is used in combination with the bamboo basket for packaging.

We do not think that these gaps limit our ability to develop our recommendations and design for an intervention plan. But during the next phase it will be important to realise that some additional time needs to be spent on talking with the "packaging solution providers".

These gaps were the results of the priorities which we set within the limited time that we had. In the recommendations of our report we propose to get a better understanding of avocado consumption preferences through a specific and separate consumer study.

[6] Sinh To Bo = Avocado fruit shake

3 World Avocado Market overview

3.1 Introduction

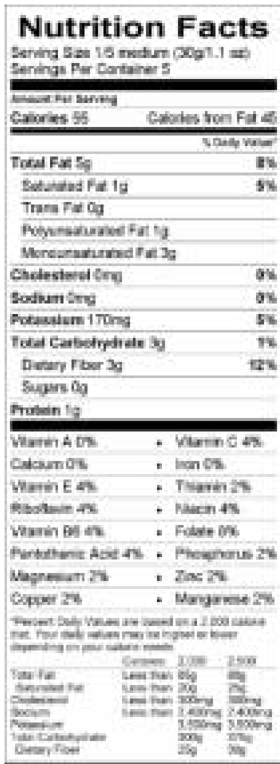
Most healthy fruit in the world

Avocado is a very special fruit and differs from all other fruits because it possesses a high oil and protein content. It is the only fruit known that contains all of the following nutrient elements: proteins, lipids, vitamins, minerals, salt, sugars as carbohydrates and water.

Calarofic value 3 times higher than banana and 50% of a beefsteak

Avocado supplies from 150 to 300 calories per 100 grams, making it an important nutritional food source and one of the most nutritious fruits in the world. Avocado is listed in the Guinness Book of Records as the healthies fruit in the world. It has a calorific value three times as high as banana and 50% of a beefsteak.

Figure 4 Nutrion label Californian Hass Avocado



Source: California Avocado Commission

14 essential vitamins and minerals

Contains folate

Other reasons why avocado is considered to be so healthy:

- It contains 14 essential vitamins and minerals.
- Is cholesterol and sodium free
- Contains monsaturated fats, the so called "good fats"
- Contains beta-sitosterol which helps to lowers cholesterol
- Contains folate especially healthy for pregnant women as it reduces the risk of spina-bifida
- Contains potassium which has an anti ageing effect
- One of the richest sources of glutathione which is very active against carcinogens

Therefore, it is no surprise that avocado is one of the most popular fruits among vegetarians.

Avocado as source for assisting in reduction of malnutrition

Avocado could potentially also play an important role to reduce the malnutrition among children under 5. According to UNICEF (2006), in 2005, still 25 percent of Vietnamese children below five were malnourished. Already an enormous improvement compared with 1985 when this figure was over 51 percent, but still much higher compared with for example neighbouring China (8%).

Avocado originated from Mexico and Central America

Avocado originated from Mexico and Central America. The early Spanish explorers recorded its cultivation from Mexico to Peru. It was introduced into Jamaica and Spain in the 17th century, first recorded in California in the 19th century (Gosh, 1999). In Vietnam the first avocado was introduced in Lam Dong Province by the French in the 1940s (Nguyen and Vo, 1999).

West Indian variety performed best in Dak Lak

Three main avocado horticultural races or species exist according to the areas of origin and distinctive features. These are the West Indian, Guatemalan and Mexican (*Table 4*). As we will see in chapter 4, all three races were tested in Dak Lak in the fifties. The West Indian variety performed the best, which might be explained because the climate in Dak Lak is tropical.

Table 4 Comparison of the three main avocado races.

Trait	Mexican	Guatemalan	West Indian
Tree			
Climatic adaptation	Semitropical	Subtropical	Tropical
Cold tolerance	Most	Intermediate	Least
Salt tolerance	Least	Intermediate	Most
Hairiness	Most	Less	Less
Leaf anisette	Present	Absent	Absent
Leaf colour	Medium	Often red	Paler
Fruit			
Months to mature	6	12 or more	5
Size	small	variable	variable
Pedicel (stem)	slender	thick	nail-head
Skin thickness	very thin	thick	medium
Skin surface	waxy bloom	rough	shiny
Seed size	large	small	variable
Oil content	highest	high	low
Pulp flavor	*spicy*	*often nutty*	mild

Source: Bergh & Ellstrand, 1989 in Requejo-Tapia 1999:

Hass variety dominates world avocado trade

The main avocado cultivars are based on these races. Although a range of cultivars are grown, the Hass cultivar is the world's most widely grown and exported variety. One of the reasons for the popularity of Hass is that it produces high yields of rich fruit with excellent storage and shipping characteristics.

The required soil and climate conditions to cultivate avocado are only met in a few areas of the world, particularly in southern Spain, Israel, South Africa, Peru, northern Chile, Vietnam, Indonesia, Australia, New Zealand, United States, The Philippines, Mexico and Central America (*http://en.wikipedia.org/wiki/Avocado*).

3.2 World production

Mexico largest producer of avocado

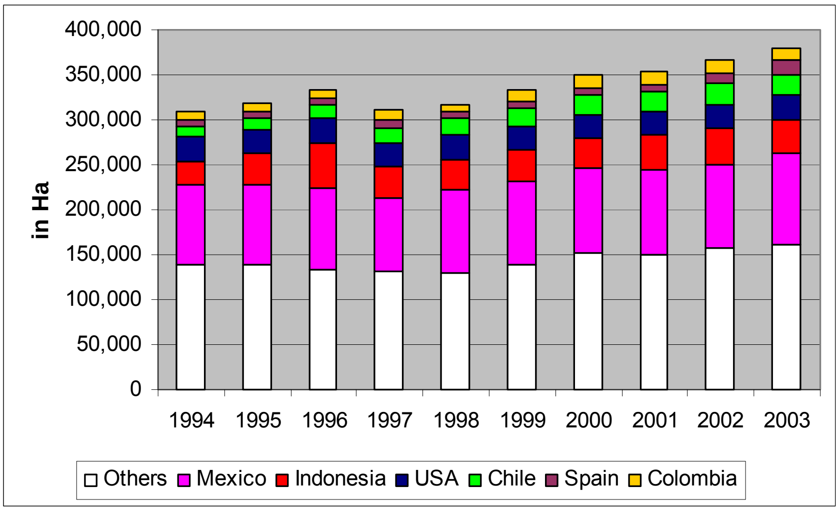
Intensive cultivation of avocados for commercial purposes began in California and Florida in the 1930s (USA), followed later by Israel, South Africa and Chile. These countries along with Mexico, Colombia Indonesia and Spain are the main producers. From 1994 to 2003 the harvested area increased with 23%, with especially the areas in Chile (103%) and Spain (105%) growing rapidly, while the area in the USA declined (-4%).

Vietnam not in avocado FAOSTAT data

Although the harvested area in South Africa and Israel is relatively small, most of their production is for export and therefore plays an important role in the international trade of avocados. This is contrary to Indonesia, which is a large producer but only for domestic consumption. No data about avocado in Vietnam appear in the dataset of FAOSTAT.

Figure 5 Harvested avocado area

Avocado areas in Chile and Spain are growing rapidly



Source: FAOSTAT

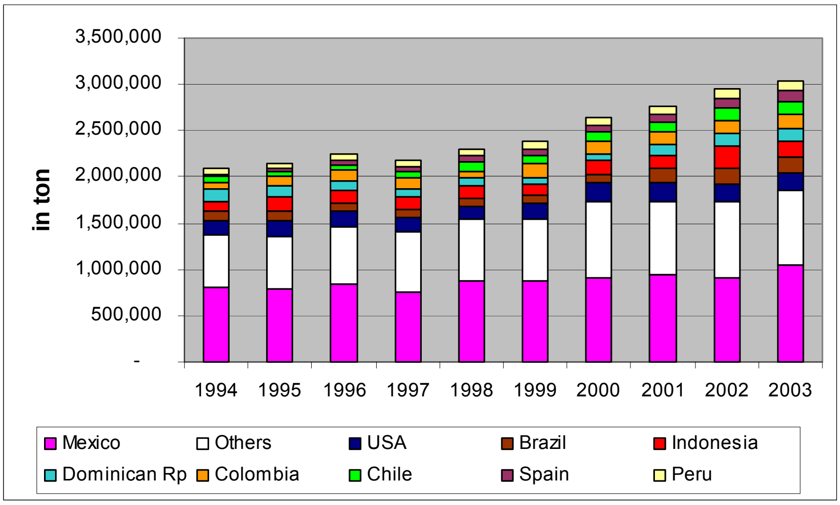
World avocado production> 3 mln ton

World production of avocado in 2003 was over 3 million tons, of which Mexico produced the largest majority (34%). All other individual countries are within the three to seven percent range of their share in the total world avocado production. The nine individual countries presented in Figure 3, together produced 73% of the world avocado production. World production increased with 46% during the 1994-2003 period, with especially production in Spain (296%) and Chile (133%) increasing rapidly.

Figure 6 World avocado production

Mexico largest producer

Nine individual countries responsible for 73% of world production



Source: FAOSTAT, 2005

Several countries (Chile, South Africa and Spain) have relative young avocado industries, which implicates that a large share of their orchards have not yet reached full production. If this happens this will have a price reducing impact (Requejo-Tapia C. L., 1999) if consumption does not increase.

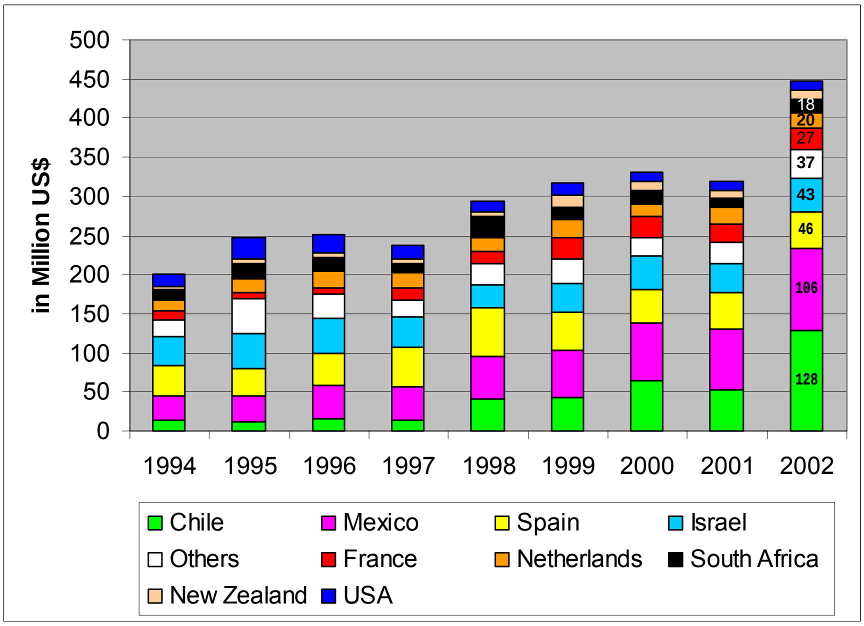
3.3 World trade

World trade in 2002 US$ 448 mln

According to FAOSTAT trade data the total worldwide exports of avocado had a total value of US$ 448 million in 2002. Compared to 1994 this means that the world exports have more than doubled.

Figure 7 World avocado exports

Biggest exporters are Chile, Mexico, Spain and Israel



Source: Compiled from FAOSTAT

The biggest exporters are Chile, Mexico, Spain and Israel. Although there is no avocado production in France and the Netherlands, they appear in the list op top exporters because they are important traders in avocadoes. Most of Chile's exported avocados are destined towards the USA (70%), but this will probably change rapidly in 2006 as the American import ban on Mexican Hass avocados was lifted to 47[7] American states at the end of 2005.

USA and France largest importers

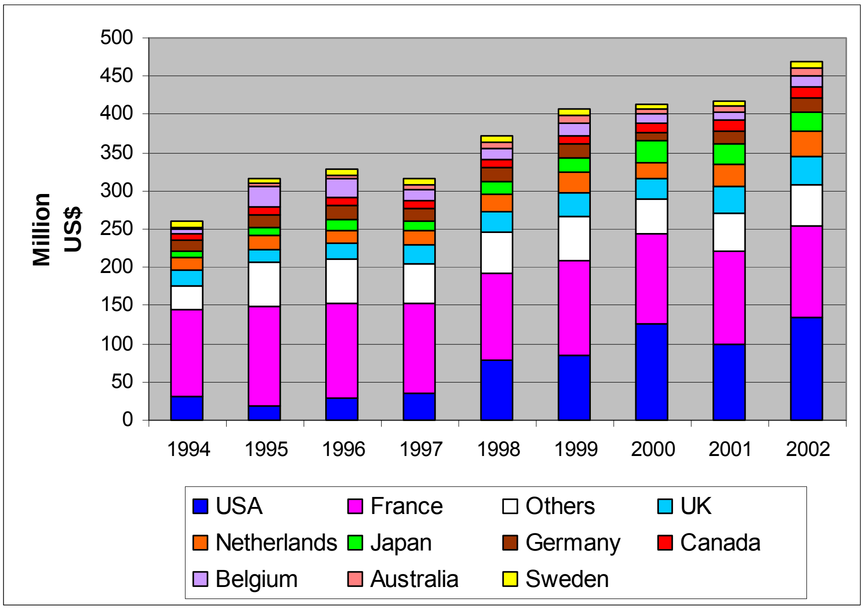
The USA and France are the largest avocado importers (*Figure 8*). Together they are responsible for over 50% of the total imports. Japan, an interesting potential export destination for Vietnam, imported avocados in 2002 for a total value of US$ 25 million.

Special charge on Hass in USA to invest in marketing and research

It is interesting to mention that in the USA on all sold Hass avocadoes, either imported or grown domestically, a levy of 2.5 US$ cents per pound is assessed under the Hass Avocado Promotion and Research Order. The purpose of this fee is to fund a marketing and promotion effort to increase the consumption of Hass avocadoes in the USA. These promotions have been partially responsible for the rapidly growing demand for avocadoes in the US. The overall growth in demand has exceeded the growth in domestic output, with imports increasing as a result (USDA, 2006).

France imports for consumption and to export again

Figure 8 World avocado imports



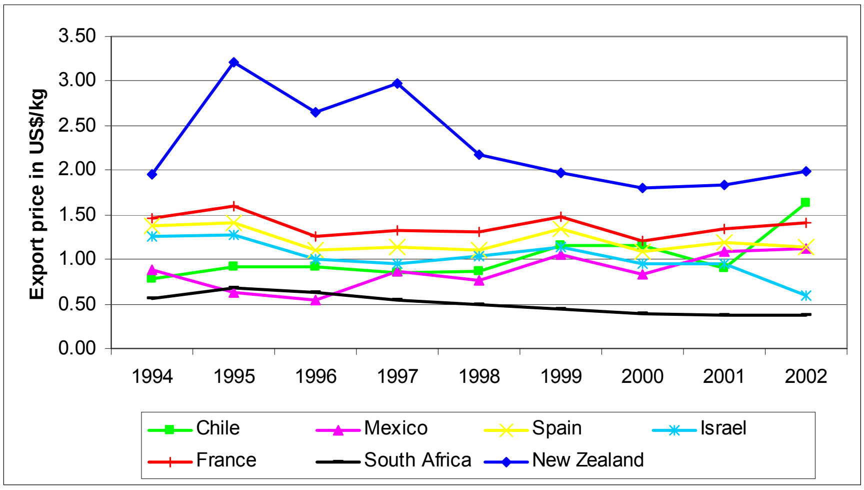
Source: Compiled from FAOSTAT

Highest prices for NZ avocados

With regards to export prices, New Zealand avocados received the highest prices, about 2 US$ per kg. For some countries prices have been going down, especially for avocadoes from Israel, Spain and South Africa. While for Chile and Mexico the prices have been going up.

7 Phyto sanitary concern still restrict the export of Mexican Hass avocados to California, Florida and Hawaii

Figure 9 Avocado export prices of leading exporters



Source: Compiled from FAOSTAT

Pressure on lower export prices

In a study of the world market for avocados Requejo-Tapia (1999) concludes that: *"Analysis of the avocado industry in the selected countries shows that the general export volumes would tend to increase at a slower rate than production. These factors would eventually bring an oversupply of the fresh market. In fact average export prices have decreased during the years as higher volumes are traded and new exporters enter into the business".*

3.4 Avocado products

The main avocado products are the fruits and oil which can be produced from the fruits. Avocado fruits can be used in several forms:

Avocado food use

- As a sauce known as *guacamole*. This use originated from Mexico and spread to the USA and Europe
- As a salad
- As a milk-shake
- Added to ice-cream
- In Central America avocados are served mixed with white rice

Avocado oil for cosmetic industry

Avocado oil is used as an ingredient for the fast growing cosmetic industry. Avocado oil is considered to be moisturizing and healing (helping with cell regeneration).

….and also as food oil

In addition, avocado oil can also be used as a food oil, like olive oil. The extra virgin oil can be used for example to make salad dressings. Avocado oil also has a high smoke point (over 250 ^{0}C) which makes it very suitable for cooking.

Even healthier than olive oil

Avocado oil has been found to be one of the most nutritionally valuable oils. It is considered healthier than sunflower oil and olive oil. Moreover, avocado oil was ranked fifth in the list of most desirable oils known as anti-cholesterol agents (Pearce, 1959). It has been granted the Heart Mark by the South African Heart Foundation in recognition of its positive effects on the heart.

4 The Avocado Sector of Dak Lak

4.1 Introduction

Lack of statistical data

No statistical data and hardly any literature is available on avocado production and marketing in Vietnam. Only two reports give some insight into the technical aspects of avocado cultivation in Vietnam. Despite this lack of information, the Vietnamese government has selected avocado as one of the seven priority fruits for development (FAO, 1999). What such selection by the Government exactly means in term of investments and policies is not clear, but our institutional analysis in Dak Lak Province gave some insight in this.

This study tries to fill some gaps

Based on data which we obtained through farmers, collectors and traders, we have calculated and estimated production areas, number of involved actors and margins. Therefore, we hope our report can fill a part of the knowledge gap about avocado in Vietnam.

4.2 Vietnam

Nguyen Minh Chau and Vo The Truyen (1999) report that the first avocadoes in Vietnam were introduced by the French in 1940, which developed well and even with an interesting market among the foreigners living in Vietnam. More avocado varieties were reported to be donated to Vietnam by the government of the Philippines in the 1960s (Nguyen and Vo, 1999). According to scientists in Dalat (Minh, pers. communication) there also has been a considerable gene bank donation of avocado varieties by the American government in the early sixties.

Main production areas in Vietnam

The main production areas of avocado are in the upland areas of the Southern Provinces of Dong Nai, Ba Ria-Vung Tau, Lam Dong, Dak Lak and Phu Tho Province in Northern Vietnam *(ibid.)*. Based on our own extensive interviews with the 15 largest avocado wholesalers in Vietnam, it is very clear that the largest volumes of traded avocadoes come from Dak Lak, followed by Dong Nai and Lam Dong Province.

The main avocado season is from May until October, with the peak in June, July and August. Although year round produce is available, the quantities are smaller, especially in the months of November and December.

Number of avocado trees per farmer very low in VN

Slowly some orchards are developing

Avocadoes in Vietnam are hardly grown on a commercial orchard scale, but pre dominantly produced as backyard crops or scattered in coffee fields, where they play a role as shade tree and windbreaker. In the earlier mentioned report of Nguyen and Vo, it was stated that no commercial avocado orchards are present in Vietnam. But since that report was published in 1999, there have been some changes as we discovered during our fieldwork in Dak Lak. We came across some farmers who have developed orchards of about 0.5 hectare. Although still very small, there seems to be a start of the rise of more professional avocado sector.

Prices are improving

This rise is driven by a growing popularity among Vietnamese consumers for avocado, which is reflected by higher prices. Compared with the farm gate price for avocado in 1999 of between VND 300 and VND 1000 per kg, prices have increased considerably. In the main season of 2006 they are between VND 2,000 and VND 4,000 per kg and can increase in the off-season to VND 8,000 – 15,000 per kg.

Avocado shake is main use in VN

By far the most important use of avocado in Vietnam is to make avocado shakes. All interviewed traders reported that the demand for avocado is very much related to the weather. If it is hot and sunny the demand for avocado shakes is high, but when it rains the demand is much lower.

Although the product is still not yet well known among all Vietnamese, the product is slowly but steadily gaining market share in Vietnam. Everyday more and more people discover avocado and keep on buying it.

Avocado tree as shade tree and windbreaker for coffee

But the large majority of farmers still only plant the tree as a shade tree, or as a fence around their field or next to their house. Farmers hardly use any inputs and undertake almost no management of their trees or fruit care.

Hardly any agro chemicals are used for avocado

Almost organic

Only when avocados are intercropped they receive some fertilization. When farmers applies fertilizers to his coffee he will just throw an extra hand of fertilizer towards the avocado tree, but that is all. In general one could state that avocados are produced almost organic. This means that hardly any agro-chemicals are used in production. Only in the mono-cropped orchards farmers use chemical fertilizers and hardly any pesticides.

Propagation by seed

Farmers propagate the avocado trees by seed. They normally select seeds from highly productive trees and hope that the seedling inherit the same characteristics as the mother tree. As the avocado

4.3 Dak Lak Province

Located in the central highlands, with its capital Buon Ma Thuot 1410 kilometre from Hanoi and 320 kilometre from HCMC, Dak Lak has developed into one of the most important coffee production areas in the world. Within Vietnam, Dak Lak is one of the fastest economic developing provinces thanks to the rapid coffee sector growth. Other important crops are rubber, pepper, cashew nuts and forest products.

4.3.1 History

In eighties avocado prices very low

As mentioned before the avocado was introduced in the 1940s in Dak Lak by the French. After which varieties were introduced to Vietnam by the Philippines and later also the Americans. Because of the war and the lack of funds these gene-banks were not maintained. During the rise of the coffee sector in Dak Lak in the eighties, the number of planted avocado trees increased rapidly. But because of very low prices, farmers cut their avocado trees and replaced them with other more profitable fruit trees which could also play a role as shade tree and windbreaker. Avocado also competes with the pepper plant as a border row. Some farmers consider pepper to be more profitable than avocado.

But according to our group discussions with farmers, extensionists and

Main use for home consumption and animal feed

local researchers the avocado sector only started to develop in the late nineties. Before 1990, avocado prices were so low that avocados were mainly used for home consumption and livestock feed. After 1990 the prices for avocado increased slowly and picked up faster after the year 2000.

Prices increase because consumer demand is growing

The increased consumer demand for avocado is the main driving force behind the higher prices. This is not only caused by a growing demand from HCMC and Hanoi but also from "new markets" such as: Nha Trang, Danang, Phan Rang, Cam Ranh, Quy Nhon, Khanh Hoa, Tuy Hoa, Binh Duong, Quang Nay and Haiphong. A big influencing factor for the development of these markets has been the improvements in infrastructure and regular transport services from Buan Ma Thuot to cities all over Vietnam.

Better infrastructure, more markets

This good transport network is related to the successful rise of the coffee sector. With farmers coming from all over Vietnam to obtain land and grow coffee in Dak Lak, there was also a need for improved transport services.

The higher prices has induced some farmers to develop small avocado orchards in which they have started to take much more care of the avocado trees. This includes activities such as pruning and fertilizer application.

Government support since 2001: variety research

Direct support from the government for the avocado sector came through investment in avocado research. From 2001, the Western Agriculture Science Institute (WASI) started avocado variety research. They created a genebank with 57 domestic varieties and 12 imported varieties. Since 2006 the Eakmat Agro-forestry Consultant, Investment and Development Company (a WASI subsidiary) has started to sell grafted seedlings to farmers.

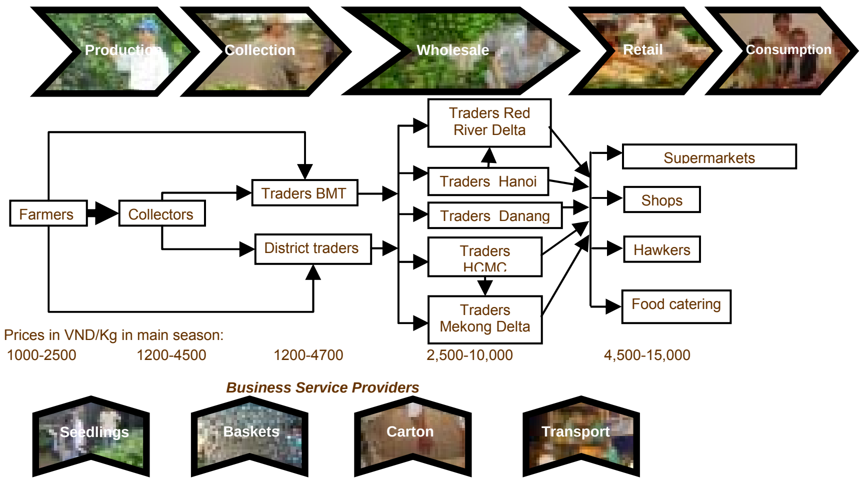
4.4 Avocado chain

Key-role for collectors

A simplification of the current avocado chain is presented in *Figure 11*. A key role in the whole avocado sector is played by the collectors. As most farmers just have a few trees, a whole army of collectors is operating to harvest and collect all the avocados. They sell them either to the district wholesalers or wholesalers in Buon Ma Thuot (BMT).

Figure 10 Avocado collectors in Dak Lak

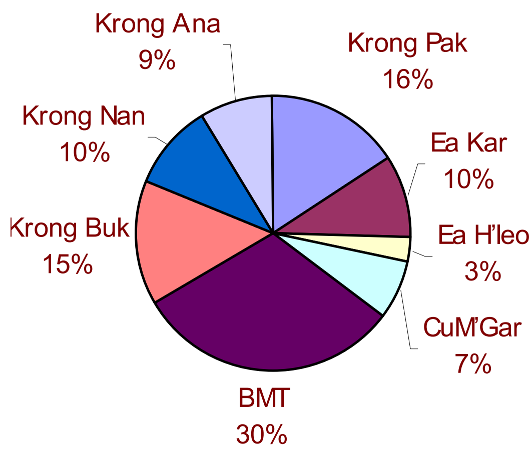
Figure 11 The Dak Lak avocado chain map



BMT wholesalers and District wholesalers

The avocados leave Dak Lak either through the wholesalers in BMT or through the district wholesalers. The common accepted knowledge among the local researchers and key-informants was that the BMT channel was the most important, with district wholesalers only playing a minor role. But already during the RDA we became aware that the district wholesalers were exporting quite large volumes from Dak Lak. This observation was confirmed by our wholesaler's survey. According to our data all the district wholesalers together were responsible for about 70% of the total avocado exports from the province to the rest of Vietnam.

Figure 12 Trade shares of Dak Lak wholesalers for the 2005 main season based on their trading location



Source: Wholesalers survey

But indeed from all individual districts the Buon Ma Thuot wholesalers were responsible for the largest exports (30%). Followed by district wholesalers from Krong Pak, Krong Buk and Krong Nan.

Only a very small percentage of avocados is harvested and brought to the district or BMT wholesalers by the farmers. The large majority relies on collectors.

Main destination HCMC

The largest majority of the Dak Lak avocados is destined to HCMC wholesale markets (Tu Duc and Hoc Mon). From these markets the avocadoes are either sold to retailers in HCMC or to wholesalers in cities of other provinces.

But as the avocado sector has been developing in the last few years, more and more of the provincial city traders start to order directly from wholesalers in Dak Lak, instead of ordering from wholesalers in HCMC.

Other provincial towns are becoming more important

According to our interviews in HCMC, about 100 tons of avocado per day are sold through the two main HCMC wholesale markets. As we made an estimate of the total exported amount of avocadoes (see next section) in the main season to be over 330 tons per day, this could mean that:

- Either the HCMC estimate is to low, or
- That the direct trade to all the other cities is quite important

We believe that both conclusions are valid. Avocadoes are also sold directly from Dak Lak wholesalers to other retail/wholesale markets in HCMC than only the Tu Duc and Hoc Mon wholesale markets.

Over 30 destinations in VN for Dak Lak avocado

The list of all cities towards which Dak Lak wholesalers send their avocados directly is quite long and contains over 30 different destinations. Volumes towards these locations vary from 0.5 ton per day to 10 ton per day. If all this is added up the figure of 330 ton per day is easily met.

Transport by trucks and busses

The avocados are transported in bamboo baskets (100 kg/basket) by trucks (8-10 tons per tuck) and in the same baskets by passenger busses. The passenger busses leave BMT for many cities in Vietnam. The growth of this private transport sector has given the Dak Lak wholesalers the opportunity to expand their market considerably. Dak Lak wholesalers just write the name of the trader, the market and city on the basket and put them on the right truck or bus. At the destination city the porters unload the basket and bring it to the right trader.

Product chain vs. value chain

For the largest majority of the avocado chain one can not talk of a value chain. Little structural cooperation exists between the various actors, with little exchange of information. If collectors harvest the trees by shaking the tree they will not see the damage to the avocados when they arrive at the wholesale markets in other cities. On the other hand, collectors who harvest avocados in a very careful way, are not rewarded for this. Wholesalers in the final destination cities only see different avocado qualities arriving at their stores not knowing how this has been influenced.

Some channels could become a value chain

During the field work we discovered a few district wholesalers who operate in a different way. They do a part of the collecting themselves and also work with some regular collectors. During the main season they also open a store in Tu Duc wholesale market in HCMC. In this way they have more control over the chain and are more conscious of the impact of bad post harvest methods on the quality in the final market destination. These special cases come close of being a value chain, but can be considered an exception.

Table 5 Production chain versus a Value chain

Factors	Production chain	Value chain
Information flow	Little or none	Extensive
Principal focus	Cost / price	Value / quality
Strategy	Basic product (commodity)	Differentiated product
Orientation	Led by supply	Led by demand
Organizational structure	Independent actors	Interdependent actors
Philosophy	Competitiveness of the enterprise	Competitiveness of the chain

Source: Lundy *et al.*, 2006.

After the avocados have reached the wholesalers in cities such as Hanoi, Danang, and HCM, they are sold to:

Fruit shake café's are major use

- Retailers in these cities
- The food service sector in the same city, with the large majority being café's which sell fruit shakes
- Wholesalers in smaller cities in the same region. For example, wholesalers in Hanoi, sell the avocados to wholesalers in cities such as Tay Nguyen and Lao Cai.

Important business service providers are the transporters, suppliers of packaging materials and in a lesser extent the avocado seedling providers. The suppliers of packaging materials are the persons who:

- Make and sell the bamboo baskets
- Sell second hand carton which is used on the inside of the bamboo basket
- Who sell second hand nylon rice bags. These bags are used to cover the bamboo basket with avocados on the top and bottom from water.

Seedlings

As farmers hardly use the grafted avocado seedlings yet, there are only a few suppliers of avocado seedlings, of which the Eakmat Agro-forestry Consultant, Investment and Development Company is the most important one.

4.5 Size of sector

5 trees per farmer

98 wholesalers

On average a farmer just has about 5 avocado trees, which might suggest that avocado is not such an important product in Dak Lak. But based on the information and data collected during our RDA and survey among the 98 major avocado wholesalers in Dak Lak province we were able to calculate the number of persons involved in the avocado sector in Dak Lak.

337 ton per day exported from Dak Lak during main season

Based on the wholesalers survey we estimated that during the main avocado season, 337 ton of avocados per day are exported from Dak Lak to other provinces in Vietnam. This figure was obtained through very short interviews (max 20 min per wholesaler) with almost all avocado wholesalers in Dak Lak province. These 337 ton per day are only exported during the main season which lasts 4 months. Avocado is also traded during the other eight months of the year avocado but in much smaller volumes. We just focused our employment analysis on the main season, so the data presented below might even be an underestimation of the employment generated by the sector.

Table 6 Estimated size of the avocado sector of Dak Lak

Indicator	Per Day	Per Season
Avocados exported by Dak Lak wholesalers	337 ton	40,410 ton
Harvested number of trees	3,368 trees	404,100 trees
Number of farmers involved	674 farmers	80,820 farms
Number of collectors involved	1648 persons	1648 persons
Number of wholesalers involved	100 persons	100 persons
Harvested area	22 ha	2,649 ha
Truckloads	42 truckloads	5,051 truckloads

The cornerstone of the data presented in the table above is the figure of 337 ton per day and the assumptions in *Table 7*. As stated before we are pretty sure about this figure, we are only not certain if this amount is stable during the whole main avocado season of four months. But this is compensated by the 8 months of off season which we did not incorporate in our estimation when still considerable volumes are exported.

More than 1600 collectors, 80,000 farmers and >2600 ha

In addition to the 100 avocado wholesalers, about 1,648 collectors are active. Actually they play the most critical role in the avocado chain as they harvest and collect the avocados. They visit the farmers and harvest one or two trees per visit. In total about more than 80 thousand farmers are involved, with an estimated harvested area of more than 2,650 hectares.

Table 7 Assumptions used for calculating the Dak Lak avocado size

Assumptions

Indicator	***Assumption***
Average harvest per tree	100 kg/tree
Mean no. of trees per farmer	5 trees/farmer
Turnover per collector	200 kg/day
Number of trees per ha	150 trees per ha
Average truck load	8 ton/truck

The harvested area figure is based on the yield assumption per tree and the number of trees which would be planted on one hectare. As so few farmers have a whole hectare of avocados we relied on international practices for a plant density figure. These figures fluctuated between 100 and 200 trees per hectare, therefore, we chose 150 (see FAO, 2001).

Our data also does not yet include the employment which the sector generates for a business service provider like the bamboo basket makers. All avocados are transported in large bamboo baskets, with each basket containing about 100 kg of avocadoes. This means that every day about 3,368 bamboo baskets are required. As the baskets are also recycled, but we did not collect data about this, no estimate was yet made of the employment generation for bamboo basket makers, but it must be significant.

US$ 7 mln is estimate for avocado added value in Dak Lak

We further calculated that the total value added of the avocado sector in Dak Lak province was almost US$ 7 million in every main season.

These figures should make the sector more visible to policy makers at provincial level and clearly justifies that an investment in the sector is justifiable as so many actors will benefit from it.

4.6 Avocado varieties

As there are large differences between avocado varieties, we spent a lot of efforts on getting a better insight in the available avocado varieties in Dak Lak. Each variety will have different characteristics such as storability, oil content, taste, shape, colour, size, skin surface (for example smooth or rough), nutrient content etc.

As the avocado was not introduced in Dak Lak in a structured way with clearly labeled different varieties, there is enourmous variation and it is almost impossible to identify distinct varieties. We only know that according to the information of Ms. Le, a researcher from Tay Nguyen University who did her PhD. on avocado, the main avocado race which survived best in Dak Lak was the West Indies race.

Seed propagation

Because most farmers propogate avocados by seed, few of the original varieties from the genebanks, have kept their original traits. Actually almost every tree can be considered as a different variety.

Local farmers, collectors and traders distinguish the following three main groups of avocados:

- bơ sáp
- bơ mỡ
- bơ nước

Classification of Avocados

If these three groups can be seen as varieties is not clear. We think that these three goups are a classification method for the avocado flesh quality, which is mostly determined by the oil content. The higher the oil content the better the taste. This is clearly regocnized by all actors in the chain. Bo Sap[8] avocados have the highest oil content, while Bo Nuoc[9] avocados have the lowest oil content and are are even considered very watery. Bo Mo avocados have almost the same high oil content as Bo Sap, and in addition have a very shiney and smooth skin.

Bo Sap and Bo Mo most popular

On the market, Bo Sap and Bo Mo[10] avocados obtain the highest prices and Bo Nuoc the lowest prices. As the outside appearance of an avocado can not be used as a reliable indicator for determining if it is a Bo Sap or a Bo Nuoc avocado, it is very difficult for consumers and even traders to distinguish the difference. It requires destructive sampling (cuttting the avocado open) to be for sure if an avocado is Bo Sap or Bo Nuoc.

Some traders make misuse of this and sell Bo Nuoc avocados as Bo Sap avocados. They for example mix a batch of Bo Nuoc avocados through a

[8] Literally translated Bo Sap means: smooth butter
[9] Literally translated Bo Nuoc means: watery butter
[10] Literally translated Bo Mo means: fat butter

Longer shelf life for Bo Sap

batch of Bo Nuoc avocados. Besides better taste, all traders experienced that Bo Sap and Bo Mo avocados have a longer shelf life. Bo Nuoc avocados rot much faster.

Figure 13 Various avocado varieties

In one avocado district, Krong Ana, a focus group session with five farmers estimated that in their district about 60 percent of the trees produced Bo Sap avocados, 30 percent Bo Mo and 10 percent Bo Nuoc. In Krong Pak district a focus group session with 10 farmers estimated that about 70% of the avocado trees in the district produce Bo Sap avocados and 30% Bo Nuoc.

5 Chain actors

In this chapter insight is given in the characteristics of the various chain actors, their roles in the chain, production methods, margins and the main bottlenecks and opportunities which they see.

5.1 Farmers

In this section we do not only report about the farmers but also about the agronomic aspects of avocado cultivation. All the information presented in this section is obtained during the focus group discussions with farmers and collectors.

5.1.1 Productivity

Tree lifespan 25-40 years

According to the farmers the lifespan of an avocado tree was between 25 and 40 years. During the life time of an avocado tree various productive stages can be identified (Table 8). The first fruits appear about 3 to 4 years after planting for an avocado tree which was planted through a seed. A grafted avocado tree produces its first fruits after 2 to 3 years. The first serious harvests are obtained from the fifth until the 10th year after which the tree achieves its main productive stage. After about the 25th year, yields decline again.

Table 8 Productivity of an avocado tree

Growth stage, years after planting	**Yield (kg per tree)**
3 years	*10 fruits per tree*
5 – 10 years	50 kg – 200 kg
10 – 25 years	200 -300 kg
> 25 years	100 – 200 kg
Weighted average for a 40 year old tree	180 kg

Average harvest 200-300 kg per tree

According to the farmer focus group discussions the average harvest of an avocado tree of eight years old, with a trunk diameter of about 30 centimetres, is 200 to 300 kg. Trees of 15 years old and with a trunk diameter of about 50 cm can even produce 500 to 600 kg per tree. Some farmers reported of some exceptional trees which produce more than 800 kilogram per tree.

Dak Lak avocado very productive

Several of the local researchers in Buon Ma Thuot were sceptical about these figures, they thought that these were too high. But based on discussions with all the farmers and collectors, a consistent figure of about 200 to 300 kg per tree for trees in their main productive life stage (10-25 years) emerged. As the harvest is always weighed with a balance, both the farmers and collectors know very well how much the harvest of a tree was.

These figures clearly show how highly productive the avocado trees in Dak Lak are. Compared with figures from other Asian countries[11], the Dak Lak avocado trees appear to be one of the most productive in Asia. Especially if one realises that the only activity done by a farmer is planting

[11] Average for the Philippines of 84 kg per tree (Sotto, 2001), ranging for different regions from 23 kg per tree to 240 kg per tree.

a seed. Soto (2001), for example, reports an average of 84 kg per avocado tree, with figures ranging strongly for the different regions in the Philippines from just 23 kg per tree in Central Luzon to 240 kg per tree in the Central Visayas. With no age data, these figures are difficult to compare but they indicate that the figures of Dak Lak are not out of bound. In Thailand research station yield data for 8 year old trees were reported between 40 kg per tree to 180 kg per tree (Babpraserth and Subhadrabandhu, 2001).

5.1.2 Annual crop cycle

Harvest 5 months after flowering

Avocado trees can develop flowers during the period from November to February. From the moment a flower develops until it falls of the tree is 15 days, after which it takes 5 months until the fruit is ready to harvest. An avocado tree is normally harvested over a period of one month. Collectors often come back two or three times to harvest the same tree. As avocados only start ripening when they are not on the tree, so when harvested, collectors try to harvest the avocados as much as possible in the off-season period.

Table 9 Annual avocado cycle

	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.
Flower setting	For main season										For early season	
Harvest			Early			Main			Late			
Rain												
Prices			3000-4000 vnd/kg			1500 – 2000			3000-10,000			

Main season Jun-Aug.

For the early season harvest, flowers set already in November, while for the main season, flowers set between January in March. One avocado tree normally only develops flowers in just one period, but during the field work a farmer was met who had a tree which developed flowers during different periods of the year. Many farmers obtained seeds from this tree as they also wanted to have a tree with this special characteristic.

Small amount off season production

There are also other cases of trees which develop flowers in for example August, which results in harvests in February. Farmers assume that this happens with trees which have access to year round water sources, for example trees close to wells. As prices for off season avocados are much higher, farmers are trying to get seedlings with off-season production.

5.1.3 Pests and diseases

So far pests and diseases no serious problem yet

In general farmers have very little problems in avocado production. The main pests and diseases which occur during the various growth stages of the avocado tree are presented in Table 10. The control methods used by the small group of farmers who are managing their avocado trees, are also presented in this table.

Table 10 Main pest, disease and fungus problems during the different life stages of an avocado tree

Age of tree	Main problem[12]	Control method
First year	Root borer ("duc goc")	No control method
4-20 years	Caterpillar	Bi 58 and Bassa
	"sâu đục than"	
	"nấm hồng (a fungus)"	Dersi-S 2.5 EC
	Leaf borer	No control method used because little harm
>25 years	"Nấm bệnh và mối"	No control method

The caterpillar is the most serious problem, especially when it occurs during the flowering period.

5.1.4 Management

How to keep traits of mother tree?

As mentioned before, farmers propagate avocado trees through seeds. Usually farmers get fruits from other farmers in their district and try to select those trees which:

- Are highly productive
- Produce off season fruits
- Produce Bo Sap avocados

Farmers do not use coffee grafting skills for avocado. Why?

As avocado trees are cross pollinating chances are very small that the off spring of a certain tree have the same characteristics as the mother tree. This was clearly illustrated by a farmer who showed us the fruit from the mother tree, which had a very high yield and a good taste (Bo sap), and the fruits from the trees which were sown with a fruit from the mother tree.

Figure 14 Avocado fruits from mother tree and off spring trees

With all the available knowledge of grafting from the coffee sector, we did not discover and understand why (the majority) of the farmers did not came up with the idea to graft the avocado trees. While for coffee, many farmers[13] know how to do the grafting themselves, this knowledge does not seem to have been applied to avocado. This knowledge is certainly

12 These are the Vietnamese names used by the farmers. To know the exact scientific name more investigations are needed Vietnamese of pests

13 Some local experts estimated that about 20% of the coffee farmers know how to craft themselves

available through the seedling producers, as they also sell grafted avocado seedlings.

The only explanation we could think of was that the economic interest in the avocado sector has only been growing since 2000. Grafted avocado seedlings at commercial seedling producers have also only been available since the last few years.

Farmers usually plant avocado on land which does not flood and with red soils. Avocado trees grow very well on these soils.

Fertilizer use for small number of farmers

For the farmers who have started to take more care of their avocado trees the following management activities are undertaken:
- When the avocado seedling is planted, 50 gram of NPK[14] and 200 gram of P_2O_5 is applied per seedling
- During the annual growing cycle NPK is applied of about 500 gram/tree. This is done every two months from February until September.
- If the avocado tree is intercropped with coffee, the farmers throw and extra hand towards their avocado tree while they are give fertilizers to their coffee plants.

Researcher-farmer trials

At two farm locations, WASI and Tay Nguyen University have setup a trial with various avocado varieties. These trials are cooperation between the farmers and the researchers. An orchard was established three years ago on about 0.5 and 0.6 hectare of land. Three promising grafted local varieties and three grafted imported varieties (Hass, Booth and Fuerte) have been planted in these orchards, with a plant density of 200 trees per ha with a plant spacing of six by six meter.

In these orchards the following fertilizer schedule was followed:
- When the seedling was planted: 1 kg of micro-organisms fertilizers and 1 kg of compost
- During the growing season, fertilizer is applied about 5 times per year in amounts of 500 gr of NPK per tree

Other management activities:
- Water is supplied to the trees about two times during the dry season
- Pruning of dried and disease infected tree branches

Labour input in an orchard 25 days/ha/year

One of the farmers which we interviewed decided to invest in an avocado orchard because he has a direct family relation with an avocado wholesaler. He developed an avocado orchard in 2001 on an area of 0.4 hectare. The farmer initially planted 85 trees with a spacing of 7 by 7 meter. Of the 85 trees about 60 survived. The farmer intercrops the avocado trees with taro, yam and corn. The farmer applied in total 400 kg of NPK on the 0.4 ha and did this in two applications of 200 kg each. The farmer estimated the specific labour cost for the avocado orchard to be about 10 days per year (for the 0.4 ha).

Farmers rely on collectors for

With regards to harvesting and marketing, most farmers completely rely on collectors. Collectors determine when the fruits are mature enough

[14] A compound fertilizer with Nitrogen, Phosphate and Potassium

harvesting

for harvesting and harvest themselves, after which they transport them to the wholesalers. According to all the wholesalers that we interviewed, farmers hardly supply them directly with avocados. Although there are some exceptions, in general farmers depend on the collectors.

5.1.5 Profitability

No input cost

As farmers hardly use inputs on avocado, the calculation of the profitability is very easy. It is equal to the harvest, times the price the farmer received. Farmers either sell per tree to the collector or per harvested kilogram of avocado. Selling per tree means that the collector takes a look at the tree and pays the farmer one amount for the tree before harvesting.

Per ha value could be > US$ 3,300

The revenue which a farmer can get from a tree can vary from about VND 200,000 per tree (100 kg harvest and a price of 2000 VND) to VND 1,500,000 per tree. Using the average yield of an avocado tree over its lifespan of 40 years of about 180 kg and an average price of 2000 VND/kg, this would result in about VND 360,000 per tree. If a farmer planted one hectare with about 150 trees, this would mean a value of VND 54,000,000 or US$ 3,375. With good crop care, the quality and the yields can be higher, resulting in better prices and more profit.

Avocado performs well compared with other crops

Compared with the average net revenue per hectare for green robusta coffee (US$ 408/ha) and cashew (US$ 385) this is almost ten times higher. This difference is mainly caused by the high input costs in coffee and cashew. Farmers also mentioned that in their experience avocado trees require less water than coffee.

What if farmers switch to orchards? More pests and diseases

Off course one is not sure how much pest and disease problems will increase if a large number of farmers start to establish avocado orchards. Input costs will probably increase, but one might also expect higher yields and better quality under good management.

Some conflicting opinions were obtained during the focus group sessions. Some farmers thought that avocado was far more profitable than coffee, while others doubted if avocado was more profitable than both coffee and pepper. But all farmers shared the same concern, they were not yet sure in which direction the domestic avocado market and price would develop.

Avocado very small share of income

The farmers of the focus group session in Krong Pak estimated that in their district, farmers currently 75 to 80% of their income from coffee, 10 to 15% from rice, pepper, peanut, taro or yam and about 5% to a maximum of 15% from avocado.

5.1.6 Farmer types

Farmer types based on no of trees

A group discussion with eleven farmers from Ward 6a from Hoa An commune in Krong Pak district gave some ideas of the different existing avocado farmer types. Of the 290 households in this Ward an estimated 80% grow avocado.

The focus group used the number of avocado trees as the main indicator to classify farmers in a different group. The following groups were distinguished:

1) Farmers with no avocado trees
   - Have little or no land
   - 2% of the farm households in Krong Pak district belong to this group
2) Farmer with 1 to 5 avocado trees
   - Small amount of land
   - Grow avocado mainly for home consumption, sell only the amount which the family can not consume
   - 3% of the farm households in Krong Pak district
3) Farmers with 5-100 trees
   - Use avocado trees as wind breaker around their coffee fields
   - 90% of farm households in Krong Pak district
4) Farmers with more than 100 trees
   - The avocado trees are intercropped with coffee or grown as mono-crop
   - This group has especially been growing the last 3 years because of the better avocado prices. Avocado is further very easy to grow and combines well with the coffee.
   - 5% of farm households in Krong Pak

Avocado can be grown by the poorest

The group further told that even the poorest grow avocado trees, as long as they have land. Avocado is so easy to grow, requires little investment and produces a lot nutritious food. The biggest cost for farmers is the opportunity costs of the land. What would be the best alternative use of the land if an avocado tree was not planted there? Is the value of the avocado tree higher than other land use options?

Expect that the avocado sector will grow

The large majority of the interviewed farmers expected that in the coming years the demand for avocado would increase, that prices would slowly keep on going upwards and that the total avocado area would increase.

5.1.7 Problems & Solutions

The main problems mentioned by farmers were:

Farmers have no idea how the market will develop in the future

- Farmers are currently very content with the avocado prices, but they do not dare to make avocado orchard investment decisions as they have no idea how stable these prices are. They have no idea how large and consistent the market for avocados is. Farmers feel that they lack market information. They can daily see the prices for products like coffee, cashew nuts and taro on TV, but avocado is not mentioned. After long years of low demand and low prices for avocados, farmers are not yet sure if the price and volume demand increases of the past few years will be consistent or not. This makes the farmers hesitant to invest in the expansion of their planted avocado area.
- There is a lack of good avocado varieties. When a farmer plants an avocado variety he wants to be sure what kind of fruits the tree will produce and in which period.

Need for an estimate for avocado demand

- A majority of avocados become available in the same period. There is a strong need for technologies or varieties which can spread the avocado season over a longer period.
- Stealing of fruits. As farmers currently grow avocado trees in a

scattered pattern it is very difficult to guard them from thieves. In such a system an expansion of the number of trees is difficult.
- Pests and disease were mentioned as a small problem
- Farmers are very dependant on collectors, as their volumes are too small to develop a direct relation with a wholesaler. Collectors also trade other products than avocado, which is another reason why wholesalers prefer to work with collectors above farmers.

Ideas for solutions and wishes from the farmers were:
- A large stable market for avocados, which will allow farmers to start to develop avocado orchards. This could be stimulated by the development of an avocado processing industry, in which the government possibly could play a role

Market info

- Include avocado daily market price information on TV

Improved varieties

- Supply high quality avocado seedlings
- Training programs on how to take care of avocado trees and manage pests and diseases
- Training programs on post harvest management

Training programs

- Making special storage facilities available to extend the shelf life to market avocados
- Several farmers wish government interventions in setting minimum prices and preventing farmers from being extorted by traders
- Some farmers also wanted the government to assist to develop specialised avocado production zones.

5.2 Research & Extension

During our field work we focused our efforts on the following organisations:
- WASI
- Eakmat Agro-forestry Consultant, Investment and Development Company
- The Dak Lak Center for Crop Seeds and Animal Species
- The Dak Lak Center for Extension
- The Krong Ana extension station

This means that the following two other research and extension organisations were not included in the analysis:
- Tay Nguyen University
- The Center for Science and Technology Application (CSTA)

We know that the university also carries out research on avocado, while the Centre for Science and Technology Application sells avocado seedlings. We hope that in the near future this information gap can be filled.

5.2.1 WASI

The Western upland Agro-forestry Technology and Science Institute (WASI) currently has about 90 researchers, 60 workers and 200 hectares of land. It also has a small avocado net house nursery (30 m^2) in rather poor condition. In addition WASI has an avocado variety orchard with a collection of:

Variety collection

- 57 selected local varieties with high potential

- 12 imported varieties such as Hass, Booth and Fuerte

Avocado research funds since 2001

WASI has focussed its research on industrial tree crops such as coffee, cashew nuts, cacao and rubber. With regards to avocado already some activities took place in the late seventies, but were stopped in the eighties and revived again in the nineties (see Table 11). But real research efforts on avocado started in 2002 with the funding of a variety selection program by the Department of Science and Technology (DOSTE). The varieties were not only tested at the WASI avocado orchard but were also setup at various farmers fields.

Different sector size estimates

The interviewed researchers at WASI also gave their estimate of the avocado sector in Dak Lak. They estimated that:
- The total avocado area in Dak Lak is 5,000 hectares
- The average yield per tree is 30 kilograms. This figure is so low because the researchers think that many trees were just recently planted
- With a plant density of 100 trees per hectare this results in an annual productivity figure of 15,000 ton/year.
- The number of growers is estimated to be 30-40% of all farming households in Dak Lak

Table 11 Time line of research undertaken by WASI with special attention to avocado

Time line WASI

Year	***Main event***
1979	Research focuses on industrial and fruit trees
	Initial studies on avocado are available (including 3 varieties, group garden area: 3 ha), and several other fruit trees such as jackfruit, durian and mango
	WASI started with training courses and technology transfer to farmers
1981	Research on coffee and cacao
	The avocados in the variety orchard are cut
1990	Study on how to graft avocado
	Study on collecting good local available fruit tree varieties in Tây Nguyên
1997	Research on coffee, cashew nuts and cacao expanded
	Technology transfer implemented by 3 WASI units in in 3 provinces: Đắk Lắk, Gia Lai, and Lâm Đồng
	Technology transfer focused mainly on realising improved varieties. Training on plant protection, crop management and fertilizer use. On average three training courses per year were given with in each training course about 20 to 30 trainees (mostly farmers)
2002	From 2002 special attention starts to be paid on avocado. A large study to identify and conserve high quality local avocado varieties in Dak Lak and Lam Dong province was started. With a budget of VND 200 mil 57 local varieties were collected. The funding was provided by the Dak Lak Dept. of Science and Technologies (DOSTE). An avocado orchards of 2 ha was established with 53 promising local varieties and . 12 imported varieties.
	The study on proper avocado grafting methods was finished
2006-2010	Continue with variety selection activities
	Set up trial experiments in Dak Lak, Gia Lai, and Lam Dong province on an area of 6 hectares (2 hectares in each region).
	Undertake a study on developing fertilizer recommendations and irrigation systems for avocado
	Undertake a study on post harvest treatment of avocado
	Produce avocado seedlings of several selected promising avocado varieties in the WASI nursery
	Continue to import new avocado varieties
	Test the imported varieties in different regions. This is already happing for the earlier mentioned 12 varieties which are tested Gia Lia and Lam Dong
	The imported varieties have not yet been introduced to farmers to be used for production
	Received funding from MARD with a budget of VND 1.8 billion for: *"Variety selection and methods of post harvest treatment and preservation of avocado in Tay Nguyen"*

These figures are quite different from our estimates. The planted area is almost double from our figure, while the average tree yield is nine times lower from our estimate. It is not clear how the researchers estimated the 5,000 hectare planted with avocado. Our total annual production figure is 3 times higher than the figure from the WASI researchers.

As explained earlier our figure is based on interviews with all wholesalers in Dak Lak province, so we have quite some confidence in these data. But at least one could say that the figure is somewhere between 15,000 ton per year and 40,000 ton per year.

Need to know demand and supply of avocado

For the next steps in the project it will be important to get a good idea of how much the total production currently is. This will give the avocado sector an idea of which quantities can be absorbed by the market without a price collapse.

The researchers also gave their opinion about the strengths and weaknesses of the Dak Lak avocado sector. Although they see fluctuating market prices as a threat, they also see that prices are tending to go up.

They further observe that the climatic and soil conditions are very good for avocado in Dak Lak and that they can well mixed with coffee. The weaknesses are mostly related to the very small number of trees per farmer and the low cultivation and post harvest treatment level.

Table 12 Perceptions of WASI researchers with regards to strengths and weaknesses of the Dak Lak avocado sector

Good climate

Prices tend to increase

Weaknesses/Threats	***Strengths/Opportunities***
Varieties have not been selected and improved	Favorable climate and soil condition for avocado
Very small number of trees per farmer, no orchards	Price tends to increase
Lack of capital	Abundant labour source
No preservation technology is available	Avocado can be intercropped, provides shade for coffee
Lack of technical learning experience from developed countries.	Variety selection program is getting the first results
Unstable market price of avocados	

5.2.2 SIAEP

SIAEP in HCMC

The Southern Institute of Agricultural Engineering and Post-Harvest Technology (SIAEP), based in HCMC, is a government/ semi-private organization focused on assisting the farmers and private companies in post-harvest strategy development in fruits and vegetables. They are also involved in facilitating value chain analysis, training-the-trainers and setting up farmer's field schools. All these technology service systems are supported by donors such as FAO, DANIDA, World Bank.

So far little work on Avocado

According to Dr. Tho, they have been working very closely on mangoes and dragon fruit for the past years together with farmers. They have been looking at post-harvest application, creating modified atmosphere for fruits to prolong shelf life and reduce incidence of pest and diseases. Apparently, they are not working on avocados so far. But, he said he is favorable to a joint –project with DOSTE/WASI.

Take care of pests and diseases when switch to mono cropping

Dr. Tho warned us that if the avocado growing area increased, the spread of pests, diseases and fungi such as Anthracnose and Phytophthora are mostly likely to become important diseases.

In the institute we visited the laboratories. There were two laboratories for applied research purposes located within the building:

- Room which houses mini-cold storage facility (4-door-type),
- Phytotoxin rapid diagnostic equipment, water analyzer, microbiology assay tools and equipment.
- Analytical lab which contains gas chromatography equipment used to analyze various concentrations of gases and other volatile materials.

Some avocado post harvest work recently started

According to the laboratory staff already some preliminary trials on avocados had been done:

- Use of chitosan to modify the atmospheric concentration around the fruits
- Application of cold storage and its impact on pest and disease control.

Results, however, were not yet conclusive and available

Extraction of avocado oil has not been done. There was no project handed over to them and if in case, there have concerns about machine and method to be used. However, they are trying to do extraction of oil from neem tree fruits for using on control of certain pests and diseases.

At the present, SIAEP imports some botanic oil from Australia and US to use as biological pesticides on some pests and diseases on dragon and mango crops. The SIAEP staff said that they are willing to extend their services to outside clients/companies.

5.2.3 Tu Duc Agriculture Unversity

Just started

Through our network we heard that within the post harvest technology department of the HCMC Agriculture University a project was started on avocado oil extraction. The project is led by Dr. Phan The Dong (PhD), who we interviewed.

Avocado oil extraction project

- History: Dr. Phan the Dong was inspired by the Australian Avocado Oil Association to come up with a proposal to the Vietnam government on the *"Characterization of lipids (oi) in Vietnam avocados (all available cultivars)" for commercial use as either edible/cooking or cosmetic oil"* . He organized a team of 7 technical faculty experts who will work with him on the project for two years: 2 BS Engineering, 2 MS Food Science, 2 PhD Food Science and 1 PhD Sensory Evaluation. The project was approved this year and just recently, they started to do preliminary investigations. The total project budget is 200 million VND and is funded by MOET, Vietnam.

Interesting cooperation partner

- Materials and methods: Dr. Dong shared with us briefly his project plan of activities. However, owing to national examinations at the moment of the interview, his team has not yet started the project. Sourcing of all avocado cultivars at various maturity ages will be done in both Dalat and Daklak. He said, they will be following conventional way of oil extraction using soxhlet and hexane solvent techniques. Classification of fatty acids will be analyzed using gas chromatography method. He relies on existing avocado oil extraction technology of Australia and New Zealand. He mainly gets the information from websites.

- Expected output. His group hopes to produce a considerable amount of avocado oil with stable color and aroma.

- Issues and concerns. 1) Not enough sources of samples of various cultivars. Amount of samples needed: 5-10 Kg/cultivar. Could be logistic problems? 2) Low capacity extractor (machine).

5.2.4 EACIDC

Part of WASI

The Eakmat Agro-forestry Consultant, Investment and Development Company has been part of WASI since 2001. Its duties are on technology transfer and trading in products and technologies created by WASI.

Sale of grafted avocado seedlings

With regards to avocado the EACIDC focuses on the sale of grafted avocado varieties. In 2006 EACIDC prepared 1,000 grafted seedlings, but the market demand is much higher. The staff believed that about 4,000 to 5,000 seedlings could have been sold. Therefore, for 2007 EACIDC will prepare 10,000 seedlings. The production cost per seedling is about VND 3,000 – 4,000 and they are sold for VND 15,000 per seedling to the farmers. Of the seedlings sold in 2006, 65% were late season producing avocado varieties and 35% early seasoning producing varieties.

Rootstock quality?

The grafted seedlings are prepared in the following way:

- For the rootstock no special selection has been made. Cheap avocado seeds have been bought from which the rootstock is grown
- The branch which is grafted on the rootstock is carefully selected from highly productive trees of farmers. Also fruit quality, off season productivity and long shelf life is an important selection trait.

In addition to EACIDC, the staff mentioned that also the Dak Lak Center for Science and Technology Application is selling avocado seedlings. In 2006 about 600 seedlings so far. In addition the private sector seedling producers are also estimated to have been selling about 3,000 to 4,000 seedlings in 2006 for a price of VND 10,000-12,000 per seedling.

Consulting, training and trading

Other functions of EACIDC are:

- Selling other seedlings such as coffee, cashew, cacao and various fruits
- Produces and sells foliage fertilizers (NuCafe) for coffee. A product developed by WASI
- Provides consulting services to for production companies such as Coffee Farms 715A, 715B, 715C, Dak Uy (State owned), Factory 83, Duc Cuong factory (private). Monitor soil fertility, pest & diseases in order to propose solutions.
- Organises training courses for technology transfer for producers and free of charge consultancy services for individual smallholders

5.2.5 Dak Lak Centre for Extension

Since 1993

The Dak Lak Centre for Extension was established in 1993. Before 1993, it was a branch of the Vocational School for Agriculture. The Provincial People's Committee decided to change it into an extension center as the demand for vocational training decreased. The school teachers than become the center's staff.

The Center has 39 permanent staff. There are in total 13 extension stations with 40 extensionists in the whole province. The exact number of extensionists is not known as there is a lot of seasonal staff and every station is managed by the district since 2002.

Large fund from Danida

From 1996-2000, the Center received funding from DANIDA, with a total value of US$ 800,000 for purchasing equipment for extension services such as motorbikes (57), computers (25 sets including printers), digital cameras, radios, projectors, etc. At that time, with all this equipments, the Dak Lak Center for Extension was considered to be the best equipped extension center of Vietnam.

Loans for farmers

Besides this fund, the center also received a loan of US$ 500,000 which they were supposed to use to lend to farmers against interest rate which were equal to that of a commercial bank. However, farmers did not want to get a loan from the Center because the paper work was more complicated compared with a commercial bank.

The provincial extension objectives were to promote technology transfer for annual crops in remote communes, so that farmers could become self-sufficient in food. Activities carried out to meet this objective were:

Extension on annual crops

- In 1994, the Center started an extension activity in cooperation with the Department of Agriculture and Rural Development to develop a program for a maize variety named Bio-Seed. In the program, seeds were provided to farmers for free, but with the condition that after the harvest, farmers were requested to pay a cash amount equal to 50% of the seed cost. However, most farmers did not do this. Therefore, farmers who participated in Dak Lak in the program are currently in debt of VND 500 – 600 million.
- In 1996 – 1997, an experiment of dry rice (rice is produced in the uplands) was carried out.

But attention to coffee

- Since 1993, the center also started to pay attention on coffee. A system was set up in which farmers who participated in trials had to pay back some investment costs after the harvest. Extension staff was made responsible for this. If farmers would not pay, the extension staff would have to pay it from their own salary. This was a reason for some conflicts between extensionists and farmers who were involved in trial experiments. This made it difficult for extensionists to put efforts on developing coffee and cacao.

Large number of trainees

- It is estimated that the number of trainees in the Center's training courses is about 10,000 persons per year, of which 30% are from ethnic minority groups. However, the number of farmers never taking part in a training course is unknown since the selection of trainees was made by the communes.

The budget for the Centre is provided by the Province. According to the province's Decision 352, the center is provided an annual budget of VND 700 million since 1998. Of this amount, VND 300 million is for staff's transport expenses and the remaining VND 400 million for experiments and training courses.

3 extension zones

Dak Lak province was split up in three zones. With zone 1 being the least developed zone with the poorest farmers and zone 3 the zone with the richest farmers. Farmers from zone I had to return 50 percent of trial investment costs, farmers in zone two 70% and farmers in zone three a hundred percent. Therefore, both extensionists and farmers in region I and II did not want to participate in any experiments.

Less experiments with perennials

Moreover, because it takes longer time to collect investment cost and higher risks in perennial crops, experimental models were usually implemented for annual crops.

In the last 4 years, more support has been provided by MARD to the Center. It receives a fund of about VND 1 billion per year for extension work.

Farmer clubs

Market information

No work on avocado

Since 2001 (after coffee prices dropped significantly), several changes took place in the extension strategy:
- Extension work is more focused on important crops/animals (for example: hybrid rice). For hybrid rice, farmers in regions III, II who strictly followed the technical instructions obtained an average yield of 7-8 tons/ha.
- The center has helped to set up farmer clubs. These clubs are equipped with a library of technical books, agricultural magazines, and provided with some budget/fund for collective activities.
- Participants in trials are usually club members. The center tried to recruit non-members in doing experiments but has not yet been successful.
- After the coffee price declined, farmers started to pay more attention on market price information of agro-products. In 2003, DARD planned to establish a center for trading promotion with the objectives of collecting and disseminating market information to farmers. However, the task was transferred to the Center for Extension due to the lack of permanent staff at DARD. At present, the center provides market information of 24 agro-products to communes once every 10 days. There is also a Center for Trading Promotion under Daklak Department of Commerce who is in charge of providing market information of jewelry items, construction materials but also of main agro-products. However, there is currently no information exchange between these two centers.
- Due to increasing demand for seedlings, a separate centre was setup: the Dak Lak Center for seeds and animal species.
- No work has been done on avocado

According to the director of the centre, the main constraints in the extension work are that:
- The Centre is represented at district level only, so not at commune level.
- Experienced extensionists at the district level are offered

administrative jobs and stop working

More emphasis on beef cattle and cacao

The director of the center gave us interesting information about provincial agricultural strategies. Since the decline in coffee prices the provincial strategy focused more on diversifying the income base of the province. For the period 2006-2010 more emphasis is on developing a beef cattle sector, enlarging the cacao area and cashew nut area.

As the demand for meet is increasing and animal husbandry currently only makes up only 10% of the total agricultural production. The government is investing into increasing the currently low beef productivity, by introducing higher productive varieties (Shind and Bradman).

The cacao and cashew nut sector is stimulated by providing farmers free seedlings.

5.2.6 Krong Ana extension centre

Since 2002 managed by district

The Krong Ana extension centre was established in 1994 and was part of the Dak Lak extension centre discussed in the previous section. Since 2002, the station's personnel has been managed by the District People's Committee. There are currently 3 permanent staff and 2 temporary staff who have an agricultural technical degree,

Training

Collect market information

The functions of the centre are:

- As an intermediate institute between state research organization, research institute, and farmers
- Implement technical training on animal husbandry, farming practices, and set up pilot models.
- Do service trading on rice and maize varieties
- Collect and provide market information of certain products.

Disseminate price info

No prices of avocado collected

Due to the increasing demand of farmers on agricultural product prices the station reported to the district and received guidance from the district. Cost for the information collection and supply is covered by the station. Since 2003, the station's staff collects price information of agricultural products on a weekly basis for rice, coffee, cashew nut, port, beef, and chicken, etc. Sources are the retailers in markets and sales agents of agriculture inputs. The market price report is printed and sent to communes. How farmers access this information at the commune level did not become clear. The market price of avocado has not been collected due to little demand.

Furthermore, the market report is also broadcasted on the district and provincial radio and posted on the website www.daktra.com of the Dak Lak Trading Promotion Center (under the Dak Lak Department of Tourism).

Technical training/consultancy:

- Several hundreds of farmers (living nearby the station) regularly come to the station to request for information of new varieties/species, new animals, or the latest production technology.
- On average, 100 training courses on farming and animal husbandry

technology are organized per year. There are approximately 30-40 trainees in each class. Out of 100 courses, about 30 are funded by the District People's Committee with the cost of VND 1.2-1.5 million per course. The rest is funded by other organizations such as the commune women's union, the farmer's union.

- An estimated 30% of farmers in the district never take part in any course.
- In the last 2 years, the number of training courses increased. The number of people coming to the station to ask about farming and animal husbandry production technology has also increased considerable.

With regard to the districts production plan the extension centre gave us the following information:

No development strategy for avocado

- In the district's 5-year development plan (2006-2010), there is no development strategy for avocado.
- The Extension Station also has not put avocado in the list of crops about which market price information is collected.
- The district's development policies (2006-2010) are to stabilize the coffee and bioseed area, to increase the livestock contribution to the agricultural GDP from 15% to 17% which focuses on beef cattle. It is expected to increase the number of cattle up to 16,700 by 2010 (based on the statistic data in 2004 of 1,400 beefs).

20% of 50,000 households grow avocado

With regard to avocado production the centre estimated that about 20% of the 50,000 households in the district are growing avocado. This results in a net area of 400 hectare. On average, each household grows 4-5 trees. The average yield is about 100 kg/tree.

The wealth classes composition of households in Krong Ana was estimated by the staff of the extension centre to be:

- Rich households: occupy about 5% of the total with the annual income of greater than VND 50 million.
- Moderately rich households: make up 35%; annual income: VND 20-40 million
- Average households: 40%; income: VND 10-15 million/year
- Poor households: 20%; income: below VND 10 millon/year

There is no difference between wealth classes and the number of grown avocado trees. Also the poor grow avocado trees.

5.2.7 Dak Lak Center for crop seeds and animal species

Plant variety collection

The main function of the centre is to collect plant varieties, animal species and to produce and trade seedlings and breeding animals. The Centre has 42 permanent staff and three experimental stations:

- Easo beef cattle farm with an area of 92 ha
- Hoa Xuan rice seedling farm: area of 30 ha
- Collective farm: area of 30 ha

Includes avocado since 2004

The centre has a plant variety collection (in the collective farm) which includes:
- 1 ha of cashew nut (since 1999)
- 2 ha of cacao (since 1999)
- 2,000 m2 of avocado (since 2004).

There are 5 cashew nut varieties and 5 cacao varieties that have been certified by MARD and introduced for production. In addition, 3 other cacao varieties have received a temporarily certification by MARD.

The center has a business connection with a seed company in the South and a high quality seed company in Hai Phong where it can get rice seed from to sell to farmers, as the center did not produce sufficient seeds themselves.

6 varieties of avocado

In 2006, the center has provided 60,000 cashew seedlings and 48,000 cacao seedlings for farmers in MaDrak and KrongBong under the financial support from the province. Besides, it also sold 420,000 seedlings of other crops such as lime and acacia.

Plans to sell avocado seedlings in 2007

The center currently has 6 avocado varieties, which were bought from WASI. So far it has not yet produced any avocado seedlings nor did it have a production plan for avocado seedlings, as there were little market demand.

However, the center expects to increase the collection garden of avocado to 1 hectare in 2007-2008 in order to supply rootstock and shoots and knots to farmers which they can graft. The interviewed staff estimated that approximately 20% of the coffee farmers are experienced enough to do grafting themselves.

The fruit tree for which the seedling demand is currently the highest in Dak Lak is the durian.

5.3 Seedling producers

From the previous section it becomes clear that quite some governmental organisations are involved in producing seedlings:
- WASI
- Eakmat Agro-forestry Consultant, Investment and Development Company
- The Dak Lak Center for Science and Technology Application
- The Dak Lak Center for crop seeds and animal species

Hardly any private avocado seedling producers

In addition to these public funded avocado seedling producers there are also several private sector seedling producers which sell avocado seedlings. But this number is very small as it seems that the demand for avocado seedlings is just starting to take off. We spoke with one private sector seedling producer. The main traded seedlings were coffee, durian, rambuttan and also some avocado. This seedling trader obtained the avocado seedlings from the Center of Science and Technology Application.

According to staff of the EACIDC the avocado seedlings produced by private seedling producers are often of low quality because they do not graft carefully selected varieties on the rootstock.

5.4 Agro-chemical input providers

As agro-chemicals do not play an important role in avocado production (so far) we only interviewed one agro-chemical retailer. The retailer had 12 years of experience in fertilizer and pesticide trade. Since 2000 she also started to trade in rice, corn and green bean seed varieties. In her district, Krong Ana, there is no one who is selling avocado seedlings.

The retailer's fertilizer trading history is as follows:

- In 1994, the amount of fertilizers sold was 10-20 tons/month, of which 40% for rice and 60% for coffee.
- In the period 1994-1998, the amount increased to 30-40 tons/month, due to increasing coffee prices.
- From 1999 till now it is about 30 tons/month
- There are currently about 20 retailers who trade in fertilizers in Krong Ana

Sells on credit

The retailer sells the fertilizers mostly on credit to the farmers with an interest of 1.5% per month (based on the market price). The retailer supplies about 60 farmers of which 20% pay immediately or pay in several batches. The other 80% pay the retailer after harvest. Some times farmers but the fertilizer on credit and than (in case of urgent cash need) sell it for a lower price to other farmers. Later the retailer finds it very difficult to get money back from these clients.

Before 2000, there were only five level 1 pesticide retailers in Krong Ana. In 2006, this number has increased to 20 level 1 retailers in the. These retailers hire technicians to discover pests/diseases and give advice which pesticides should be used. This is mainly done for rice.

Krong Ana retailer: no sale of agro-chemicals for avocado

With regards to pesticide trading, farmers normally pay directly after buying because the volumes and costs are rather small.

In order to trade in pesticides a retailer is required to have trading certification for pesticides and is trained about pesticides by pesticide companies

According to the retailer in Krong Ana, there have been no farmers who buy fertilizers and/or pesticides for avocado production.

5.5 Collectors

Collectors crucial role

Collectors play a crucial role in the avocado sector. They are responsible for harvesting the avocados from thousand and thousand of farmers, transporting and selling them to wholesalers. The number of collectors is very large, which we clearly observed during the field work. When we were in Phước An town – KrongPac district we counted between 9:00 – 11:00 on July the 4th about 100 collectors supplying avocados to the district wholesalers. During a focus group discussion with several of the collectors we were informed that in KrongPak district alone about 400 collectors were active.

Collector types

There are two types of collectors involved. Collectors who work year round as collector and farmers who only work as collector during the main avocado season. The collectors who work year round switch to other crops during the avocado off-season. For example coffee, pepper, jackfruit or custard apple.

A discussion with a wholesalers in Krong Ana district about collectors informed us that she was supplied by about 60 collectors, which she divided into 2 groups:

- Regular collectors who do business year-round, make up 80% of her suppliers, of which 10 are regular preferred suppliers and provide avocados on a daily basis.
- Farmers in the neighborhood who only work as collector in their free time after harvest (20%).

5.5.1 Sourcing

Sourcing from farmers

Collectors source directly from farmers. There are two different sourcing practices between collectors and farmers. In the most simple system a collector approaches farmer to buy the avocados either per kilogram of pays one amount for the whole tree. Good collectors can estimate "with their eyes only" quite precisely how many kilogram of fruits they can harvest from one tree. For trees which produce large fruits, of about 500 to 800 grams per fruit, collectors normally pay per kilogram after weighing the fruits.

Deposit system

The second method is a deposit system, in which the collector gives the farmer a first payment several months or even one year before harvesting. Collectors do this for trees which produce good quality avocados, or which produce during the off season. a first and requires is a long term relation between the collector and the farmer.

Avocado tree portfolio

In this way professional collectors develop a kind of "portfolio" of good avocado trees. This can add up to over hundred trees scattered over quite a large area.

5.5.2 Maturity index

When to harvest?

One of the most crucial skills which a collector requires is to determine the right moment of harvesting. As avocados only start ripening after they are harvested, it is not easy to see if an avocado is ready to harvest or not. If an avocado is harvested too early it will never develop into a well tasting ripe avocado.

Method of professional collector

The approach used by one specialised avocado collector is as follows:

- He visits his "contracted trees" once a week to check maturity of fruits approximately 4 months after flowering
- About 18 fruits are sampled from different portions of the tree and examined for their maturity level. Samples could be representative of various sizes: small, medium and large. Smaller fruits should not be underestimated in terms of maturity. Meaning that the size of the fruit

is not always a good indicator for the maturity level. Although, selling price is higher for bigger fruits of the same quality.

- Characteristics of matured or harvestable fruits or so called maturity index parameters:
  - Smooth surface texture
  - Dry skin covering the seed, peels off easily
  - Seed detached from the pulp (meso-carp)
- Destructive sampling methods (cutting open the fruits) are needed to see how the fruits score on the above mentioned maturity indicators
- After sampling the collectors has a good idea of the right harvest moment
- The harvest will be done usually in the early morning.
- Not all fruits of one tree are harvested on the same day, as not all fruits on the same tree have the same maturity stage. Immature fruits will be harvested on a later date at the end of the season, which often means that they can be sold for a higher price.

5.5.3 Harvesting

Harvesting methods: very rough

Collectors use several of the following harvesting methods:

- Shaking the tree until the fruits fall off.
- Using a picking pole and throw the fruit on a canvas sheet which lays on the ground
- Hang a canvas sheet in the air and throw avocadoes on the sheet
- Let a someone climb in the tree and use his hands or picking pole to harvest the fruits, after which the fruits are thrown down to someone who catches the fruits with an empty nylon bag which is stretched between two wooden sticks

In general the harvesting and handling methods are very rough and severely damage the fruits. It seems as if the collectors do not know what the impact of their fruit handling is on the final product when it arrives at he consumer. Often fruits fall from 5-10 meters high on the ground. Maybe because the fruits are still very hard at the moment of harvest, it is difficult to see direct damage.

After harvesting some very basic sorting takes place at the field, with the most damaged fruits being thrown out. The avocados are put in empty nylon rice or fertilizer bags after which they are weighed and transported in metal baskets which are constructed on two sides of the motorbike.

Normally collectors do not sort and grade, but just bring their collected avocados to a wholesaler either in the district or in Buon Ma Thuot. For collectors who sort the avocados the profit is much higher.

5.5.4 Margins

Margins & income

The margins and income which collectors can make from avocado trading depends on:

- Traded volume per day
- If the collector sorts and grades the avocados before he delivers them to the wholesaler
- Type of avocado: Bo Nuoc, Bo Mo or Bo Sap
- His fuel costs, which is determined by the travelled distance

Unprofessional collector can still make VND 112,000 per day

Traded volumes per day of a collector vary between 100 and 500 kilogram per day. There are also quite some differences in their margins. In Table 13 an example is given of a collector who buys mostly Bo Nuoc and who does not sort himself. Despite this, his margin is still considerable. As this collector only has enough cash to buy 200 kilograms per day, he can make VND 112,000 per day. The example in Table 13 is a professional collector who sorts his avocados and mostly buys Bo Sap and Bo Mo. This collector makes a margin of VND 725,000 per ton, which is also the amount which he earns in a day.

Table 13 Margin(VND/ton) for a collector who hardly sorts and who buys Bo Nuoc

- Purchase price (VND/ton)	500,000
- Transportation (VND/ton)	100,000
+ **Selling price** (VND/ton)	**1,160,000**
▪ 40% large size fruit (1,400/kg)	560,000
▪ 60% smaller fruits (1,000/kg)	450,000
Gross margin (VND/ton)	**560,000**

To calculate the net income for both collectors the depreciation and maintenance costs of their motorbikes should be deducted.

Table 14 Margin(VND/ton) for a professional collector who sorts

- Purchase price (VND/ton)	1,000,000
- Transportation (VND/ton)	100,000
- Harvesting cost (VND/ton)	200,000
+ **Selling price** (VND/ton)	**2,025,000**
▪ 5% special grade (3,500/kg)	175,000
▪ 15% grade I (3,000/kg)	450,000
▪ 60% grade II (2,000/kg)	1,200,000
▪ 20% grade III (1,000/kg)	200,000
Gross margin (VND/ton)	**725,000**

Box 1 Case study of a small avocado collector, Mr Y Drung

Mister Y Drung has been collecting avocado for the past five years during the main season. During the rest of the year he spends his time on coffee production. Y Drung currently also grows three avocado trees which have not yet produced fruits.

Case of a simple collector

Trading volume and source.

- His daily avocado turn over is 150 kg
- This is sourced from his village with mainly ethnic minorities
- According to Y Drung, there are in total 8 collectors, including himself, in the village who only collect avocados in the main season.
- Avocado is purchased per tree. Y Drung buys the fruits of 10 trees from 2-3 farmers, with an advance payment when the fruits are still small. His financial situation only allows him to buy this amount.
- He pays the farmers between 100,000 VND and 50,000 VND per tree, or 500 VND per kg as three of "his contracted trees" produce 200 kg per tree and seven produce 100 kg per tree.
- All avocados are "Bo Nuoc" and are collected from different trees and put all together into the same basket. No grading is done.
- In the first two years that he started, the avocados were bought per basket (made by the ethnic minorities), each weighed 5-6 kg. Since the last 3 years the collectors switched to buying per tree.
- In the last five years the avocado production remained the same, while the market prices doubled or even tripled.

Buying per tree: seems low price for farmer

Y Drung's customers:

- The two regular customers of Y Drung are Ms. Ba at the Duy Hoa and Sau To intersection at the Dak Lak bus station. In the past, Y Drung sold to these two wholesalers on an equal basis. However, he now chooses to sell most of his avocados to Ms. Ba. Although Y Drung can sell avocados for a higher price to Ms. Sau To, the distance to Ms. Sau To's shop is longer compared to Ms. Ba's shop, which makes it less profitable due to the increasing gasoline cost.

Selection of wholesaler based on travel distance

Avocado price

- Before 2003 Y Drung would buy avocados for VND 200 per kg and sold them for VND 500-600 per kg. Currently he buys for 500 VND/Kg and gets for the larger fruits about VND 1,400 per kg and VND 1,000 for smaller fruits.

Prices increased

Transactions

- Y Drung harvests the avocados at the farmers' field and brings them to the wholesaler's shops where he receives the cash immediately.
- Y Drung does not sort and grade and never stores the avocados at his house
- Because Y Drung does not have cell phone, the wholesalers usually make an order a day in advance. The price is set by the wholesaler, but Y Drung has never felt extorted.
- Y Drung said that the relation between him and the wholesalers has been good so far.

Good relation with wholesaler so far

Local government support and wishes

- There has been no support from the government so far with

Need for better avocado varieties

regards to avocado
- Y Drung has little knowledge about avocado prices, which makes it difficult for him to negotiate. But he does not seem to be concerned about this because he makes a nice profit already.
- He hopes to obtain higher quality avocado varieties so that he can establish an avocado orchard. Avocado is currently not under serious farm management and mostly grown for home consumption in Y Drung's village. Therefore he strongly believes in the future potential of the avocado sector

5.5.5 Problems & wishes

In general collectors do not seem to have many large problems. The most important ones which they mentioned were:
- Not enough working capital to place deposits
- Ants in the tree when harvesting
- A problem which is not perceived by the collectors themselves but which was easy to observe: the rough way in which the avocados are harvested and transported. This seriously harms the competitiveness of the Dak Lak avocado sector
- Some risks in advance payments for tree deposits, but this is not a serious problem
- Do not have information about prices in the final consumer market

A lot of collectors hope that high quality avocado tree varieties will become available and that there is a kind of quality guarantee system when seedlings are bought. Some collectors would like to provide their farmers with these high quality seedlings. They would further also like to learn more about how to cultivate avocados in a more professional way.

5.6 Dak Lak wholesalers

5.6.1 Types

Types

Based on our field work we can distinguish the following three different types of wholesalers:

Types

- BMT wholesalers: about 30 persons
- District wholesalers: about 126 persons
- Special wholesalers who have warehouses in Dak Lak and their own outlets in Hoc Mon and Tu Duc wholesale market in HCMC. We came across three persons of this type

District vs BMT wholesalers

The main difference between the district wholesalers and BMT wholesalers is that the district wholesalers often still collect a small share directly themselves from trees of farmers. In the past there were few district wholesalers and everything went through BMT wholesalers. But with improving infrastructure (roads, phones) and more interest in avocados, traders from other cities have started to source more and more directly from the districts.

5.6.2 Suppliers

The large majority of suppliers are collectors. During the main season large wholesalers have to deal with about 50 different collectors per day, while during the off-season they have to deal with 10 collectors per day.

Supplied by collectors

At first sight relations between wholesalers and collectors are only based on spot buying without any contracts. But most wholesalers mentioned that they have to take care to keep the relations with collectors good. Especially with good and regular collectors they almost never refuse to buy their stock even when they have already sourced enough that day. This assures them that the collectors also come to them during periods with avocado shortages.

Sorting, grading and packaging

Sorting is major effort

Most collectors bring the avocados to the wholesalers unsorted. After which the wholesaler needs to spend considerable time on sorting and grading of the avocados. During the main season it takes about 1 hour for three persons to sort 1 ton of avocado. Avocados are sorted on fruit size, shape, color and smoothness of skin. The maturity stage is not yet an important sorting factor, as the avocados arrive at the wholesalers in Dak Lak just a few hours after harvesting.

Several wholesalers indicated that they are not buying any unsorted avocados anymore, but only want to buy sorted avocados from collectors so that they can concentrate on trading in larger quantities of high quality avocados.

Wholesalers pack the avocados in 100 kg bamboo baskets, but also carton boxes, nylon bags, plastic bags are used. No cold storage facilities are used or chemicals to preserve the avocados.

After sorting and grading the avocado is transported to the Southern provinces on the same day of harvesting at around 17:00 and to the Northern Provinces, the next day at 5:00 am.

Rough handling of avocado, bad hygiene

Again we observed very rough handling of the avocados by the wholesalers. Bags are unloaded on a cement floor on which they are bruised. The floor is also often very dirty which will speed up al kind of bacterial rotting processes. Despite this the post harvest loss at the Dak Lak wholesalers after sorting and grading fluctuates around 5 %.

5.6.3 Transport

The main transport means to HCMC are trucks which can carry between four to ten tons of avocados. For the other locations passenger bus services are used, which can carry between 1 to 4 ton of avocados. But in the main season traders from other cities come with their own trucks and go especially to the district wholesalers to buy large volumes.

Motorbike on top of avocado baskets

Again the avocados are not taken well care of. We saw several buses with avocados (in bamboo baskets) on top of the roof , with little protection from sun, heat and rain. We even saw that a motorbike was put on top of the avocados. That bus had to go all the way to Hanoi (> 30 hours), so one can imagine what will happen with those avocados.

5.6.4 Volumes and destinations

Trade between 2-10 tons

In the main season, wholesalers trade between 2-10 tons of avocado per day. In the off season this figure is about 0.2 to 1 ton per day. A big influencing factor on the daily turnover is the weather. As avocado is mainly used for making avocado shakes, hot weather will substantially increase the demand for avocados, while a rainy day considerably decreases the demand for avocados.

Over 35 destinations for Dak Lak avocado

Dak Lak wholesalers are already shipping avocados all over Vietnam. In Table 15 an overview is given of all the destinations mentioned by the Dak Lak wholesalers as where they have a regular buyer of their avocados.

Export link to China?

HCMC is by far the most important destination, with an estimated 30 percent of all avocados exported from Dak Lak, but the other 35 destinations should not be underestimated. What was very interesting, was that one wholesaler sold to a trader in Haiphong who exported the avocados to a trader in China. This might be an interesting link to follow up to see if China could be an interesting market.

Table 15 Destinations of Dak Lak avocados as mentioned by Dak Lak wholesalers

All over Vietnam

HCMC	Thuy Hoa	My Tho	Duc My
Hanoi	Ben Tre	Dong Thap	Nghe An
Danang	Tay Ninh	Tien Giang	Ninh Tuan
Nha Trang	Long Khanh	Vinh	Hue
Can Tho	Quang Nhai	Binh Dinh	Tra Vinh
Cam Rang	Haiphong	Buon Ho	Rach Gia
Quy Nhon	Hoa Khanh	Phan Tiet	
Khanh Hoa	Ninh Bình	Tuy Hoa	
Binh Phuoc	Quang Nam	Phan Rang	
Phu Yen	Binh Thuan	Phan Ri	

Figure 15 Passenger bus BMT-Hanoi with avocado baskets on the roof of the bus and on top of the baskets a motorbike

Box 2 Case study of Ms. Lan, district wholesaler in Phuoc An town, Krong Pak district

District wholesaler with main client in Nha Trang

Ms. Lan sells avocado to a wholesaler in Nha Trang. She trades in various agro-products such as gingers, wax gourd and durian to Nha Trang. Her buyers in Dam market (Nha Trang) prefer to buy Daklak avocados instead of the Dalat avocado. Currently she is transporting her products to Nha Trang by a truck which is taking cement to Dak Lak. She often accompanies her products to Nha Trang on a daily basis.

She mainly buys avocado from collectors. She buys all kind of avocados but prefers the big avocado with green skin and yellow flesh. Payment is made in cash right after delivery at store.

There are about 3 big wholesalers making business around the bus station of Phuoc An town. The average volume of avocado traded is around 10 tons/day/wholesaler in the high season. There are 7 wholesalers existing in Phuoc An town.

The buying price of avocado for wholesalers ranges from VND1,400/kg to VND 4,000 per kg, based on the smoothness of the skin and size of avocado.

Actors	Buying (vnd)	Selling (vnd)	*Remarks*
Krong Pak district wholesalers			
> 800gr	4.000 – 4.500	4.500 – 5.000	5% total volume
500gr > 800gr	3.000 – 3.500	3.300 – 4.000	About 15% of volume
300gr > 500gr	1.900 – 2.800	2.000 – 3.000	About 60% of volume
< 300gr	800 – 1.400	1.200 – 1.500	About 20% of vomue
Krong Pak district collectors			
- Buy whole tree	1.000	800 – 2800	Tree with fruits < 500gr/each
- Buy by kg	1500 – 3000	3000 – 4500	Tree with fruit > 500gr
Tarders in Nha Trang			
> 800gr	4.500 – 5.000	7.000 – 10.000	
500gr > 800gr	3.300 – 4.000	5.000 – 6.000	
300gr > 500gr	2.000 – 3.000	4.000 – 5.000	
< 300gr	1.200 – 1.500	2.000 – 3.000	

Marketing cost covered by the buyers in Nha Trang:

- Transportation cost: VND120.000/ton
- Nylon bag : VND2.500/65kg
- Bamboo basket : VND5.000/basket/100kg
- Paper or carton sheet : VND2.000/basket/100kg
- Loading charge : 1.500đ/for a 65 kg bag or 3.000đ per 100 kg basket
- Unloading charge : 6.000đ/bag and 10.000/100 kg basket
- Market fee : 3,000/bag or 5,000/basket

5.6.5 Buyers

The buyers of the avocados are mostly wholesalers in other cities. Although some BMT wholesalers also supply large retailers, food catering business and supermarkets. On trader in BMT supplied for example the Big C, Dam Sen park and Suoi Tien tourism area in HCMC.

The highest quality avocados are shipped to the largest cities. Especially Hanoi is supplied with high quality avocados. Market preferences mentioned by wholesalers are:

Market preferences

- Large size avocados, more than 300 gram per fruit
- Bo Sap or Bo Mo
- Long shape
- Smooth skin

- Shiny green colour
- Creamy yellow flesh

But rough skin avocados can have fantastic taste

A few district wholesalers mentioned that in their experience especially the avocados with a rough skin have fantastic taste. But because of its rough skin the market does not appreciate this avocado very much.

Orders are normally placed by phone, two or three days in advance. Payment takes place through a bank transfer or through the transporter who brings back cash after he has delivered the avocados to a buyer.

Blacklist for buyers who do not pay

These transactions rely on trust as no contracts are made. Sometimes buyers do not pay, but this does not happen often. If a buyer does not pay, his/her name ends up on a kind of informal blacklist among BMT wholesalers of non paying buyers. As most wholesalers in BMT are located very close to each other, the information of someone who does not pays is quickly passed on to warn each other.

5.6.6 Margins

In Table 16 and Table 17 the margins per ton for a district wholesaler and BMT wholesaler are presented. In the margins no transport and packaging costs are presented as these are paid by the receiving party.

District wholesalers buy at lower prices

District wholesalers make a better margin because the buy at lower prices. If collectors deliver to BMT wholesalers they have to travel further and want higher prices. District wholesalers seem to be closer to the source.

BMT wholesalers have lower margin but through higher turnover more income

BMT wholesalers follow a strategy of small margins but large volumes. If we look at the final income they earn more than district wholesalers as BMT wholesalers often trade about 10 tons per day, while district wholesalers are more in the range of 2-5 tons per day.

Table 16 Margins on 1 ton of avocado for a district wholesaler

Purchase price (1 ton)	**2,025,000**
+ 5% special grade (3,500/kg)	175,000
+ 15% grade I (3,000/kg)	450,000
+ 60% grade II (2,000/kg)	1,200,000
+ 20% grade III (1,000/kg)	200,000
Selling price (1 ton)	**2,460,000**
+ 5% special grade (4,500/kg)	225,000
+ 15% grade I (3,300/kg)	495,000
+ 60% grade II (2,500/kg)	1,500,000
+ 20% grade III (1,200/kg)	240,000
Loss (2%)	**123,000**
Gross margin	**385,800**

Table 17 Margins on 1 ton of avocado for a BMT wholesaler

Purchase price (VND/ton)	**3,200,000**
+ 20% grade I (4,500/kg)	900,000
+ 60% grade II (3,500/kg)	2,100,000
+ 20% grade III (1,000/kg)	200,000
Selling price (VND/ton)	**3,400,000**
+ 20% grade I (4,700/kg)	940,000
+ 60% grade II (3,700/kg)	,220,000
+ 20% grade III (1,200/kg)	240,000
+ Loss 2%	**68,000**
Gross margin (VND/ton)	**132,000**

Box 3 Case study of a Buon Ma Thuot wholesaler

Experienced wholesalers case study

Brief information

This traders has 14 years of fruit trading experience with avocado, custard apple, ginger and banana. Avocado is the main product and is traded year around. The main season for avocado is from April to August. The traders employs 3 to 4 employees and also involves 3 family labors in the main season.

History

Started in 1991

The family came to BMT in 1991 and started trading. At first they waited for traders from other provinces to come to their store. From 1994 they became more active themselves and started to visit wholesale markets in many cities to find clients. This expanded the avocado trade considerably and the trader has now year round customers in HCMC, Danang, Hanoi and Haiphong. The daughter of the trader, has an education from HCMC university in Business Administration and good language skills. She wants to expand the company by getting more retailers (supermarkets) as clients in HCMC, Hanoi and Danang.

Trading volume and sources

In season 10 ton/day

In the main season (June, July, August), the turnover of avocados is around 10 tons/day. The trader said he can purchase even 20 -30 tons/day if available, because he has market already. During the off season (February-March and October- November) the turn over ranges from 200 kg to 1 ton/day.
The supplying areas are within a radius of 100km, including Dak Min, Viet Duc, and Cu'Mgar. According to his experience, VietDuc's avocado has the best quality. At this moment the trader buys unsorted avocados after which they do sorting and grading.. He prefers big and smooth skinned, shiny fruits.

A few years ago the quantity of supplied avocado was limited year round, with mainly small fruits. However, the supply has increased in last two years because of the increasing demand in the North and the South West. He thought that the supply also increased because of farmers' success in grafting avocado which helps to increase yields and produce big fruits.

Supplier/Collector

The majority of the suppliers are collectors. Only a few of them are small truck drivers and farmers. In the main season there are about 100 collectors per day, while only 10-20 collectors/ day in off season.

Buyers

The buyers are wholesalers from Hà Nội, Hải Phòng, Sài Gòn, Bến Tre, Ninh Bình, Thái Bình, Bình Thuận, and some South Western provinces. None of his

Has buyers all over VN

Link to China

customers are retailers or direct consumer. Avocados are transported to wholesale markets in Ha Noi and HCMC regularly year around. One customer of in Hai Phong purchases 500 – 700 kg avocado/day for export to China. Avocados for the Hanoi and HCMC market should be “Bo Sap” with yellow flesh and large size (2 fruits/kg). Avocados supplied to Hanoi usually have higher quality (big size, smooth skin) compared with those going to Southern provinces. Low quality avocados are supplied to Quang Nam and Quang Ngai. The main constraint in the long distance transportation to Hanoi is the high percentage of loss (20-30 %) due to rot or bruises.

Buying prices from collectors

Season	Type		
	I	II	III
Off –season	15.000	15.000	15.000
Main –season	3.000-5.000	1.500-1.600	500

Small margin

At the moment of the interview the selling price is currently VND 100-200/kg higher than the buying price. The price is influenced by fruit size, color, shape, and skin. For example: the long shape, smooth skin, and green color fruit is sold with higher price compared with the small and round shaped one. The price off season avocado is remarkably higher due to small volume/supply and good quality. In the main season, the price decreases due to larger volume.

Transactions

The avocado is collected and packed in his own warehouse for transport to elsewhere. The orders are place by telephone and payment is made either through banking transfer (one transfer per 2-3 transactions) or by cash (once per week). There is no formal contract, the business is done based on mutual trust.

Constraints and opportunities

- The main constraint in avocado trading is the limited quantity in the off season when the price is much higher
- More markets are available, especially those in the Northern part of Vietnam and overseas. Therefore, the trader wishes that more high quality varieties of avocado is available year round so that he can produce high quality avocado in all four seasons. He also wishes that a farmer cooperative is formed with whom they can export avocado.

5.6.7 Problems and opportunities

Low supply in off season is main constraint

Problems:

- The main problem mentioned by all wholesalers is that they would like to receive more volume in the off season, especially in the November – February period
- The share of large green shiny avocadoes (Bo Mo) supplied is too small
- More quality problems (stem end rot) on rainy days
- Daily market demand volatile and depends on the weather
- District wholesalers complain about the bad roads in the rainy season making it difficult to get the avocados from the field to the stores of the wholesalers
- Difficult to get truck transport on “unlucky days”

Market demand is growing, esp. in North VN

Opportunities
- The market demand for avocado is increasing
- Traders see a bright future for avocado. They believe that especially in the North of Vietnam the avocado market could be developed much more. The potential for the Hanoi and Haiphong market is large and not yet met

Wishes/solutions:
- Traders would like the government to assist to find more domestic anf foreign markets for avocado
- Make improved varieties available

5.7 HCMC wholesalers

5.7.1 Overview

In main season 100 avocado wholesalers in HCMC

The main wholesale markets in HCMC are Tu Duc and Hoc Mon. During the main season the number of wholesalers trading in avocados at these market can be as high as 100. In the two wholesale markets there are about 15 to 20 wholesalers who trade avocados year round. During the main season at least 100 ton per day of avocados is traded on the main wholesale markets of HCMC.

Dalat becomes main supplier when Dak Lak is in the off season

The main supply areas for the HCMC wholesalers are Dak Lak, province), Dak Nong, Long Khanh (Dong Nai Province) and Dalat (Lam Dong Province). During the May-August period Dak Lak is the main avocado supplier, from September to October Dalat becomes the most important supplier, In November and December the supply of avocado is very limited. From January to April, Longkhanh becomes an important supplier. Traders consider the avocados from Dalat to be the lowest quality, mostly Bo Nuoc.

The sales are mainly in HCMC and to the Southwestern and Central provinces. The avocados sold for the HCMC market are mostly sold to retailers, while the avocados sold to other provinces are bought by wholesalers.

The demand for avocados has increased over the past decade. More experienced traders reported that their avocado sales have increased fivefold over the past decade.

5.7.2 Sorting & grading

Sorting speed from 60 kg per hour to 160 kg per hour

The sorting and grading of the avocados is the most labour intensive task of the wholesalers. They normally employ about 3 to 4 staff who are working full time on sorting and grading. One wholesaler who sorted and graded the avocados at a very detailed level, he claimed at sorting them per tree, said that one person can sort about 450 kg per working day (or about 60 kg per hour). This wholesaler was really special as we saw ourselves how beautiful the avocados were sorted and graded, in maybe 20 different selections. Other wholesalers who are less precise mentioned that it takes 2 labourers 2 days to sort 5 tons, so about 160 kg per hour per person.

Different maturity levels

HCMC wholesalers prefer to receive avocados of different maturity levels. Such as avocados which are ready to eat, ready to eat the next day and ready to eat after two days. They now have to create such classes themselves.

Sort again and again….

Although the wholesalers in Dak Lak have done sorting and grading, the HCMC wholesalers can start all over again because the avocados have ripened unequally. Also the damages and bruises after harvest will only become apparent after the avocados have started to ripen. Mistreated avocados and avocados which have been exposed to poor sanitary conditions will start to rot.

Bo Nuoc or Bo Sap? That's the question

One important issue is how to distinguish Bo Sap and Bo Mo from Bo Nuoc. Bo Sap avocados are sold for a higher price, but it is very difficult to see from the outside if an avocado is Bo Sap or Bo Nuoc. Only very experienced traders can do this, and even they will sometimes be wrong. One trader estimated that he was only right in 70% of the cases. Certainty can only be obtained by cutting the avocado open. Some traders make use of this by mixing Bo Nuoc avocados with a batch of Bo Sap avocados and selling them all as Bo Sap avocados.

Missed chance to export to Taiwan

This lack in uniformity in maturity, varieties and many damages causes wholesalers to spend a lot of time and efforts on sorting and grading. Time which could have been spent on trading. One wholesaler, for example, told us that he was approached by a trader from Taiwan to export avocados. But he did not dare to take this business opportunity because of the heterogeneous quality supply of avocados.

Box 4 Case study of a avocado wholesaler in Hoc Mon market

Trader with store in Dak Lak and in HCMC

Ms. Thao is an avocado wholesaler in the Hoc Mon wholesale market in HCMC. She sources her products from her families district wholesale store in EaHleo, Dak Lak district. The store in Dak Lak sources avocado once every 2-3 days with a volume of 5-6 ton, of which 30% comes from farmers and 70% from collectors. Besides the volume transported to Hocmon, Thao also sells about 2 tons every 2-3 days to other provinces, directly from EaHleo.

Farmers do not take enough care when they harvest

Thao's family buys avocados from 70 people per day, of which 20 are farmers and 50 are collectors. The price her family pays for collectors is usually VND 200/kg higher than for the avocados from farmers. This is because collectors calculate their cost of labor in harvesting and collecting, and gasoline. Only mature avocados are accepted. Low quality fruits are returned to farmers/collectors. Thao is unsure what they do with the returned fruits, perhaps they sell them to other wholesalers/retailers, or use them for home consumption or animal feed. The returned amount is about 20% for farmers and 5% for collectors. Thao recommends that farmers take much better care of harvesting so that they can reduce the amount of bruised fruits. Moreover, if the supplying service is improved (faster), it would help increase the business. She is willing to pay a higher price for sorted and packed fruits.

Four years ago, 20% of the avocado was bought from collectors and 80% directly from farmers. But as 50% of the fruits harvested by farmers were bruised due to the way they harvest (shaking the tree). Since than the harvest is mostly done by collectors who have better harvesting skill, so that they get better quality fruits.

Avocado collection is done in two days and transported to HoC Mon on the third day. Avocados are classified according to fruit size into three classes:

Class I: VND 5,000/kg (3 fruits/kg)
Class II: VND 4,000/kg (4-5 fruits/kg)
Class III: VND 3,000/kg (6 fruits/kg)

An amount of 5 tons is sold out in 2-3 days. Classification is done twice a day. Each time takes 4 hours with two laborers. It takes about 16 hours to do the classification for 5 tons of avocado for two persons. The buyers of ripe fruits should sell them within a day. Some buyers get both ripe and green fruits and bring them to the retail market for selling. Thao sells to about 30-40 retailers per night. Each buys around 30 kg and four to five clients who buy 200 kg/each.

Thao has been in the avocado business for four years. The first year she did traded in Ea Hleo and the last three years in Hocmon. She rents a shop in Hocmon market in the main season from April till August. After this period, when the amount of avocado is rather limited, Thao goes home to Ea Hleo in Dak Lak to assist her family with off-season avocado trade. She also collects avocado in Ea Hleo to sell to Hanoi and HCMC businessmen. The profits which she gets during this period is quite high.

Weather in 2006 worse then 2005 → turn over lower

Thao said that so far the avocado consumption in 2005 was higher compared to 2006. In 2005, she sold a truck of 5 tons in one days in stead of 2-3 days this year. According to her, the main reason for this is that the weather was warmer in 2005, which stimulates people to consume more avocado (since avocado is a so called "cooling fruit"). In this year there was also more rain, which has a negative impact on the sales. Although avocado is known as a healthy fruit, consumers do not know many ways of preparing avocado except for making a fruit shake.

Post harvest losses in off season 20% in main season 4-5 %

The post harvest loss due to bruising is about 1 out of every 5 tons during the early season, so about 20% and 200 to 300 kg per every 5 tons during the main season (4-5%). These fruits are usually thrown to the street. Some people come and select the some less rotten fruits to bring home (purpose is unknown). The remainder will be collected by the Urban Environment Company to make compost. In the main season, the main reasons for the post harvest losses are bruising during harvest and transport. During the early season the losses are caused by to early harvesting.

Ripened avocados with a bad appearance are sold to vendors for a low price of VND 1,500/kg. The five tons of avocado are usually sold to the following buyers:

- Type I (big size): buyers are collectors for retail shops (1.5 tons)
- Type II (medium size): buyers are retail shop owners (2 tons)
- Type III (small size and damaged): the buyers are hawkers (1.5 tons).

Re-use of Baskets

A basket of avocado costs VND 10,000. The basket can be reused 4-5 times more if being collected and transported back to Thao's store in Dak Lak. However, Thao does not have a transport vehicle to bring these baskets back so she uses them only once. A foam box also costs VND 10,000, but it can not be used since it stores the heat and makes the avocado rot.

Post harvest experiences

According to her experience she uses the following methods to ripen avocado faster:

- Put banana in a box with avocados
- Wrap the avocado with banana leaves, avocado leaves or paper.
- Cover the avocados with a cotton blanket
- Make the avocados wet

In order to prevent avocados from ripening, she puts avocado in a well air circulated place. Normally an avocado batch of 5 tons transported from Dak

Lak to her store in Hoc Mon, ripens in the following way:
- One ton ripens in the first day
- Two tons in the second day
- The remainder ripens on the 3rd day.

5.7.3 Post harvest losses

Despite the fact that the avocados arrive relatively quick after harvesting in HCMC, harvested in the morning and arrive in HCMC at mid night, post harvest losses are considerable.

Wholesalers with own store in Dak Lak have lower post harvest losses

During the main season HCMC wholesalers have to throw away 5 to 10% of the avocados which they buy, while some wholesalers even report losses of 20 to 40% during the main season. There seems to be a relation between the way of sourcing and the post harvest loss. Wholesalers in HCMC who have their own store in Dak Lak province, report much lower post harvest losses than wholesalers who order from wholesalers in Dak Lak.

High losses in off-season

During the off-season post harvest losses are much higher. Even the wholesalers with their own stores in Dak Lak report figures of more than 20%. The main reason for these high losses is that fruits are harvested while they are still immature, as the collectors want to profit from the high off-season prices. Immature fruits will shrivel and fail to ripen.

Stem end rot

Wrong harvesting technique

One important reason for the high percentage of stem end rot, which was observed by our post harvest team member, was that most avocados are harvested without the stem. This allows an easy entrance of microbial infection at the top of the avocado. If the farmers and collectors would leave a stem of about 1 cm, a lot of problems would be prevented. This relation was not mentioned by the wholesalers, they only noted that stem end rot during rainy days was a bigger problem. In general stem end rot should only be a problem with immature harvested fruit.

5.7.4 Margins

How to prevent VND 400,000 post harvest loss per ton?

An example of the margins made per ton of avocado during the main season by a HCMC wholesaler is given in Table 18. Margins of HCMC wholesalers are about the same as Dak Lak district wholesalers and they trade about the same volumes. In this example we used a post harvest loss of 10%, but we could have also easily used 20-30%. So getting better quality avocados with lower post harvest loss rates should save a lot of costs to wholesalers. Dak Lak collectors and wholesalers can at least spend VND 400,000 per ton on a solution which will result in better quality avocados. This was also indicated by the wholesalers. They are willing to pay a higher price of this reduces their post harvest losses.

Table 18 Margins for HCMC wholesalers

Purchase price (VND/ton)	**2,950,000**
+ 5% special grade (5,000/kg)	250,000
+ 15% grade I (4,000/kg)	600,000
+ 60% grade II (3,000/kg)	1,800,00
+ 20% grade III (1,500/kg)	300,00
Marketing cost (VND/ton)	**475,000**
- Transportation HCMC	300,000
- Packaging:	
+ Basket (3000/basket/100kg)	30,000
+ Carton (2000/basket/100kg)	20,000
+ Packing charge (2000/basket)	20,000
- Loading charge	15,000
- Unloading charge	40,000
- Shop rental (3 mln/60 ton/month)	50,000
Selling price	**4,150,000**
+ 5% special grade (10,000/kg)	500,000
+ 15% grade I (7,000/kg)	1,050,000
+ 60% grade II (3,500/kg)	2,100,000
+ 20% grade III (2,500/kg)	500,000
+ Loss 10%	**415,000**
Gross margin (VND/ton)	**310,000**

Wholesalers mostly sell to retailers, normally to about 30 to 50 per night. Some wholesalers give their clients the opportunity to bring back avocados the next day if they appear to be rot within 8 hours after they have been bought. They will be replaced by fresh avocados.

5.7.5 Problems and opportunities

Problems:

- Not enough supply of avocados in the October – March period
- High post harvest losses, especially in the off season
- More quality problems (stem end rot) on rainy days
- Traders have no knowledge of how to store avocado
- Fruits of small size accounts for large percentage of the supplied volume
- Consumption depends a lot on the weather
- Difficult for wholesalers to control the quality, accept for the traders with stores in BMT and in Tu Duc.
- Quite large share of immature fruits
- Supply of very heterogeneous batches of avocado which requires a lot of efforts from wholesalers to sort and grade.
- Difficult to distinguish between Bo Sap and Bo Nuoc
- The demand depends a lot on weather which makes the business very volatile
- Traders would like to export but need more homogenous supply and assistance in export procedures.

Opportunities:

- Consumer awareness in Southern Vietnam of avocado is still low. Traders expect that the demand can still increase a lot. Ten years ago the traded volume was 20% of the traded volume of today
- Wholesalers are willing to pay a higher price for a supply of homogenous avocados and even willing to pay for carton box packaged

avocados.

5.8 Wholesalers Hanoi

5.8.1 History

Start avocado trade Hanoi in 1995

The first wholesaler in Long Bien started buying avocado in 1995. She started to transport the avocados by train, than by plane (until 1998) and since 1998 by bus. By bus it takes about 30 hours to transport the avocados from Dak Lak to Hanoi. The number of wholesalers in Long Bien market, trading in avocados increased from three in 1998 to six in 2005. All wholesalers preferred Dak Lak avocado above Dalat avocado, because the Dalat avocado mostly consists out of Bo Nuoc. Bo nuoc is considered to be less tasty and rots easier. All wholesalers combine the trade in Avocado with the sour sop fruit, as the avocado shake is often mixed with sour sop.

In Long Bien market 7 ton per day

The daily traded volume increased from just 0.5 ton per day in 1995 to 7 ton/day in Long Bien market. Avocado is now also spreading to provincial areas with new demand from Northern Provincial wholesalers (Quang Ninh, Nam Dinh, Thai Binh, Phu Tho etc.). In last two years the prices of avocado increased with VND 2000 per kg because of higher transport cost and increased consumer demand.

5.8.2 Sourcing & Selling

Flesh seed ratio

Wholesalers in Hanoi mostly source from wholesalers in Buon Ma Thuot. Some Long Bien wholesalers invested in a trip to Dak Lak one time to build a relation with a wholesaler in BMT. According to the Hanoi wholesalers, consumers prefer Bo Sap Dak Lak with a long shape as they believe this has the best avocado flesh/seed ratio. But one wholesaler thinks that round-shape fruit ("bo bong den") has a better flesh seed ratio In addition the wholesaler has the experience that long-shape fruit is damaged sooner as its head often rots before the lower part becomes ripe .

An estimated 60-70% of the avocados is bought by juice café's and canteens, 20% by households, 10% by restaurants and 10% by wholesalers from other provinces.

5.8.3 Post harvest losses

30% with stem end rot, 10% totally wasted

Normally about 30% of the avocados bought by the Hanoi wholesalers have stem end rot. These avocados are not thrown away but sold at a 70% or 80% lower price than what the Hanoi wholesaler paid the Dak Lak wholesaler. About 10% of the avocados are completely wasted and have to be thrown away. During the off-season this can even be 50 percent.

5.8.4 Margins

Loss of VND

Hanoi wholesalers make a nice profit with trading avocados. There should be an important incentive to reduce the quality and post harvest losses. In total the benefit foregone of selling 25% of one ton for just VND 7,500 is

2,395,000 per ton due to post harvest losses

(instead of VND 13,000) about VND 1,375,000 per ton, including the VND 1,020,000 of wasted avocado, Hanoi wholesalers could gain VND 2,395,000 per ton if better harvesting, storage and transportation practices would be applied.

Table 19 Margins for Hanoi wholesalers

Purchase price (VND/ton)	**7,500,000**
Marketing cost (VND/ton)	**1,100,000**
- Transportation	1,000,000
- Packaging	100,000
Selling price (VND/ton)	**10,200,000**
+ 25% stem end rotted fruit (7,500/kg)	1,750,000
+ 65% good quality (13,000/kg	8,450,000
+ Loss ratio 10%	**1,020,00**
Gross margin (VND/ton)	**580,000**

5.8.5 Problems & opportunities

Problems:

- High post harvest losses, in the main season about 10-25% and in the off-season about 25-50%
- "Can not control the quality at source", so Hanoi wholesalers depend a lot on wholesalers in BMT
- In rainy weather avocado rots more easily
- Daily demand very much related to the weather.
- Because of long travel time, orders have to be placed 3 days in advance. This makes it difficult to know what the weather is and order the right volume

Opportunities:

- Consumers in the North are now more interested in new experiences, try "exotic products"
- Still a huge growth potential in avocado consumption in the North
- Off-season market, prices increase to even VND 25,000 -30,000 per kg

5.9 METRO Cash & Carry

Background

In VN since 2002

Metro Cash and Carry is one of the largest modern distribution companies in the world, the 4th largest after Wallmart and Carrefour. METRO is a modern wholesaler and started to operate in Vietnam in 2002. It currently has 6 stores and will open the 8th store by the end of 2006.

Sourcing

Trading avocados since 2002

METRO has been trading avocados since 2002. DaLat is the main and only avocado supply source to Metro. The fruit and vegetable buyer of METRO did not know that the Daklak avocado is of very good quality and big size.

Source all avocados from Dalat

According to him, Metro buys avocados from Dalat because:

- Dalat is a famous area for temperate vegetables and fruits. Most of consumer favor the products from Dalat because of its good reputation
- Metro has a warehouse in Dalat which they can also use for avocado.
- They identified a collector in Dalat (Ms. No) who is able to supply avocado all year around and who is experienced in selecting the "Bo Sap" variety.

Volume and Seasonality

Daily demand 250 kg

The daily avocado demand by Metro is about 250 kg. The wastage percentage is about 20%, mostly caused by stem end rot. The various avocado supply areas from Dalat are:

- Main season (July – October) : Cau Dat – Lam Dong province
- Off-season :
    - March – April: Lac Duong
    - May : Lac Lam
    - January : Lien Khuong

In the main season, the Metro stores in the South (4) import avocados from Dalat, but the Metro in Hanoi and Haiphong import avocado from Daklak through the wholesalers in Long Bien market. In the off-season the Metro fruit and vegetable platform in the South send avocados to Metro in Hanoi and Haiphong by air.

Requirements

In order to supply avocado to Metro the following specifications should be met :

- Avocado should be Bo Sap
- Homogeneous size – 250 gram per fruit
- Smooth skin
- Several different maturity levels in a batch of supplied avocado (ready to eat, ready to eat after 1 day, ready to eat after 2 days)
- Year round supply

Quite small fruits

Price

- Buying price : VND6,500/kg
- Selling price : VND8,500/kg

Transportation

Through cold storage trucks together with the vegetables

Logistics

- Harvesting by farmer in the morning
- Transport to the collector in Dalat (Ms. No) at 3pm
- Stored to ripen within 24 hours to 48 hours by Ms. No
- Delivered to Metro at Metro Fruit and Vegetable platform, from which they are transported to the various METRO stores
- Sold in the METRO stores, normally can only be kept for 3 days The unsold fruits are thrown away when they have not been sold

Dak Lak samples

The team brought a box with Dak Lak avocado samples. Mr. Tam, farmer and member of the avocado team, gave an explanation of avocado varieties and cultivation in Dak Lak. The METRO staff were positive about the taste of the avocados and the large size.

In store check

- The avocados from Dalat do not look as good as the avocados from Daklak. Many of them were harmed and had many black spots.
- The two randomly tested avocados were Bo Nuoc, while they were advertised as being Bo Sap.

5.10 Exporter

Could not find avocado exporter

We did not come across a trader or company which exported avocados from Vietnam. Only through a wholesaler in Dak Lak did we hear of a trader in Haiphong who exported avocados to China.

To get an idea of the export potential we interviewed a successful professional fruit export company in HCMC named: Bao Thanh (see for more info: http://www.ticay.com.vn/english/introduction.html). Bao Thanh exports fruits under the brand name Ticay[15].

High end market

Bao Thanh targets the high end export markets which require high quality, reliability, consistency and high food safety levels. Its target markets are North America, Europe and within East Asia, Japan and Korea. Other Asian countries care less about quality and focus more on low prices.

Success with dragon fruit

The main export product is dragon fruit of which Bao Thanh exported for a value of US$ 2 million in 2005. Its ambition is to export 50,000 ton of dragon fruits in 2010 with a total value if US$ 25 million. Bao Thanh was very keen to obtain EUREPGAP for its suppliers and invested US$ 40,000 in it. Bao Thanh even set up an tracking and tracing system which is completely web based. But when 80% of all EUREPGAP requirements were met, his preferred suppliers pulled out. This severely harmed the trust which Boa Thanh has in farmers.

The company now targets to produce the dragon fruits itself. It has setup a pilot of 10 hectares and wants to expand it to 1,000 hectares. Several international supermarket chains are busy to cooperate with Ticay to introduce dragon fruit to their stores in Asia.

In the past approached for avocado

With regards to avocado, Ticay was approached 3 years ago by traders from Singapore who wanted to import avocados from Vietnam. At that time Ticay checked the avocados in Dalat, but these did not meet the requirements of the Singaporean traders as they wanted to have avocados with a rough skin, not a smooth skin. At that time Bao Thanh did not know that Dak Lak had such a large avocado sector and did not check the avocados there.

Need more information

Before getting involved with any product Bao Thanh wants to know which varieties are grown, in which volumes and in which period. They further want the products to be traceable and want to know what the farmers have been doing.

[15] Ti cay means fair and trustworthy in Vietnamese

Start with domestic network first

The Bao Thanh director mentioned that they had offered the GTZ program before to setup a domestic distribution network for selling the improved products coming out of the value chain products. His ideas was to set up three to five shops in the major cities and start to trade in the value chain project products. So for example avocado, litchi, vegetables etc.

Based on this experience and the professionalism of the suppliers, Bao Thanh can than start to export products from suppliers who proved to be able to handle the responsibility.

5.11 Retailers

Three different types of retailers who trade in fresh avocados were identified:

- Supermarkets, f.e. the Saigon Co.Op mart, total volumes are still very small
- Those who have a permanent stall in the wet markets with a shelf to display their fruits. They often trade avocado of the best quality.
- Hawkers who often trade avocadoes of lower quality.

Very important are avocado shake shops

Another important channel is the food catering sector, of which fruit shake café's are by far the most important for avocados. Also restaurants buy avocados which they use for salads.

Most (smaller) retailers go to wholesale market and select the avocados themselves, they often do not have a relationship with a wholesaler. Some retailers place orders with wholesalers about the quantity, fruit size and maturity level. These retailers often send someone to the wholesaler to pick up the order and check the selection.

Avocado retailing mostly takes place in the morning, but depending on the weather and success of the sales in the morning, retailers can buy more avocados to sell in the afternoon. Most of retailers prefer to sell ready-to-eat avocadoes, although when they supply fruit juice shops and restaurant they also sell less mature avocadoes. Retail volumes can range from 10 kg per day to several hundred kg per day.

Bo Nuoc market is also considerable, lower prices opens new markets

Some retailers focus on selling the lower quality and much cheaper Bo Nuoc type avocado. Bo Sap is too expensive for a certain group of consumers, therefore, the Bo Nuoc market should not be ignored as it still is considerable.

On average retailers make a margin of between VND 500 to VND 2500 per kg and sell between 30 to 100 kg per day, which means that they can make between VND 30,000 and VND 150,000 per day.

Box 5 One trading night and day of a hawker in Govap district HCMC

Avocado hawker

The reaserch team followed Mr. Tuan, a fruit and vegetable hawker, for one night and early morning. Tuan sells fruits such as mango, dragon fruit, avocado (bo nuoc), vegetables etc. He prefers to retail fruits as vegetables are much more perishable.

During the avocado season he buys about 2 – 3 baskets of avocado per day (about 35 kg per basket). He starts his retailing from 6 am untill 12 am every day. After that, he takes a rest. His regular working schedule is as follow:

- 01:00 am: Travel to Thu Duc wholesale market
- 1:30 – 3:00: Finish selection of fruits and upload them into his motor bike
- 3:30: Arrive home.
- 3:30 – 5:30: A short sleep
- 5:30 – 6:00: Wake up and place fruits on his cyclo-cart
- 6:00 –12:00: Continue until all fruits are sold and return home for a rest.

Bo Sap to expensive for his clients

The quantity of avocados he buys each time depends on the weather and the experience he had the last day that he sold avocados. He buys the cheapest avocados from a wholesaler at 2,500 VND/kg and sells them for 4,000 – 5,000 VND/kg. He does not retail Bo Sap because it is to expensive and to difficult to retail. At the end of the morning, he may reduce his price to the buying price so that he is assured of having sold all his fruits.

He does only retail avocado in the main season. In the early and late season, he does not because avocados are to expensive. His income is roughly 3 million VND/month. Each morning, he usually cycles 5 – 6 km around his living area to sell his products. Most of his customers are regular customers. If he cycles further, it will be difficult for him because he does not know the consumers in that area.

The most important constraint in his business is getting avocado at Thuduc market because he and his friends have to travel at night with risks of being robbed by thieves.

According to him, avocado retailing is becoming more difficult since more people want to buy avocados of good quality from shops and supermarkets.

Consumers are becoming interested in avocado

According to the retailers, consumers do not care a lot about the skin colour of the avocado. One experienced fruit retailer, who has been in the business for about 30 years, observed that in the past few years the number of avocado consumers have been increasing because of the following reasons:

- Consumers are becoming aware that avocado has a high nutrient and vitamin content
- Consumers tend to favor fruits with less sugar, such as avocado
- Avocados can be used for patients who have diabetese[16]

[16] Later we became very curios where this retailer got this information from. It is indeed correct that avocado is recommended for people with diabetes. See for more info: http://www.avocado.org/press/view_press.php?id=17&sub=press_nutrition&tert=healthy_releases&pg=healthy_releases

Box 6 A fruit shake café

Profitable to process avocados into shakes

Mr Minh in HCMC owns a fruit shake café. He often buys avocados of the size of 3 fruits per kilogram. He thinks that larger avocados are less tasty. He normally buys avocados at a price for 7,000 VND/kg at the market and gets a revenue of VND 30,000 per kg after he processes them into an avocado shake. One fruit produces about 2 cups of avocado shake which he sells for VND 5,000 per cup. So a gross margin per kilogram of avocado of about VND 23,000.

At the market, he checks the fruit quality buy cutting the fruit, if the cut is smooth, the fruit is of good quality. According to him if an avocado is not ripe, the processes can sped up by submerging the avocado into water for 15 – 20 minutes.

Avocado shakes should be consumed immediately after they have been prepared. Even in the refrigerator they can not be stored for longer than a few hours or the taste will become worse.

A lot of new competition

Often, Mr. Minh has to select avocado at 2 – 3 markets, each of 2 – 3 kg. When buying avocados at the market, Mr. Minh does not care about the origin of the fruit. He does only care about its quality. In the early season, he does not sell avocado shakes because the avocado is expensive and low in quality at that time.

In the 1990 – 1995 period, he could increase his avocado shake sales year by year. But as more and more "Ca phe sinh to" and restaurants opened he lost quite some clients. The competition certainly intensified.

In his opinion fresh avocado retailing is a risky business because the sales depend a lot on the weather during a certain day.

5.11.1 Problems and opportunities

Problems:

- For retailers who buy fruits from the Tu Duc wholesale market there is a problem of security. They have to travel in groups, to be safer and so that they can help each other in case of technical problems with their motorbikes. This costs a lot of valuable time
- The limited shelf life of avocados makes retailers to avoid risk. They even buy avocadoes in 2 batches per day. This takes a lot of time.
- Some retailers noticed that the competition seems to have intensified

5.12 Consumers

The main use by domestic consumers in Vietnam are avocado shakes. In Hanoi especially "sinh to bo mang cau" is popular, in which soursop is mixed with avocado. Avocado is hardly used for salads or in any other meal. Only foreign tourist oriented restaurants and hotels use avocado for salads, sandwiches or in sauces.

Richer consumers have a preference for:

- Bo Sap avocados
- Large avocadoes (300-400 gram per fruit) with a small seed
- Yellow flesh
- Shiny and smooth skin

Box 7 An avocado consumer in HCMC

Ms. Phuong often buys avocado (Bo Sap), she prefers the variety with the long-shape and smooth and shiny skin. During one market visit she buys both ready to eat and not-yet-ripe avocados for later use. Avocado is not her daily fruit. When she buys it she uses it to make one avocado shake. Her regular fruit is water melon because it is cheaper than avocado and takes less time to prepare.

Health and convenience

Each time, she buys 3 – 4 kg of avocado and uses it for 3 – 4 days for about 10 persons. On average, her family drinks one avocado shake per week. She wants to have avocado as an alternative for other fruits as she knows that the nutritional value is very high especially in terms of vitamins.

In early season expensive and bad quality

Before going to market, she has not yet decided what fruits she will buy. At the market, she depends on the quality of the fruits which one she will buy. If an avocado is good in quality than she will buy. She often buy avocados at the same shop because the retailer can tell her honestly if the avocado fruit is good or not good. She especially needs this advice in the early season when avocado is low in quality. But in the early season, she often does not buy avocado because it is expensive and low in quality.

Supermarkets

If avocados are sold in supermarkets, she will buy it there even if the price is higher, because she can find more items at one place which makes it convenient. In addition supermarkets are cleaner and the products more safe.

Figure 16 Buying avocados in METRO HCMC

5.12.1 Constraints & opportunities

Avocado still unknown, large market development potential

Constraints:

- Avocado is relatively unknown among Vietnamese consumers
- Wholesalers in Hanoi estimated that even in Hanoi City centre only 70% of consumer know avocado
- Consumers only know one use for avocado → Sinh To.
- To make avocado shakes sugar and milk are added making it expensive. Consumers do not yet know the natural avocado taste
- Sinh To Bo consumption very much related to hot weather. On rainy days no sales
- Consumers can not distinguish between Bo Sap and Bo Nuoc without cutting the avocado
- Some roughed skinned avocadoes have fantastic taste, but are ignored by consumers because they believe that only smooth skinned avocados have a good taste

Chance for safe food

Baby food!

Opportunities:

- Vietnamese consumers are keen on healthy and safe food
- Large number of consumer do not yet know avocado and its health benefits → big growth potential
- Consumers do not know that avocado is produced almost without any chemicals
- Enormous potential as baby food

Figure 17 Wholesaler sorting avocados

6 Avocado post harvest analysis

6.1 Method

Follow the avocado

To get insight into all post harvest conditions and avocado handling a part of the research team followed the avocado from the moment of harvesting in Dak Lak to the final retailer in HCMC.

To get an idea of the exposure and pulp temperatures several sample avocado baskets were selected. An datalogger was placed in one basket which measured air and pulp temperature from the moment the avocados were harvested until arrival at the HCMC wholesale market.

Table 20 Overview of activities undertaken during analysis of all operations from harvest to final supply to consumer

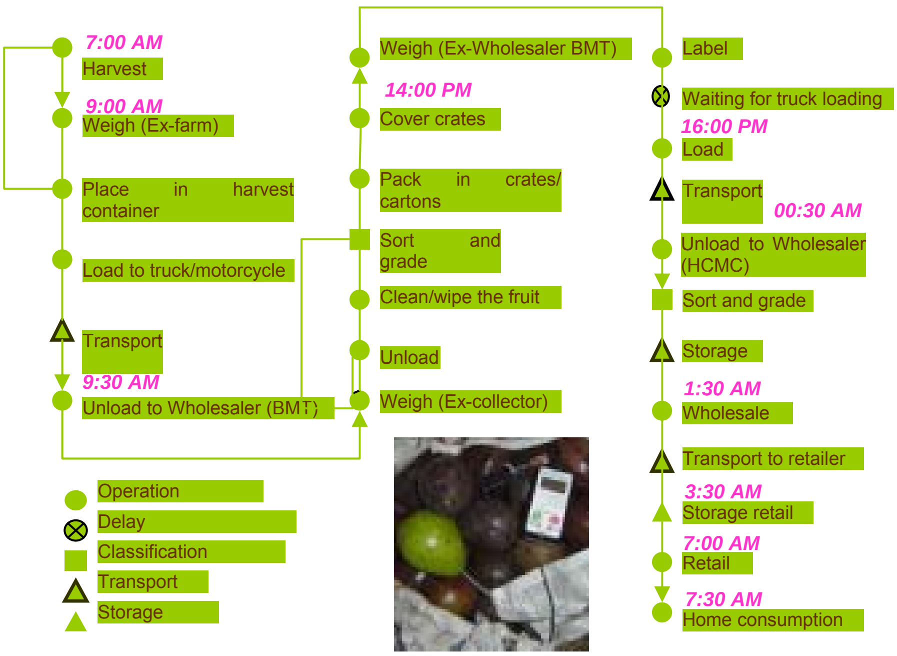
Activities	Particulars	Date/Time
Joined collector to harvest avocado	Observed harvesting procedures	*July 5* *7:45-9:30 AM*
	Set up temperature recorder under the canopy	
	Assessed over-all quality	
	physical appearance	
	internal quality	
	Arrival at Ms. Thin warehouse	
Fruit sampling at the wholesaler (BMT)	Marked 10 sample crates (using other fruits)	*3:45-3:50PM*
	Placed fruit with temp recorder	
	Information per crate obtained	
	Weight	
	Final destination (Chu dai Moi-wholasaler HCMC)	
Wholesaler (BMT)	Crate loading observation	*3:45-3:50PM*
	Took note of truck stowage plan	
	location of 10 sample crates	
	Placed temp recorder in one fruit	
Follow truck	Departure from BMT	*4:25PM*
	Recorded road conditions (good road condition)	
	Recorded activities/stop-over (Cu jut area)	*5:25PM-6:PM*
July 6, Thursday Arrival in HCMC	Checked marked 10 sample crates	*12:30AM*
	Recorded info on the ff:	*12:45-1:30AM*
	Weight	
	Over-all quality- Fruit loss due to ???	
	Followed crate with temp recorder until retailer	*2:15AM*
Arrive in Retailer	Arrival time at the retailer	*3:30AM*
	Take out the temp recorder	*3:50 AM*
	Assess fruit quality	

6.2 Results

Following the avocado from harvesting operation in Buon Ma Thuot until loading to the wholesaler in HCMC, to the retailer, made it possible to complete the post harvest handling chain shown *Figure 18.*

Figure 18 Movement of avocados from harvest to consumption

Many operations, avocado touched very often!



6.3 Quality

The team assessed the quality of the fruits upon arrival at the wholesaler in HCMC. Fruit crates were observed to contain fruits at various ripening stages (estimate 2-5%). One crate was even full (100%) of ripe fruits. We were not able to evaluate all the fruits as the wholesale market became very hectic.

Fruit weight loss was also determined from three representative crates. An average 1.5 % weight loss was obtained, which can be considered low and acceptable.

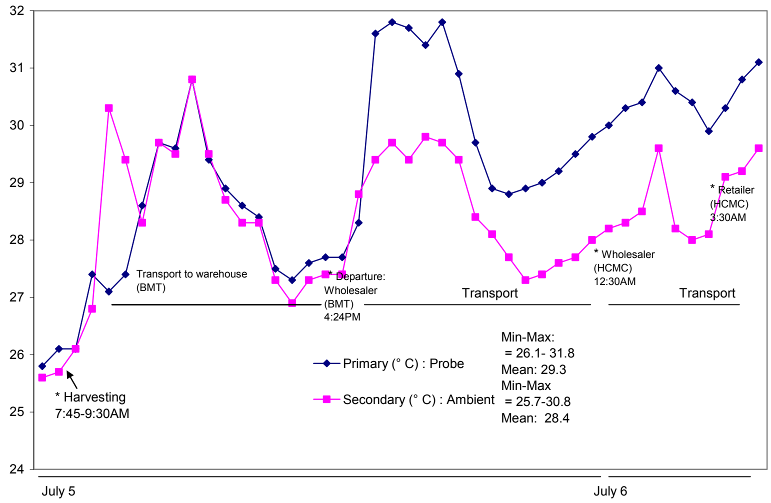
Table 21 Weight of sample avocado baskets at departure in BMT and arrival in HCMC

Weight(kg)		*%Weight Loss*
Initial	Final	
71	70	*1.0*
100	98	*1.4*
98	96	*2.1*
Mean		*1.5*

Fruit air and pulp temperature results revealed a high temperature exposure of fruits for longer hours (*Figure 19*).

Figure 19 Temperature profile of avocados during transport from the warehouse in BMT to the retailer in HCMC.

Temp always above 25 degrees.



Blue line = pulp temperature Pink line = ambient (outside temperature)

Based on information in literature, so not yet tested for Dak Lak avocadoes, we know that:

Cold storage values need to be calibrated for Dak Lak avocado

- Storage should be at 10-14⁰ C
- At these temps can store for 2 weeks and longer
- Best ripening temp 16° C

If the ripening temperature is higher than 24° C, it can result in:

- Uneven ripening and off-flavours
- Increased chance for stem-end rot and body rot

As we can clearly see in *Figure 19* the temperature is from harvesting until arrival at the retailer above 24⁰ C.

Figure 20 Avocado fruit harvesting pole

6.4 Observations

In *Table 22* an overview is given of all handling process from the collector to a wholesaler in Buon Ma Thuot.

Table 22 Handling processes from collector to BMT wholesaler

Avocados unloaded in very rough way on the cement floor

Steps in the Postharvest System	WHO	WHERE	WHEN	HOW
Harvest	Collectors (90%) Farmers (10%)	Farm	8:00-10:00	using long bamboo poles with basket/ hook- fruits fall to wide piece of cloth or sack placed above the ground
				hand picking one by one
				climb the tree and hand pick
				shake the tree branch until fruit drops
Check for maturity	Collectors	Farm		Fruits are checked for maturity in terms of skin texture (smooth), size, dry, easy to peel off seed coat.
Place in harvest container	Collectors	Farm	10:00-11:00	one by one fruits are placed in rice sack or bamboo crates
Carry and load to motorcycle	Collectors			
Transport	Collectors	Farm to BMT trader 20 km	11:00-12:00	fruits are loaded sideways or can be in front or back side of the driver
Unload	Collectors	BMT trader	12:00-12:05	Fruits are unloaded from the motorcycle
Weigh		BMT trader	12:05-12:10	Place fruits on weighing scale and weigh
Unload into the ground		BMT trader		"pour" the fruits on the ground together with other fruits
Sort and grade	Wholesalers (3 manpower / 3 hrs/ 6 tons per day)	BMT trader	12:10-15:00	Fruits are checked for internal quality, sometimes no cutting since they are familiar already with fruit quality. Selection is done in terms of size and shape/variety.
Put in bamboo crates		BMT trader		Selected fruits are "thrown" in bamboo crates with side-cartons, estimate ave= 100 kg per crate
Pack, weigh and label		BMT trader		Cover the fruits with layers of old newspaper or any paper and rice sack on top. Insert the rice sack on the sides and manually sew using plastic straw. Weigh and put label (weight and clients name) on the rice sack by color paint.
Load to truck	2 Drivers +1 assistant	*BMT trader*	15:00-17:00	Crates are loaded to truck until filled up (5 tons= 50 crates)

Harvesting:

Stem removed, wound!

Avocados are harvested in a very rough way. The stem is completely removed which leaves a wound on the top of the fruit, from which stem rot can easily start.

Operations: Other traders follow the same steps mentioned above from fruit receiving to unloading, weighing, sorting and grading, packing, weighing and labeling (market preparation). All of these operations were also done in the same "rough manner" and it seems that the actors are not conscious of the impact of their cumulative actions in damaging internal and external quality of the fruit.

Sorting and grading: Fruits were sorted on the basis of size, shape and skin texture. There are no clear cut classification guidelines followed to distinguish between Class A or B, while fruits graded as good fruits appear to be based on medium to large size, luster or smoothness of skin texture and slight to moderate blemishes or scars.

No disinfection

Cleaning/Disinfection/Sanitation; It is interesting to note that cleaning fruits is not a usual practice. In this case, there is a high risk of contamination of fruit diseases that will likely decrease its shelf life. The working area was dirty which could be source of undesirable air and soil-borne microorganisms that cause early spoilage.

A lot of pre-harvest damage

Fruit quality upon arrival in the trader's area; Large amounts of fruits showed pre-harvest damages from slight to moderate incidence: old scar, insect scratches, blemishes, remnants of black molds, deformities etc. Fresh bruises were common among fruits particularly on the "cheek sides".

Air/pulp temperature: One fruit was sampled from a batch of fruits received by the trader. Air/pulp temperature recorder was inserted into the newly-harvested intact avocado fruit and placed on the table near the receiving area. Temperature readings from 9:00-11:00AM reached an average of 25 C (75.2 F). Based on previous studies, avocado fruits kept at this temperature for longer periods tend to ripen and deteriorate faster than those exposed to temperatures lower than 20 C (68 F).

7 Conclusions & recommendations

In this chapter we present our main conclusions and recommendations for action. Only conclusions which can be influenced through an intervention project are discussed here. The recommendations can be considered as possible building blocks for an intervention project to create an unique avocado fruit sector in Vietnam, which aims to gain a large domestic market within three years time.

7.1 Market development

Demand increasing

Conclusion 1a:

Most chain actors indicated that in the past few years the demand for avocado has increased steadily, that prices increased and that much more growth is possible.

Avocado produced with almost no chemical inputs

Conclusion 1b:

Avocado is a very healthy fruit, which is produced in Dak Lak with hardly any use of agro-chemicals. If avocado would not have been intercropped with coffee, one could apply for an organic production certificate. This perfectly fits with the important consumer trend in Vietnam of healthy and safe food.

Consumer knowledge of avocado still limited

Conclusion 1c:

Still large numbers of consumers in Vietnam have never heard or tasted an avocado. The consumers who have heard about it or even tasted avocado are unaware of how healthy avocado is and how well it can also be used as a beauty product. This also matches well with another important consumer trend of rapidly increasing household expenditure on beauty.

Only know one use

Conclusion 1d:

Most consumers only know one use of avocado, namely as an ingredient for an avocado shake

Avocado to fight malnutrition under 5 year olds

Conclusion 1e:

With 25% percent of Vietnamese children under 5 still being too short for their age, avocado could play an important role in providing the needed proteins, carbohydrates, minerals and vitamins to help to solve this problem. Avocado is perfect food for babies as it is very easy to eat and is recommended as one of the first solid products which a baby can eat.

Consumer awareness campaign

Recommendation 1:

Our recommendation is to actively stimulate the market demand for avocados by creating a consumer awareness campaign which will excite the Vietnamese consumer about the health & beauty aspects of avocado. Four campaign topics could be developed:

- Avocado for your health
- Avocado for your baby
- Avocado for your beauty
- Avocado for your culinary adventure: avocado recipes & cooking tips

These campaigns could promote avocado in general and at the same time a strong Dak Lak based avocado brand could be launched. These

Create more stable market demand

campaigns will also have the expected impact to make the current volatile avocado sales more stable. Instead on depending on just one use, avocado shake which is strongly correlated with the weather, avocado consumption will start to depend on more uses resulting in a more stable demand.

Consumer study, esp. for perceptions about avocado as baby food

To make the consumer awareness campaign effective we would recommend a small consumer study to obtain perceptions of Vietnamese consumers with regards to avocado, the relation with health, baby food, beauty products and a wide range of avocado dishes. A consumer panel should also be used to test the promotion materials which the campaign wants to use.

Export to Asian markets which do not require Hass variety

Conclusions 2:
Vietnam is not yet exporting any avocados on a structural large scale. With its heterogeneous supply, caused by the fact that every tree is almost a different variety, exporting to high end consumer markets is probably too difficult. Instead less demanding consumer markets in Asia might be an option.

Cooperate with exporters

Recommendations 2a:
Contact several traders who are currently already exporting, for example the trader in Haiphong who exports to China, and investigate if there are any possibilities to improve and expand the existing trade link.

Asian trader study tour

Recommendations 2b:
After the first quick wins have been implemented invite Asia avocado traders for a study tour to Dak Lak.

7.2 Quality brand

No avocado brand yet. Well treated avocados remain anonymous

Conclusion 3:
Currently no quality avocado brand exists. Avocados which are harvested by collectors in a careful manner or which are treated in a good way by Dak Lak wholesalers, disappear anonymously in the overall avocado volume. The system currently does not reward better cultivation, harvesting, packaging or transporting practices. Only traders who control the chain from harvest to sales can be reap rewards from better management practices.

Develop a brand

Recommendation 3a:
Develop a brand which can only be used by farmers, collectors, transporters and wholesalers who follow certain protocols and standards in which they will be trained.

Introduce avcado levy

Recommendation 3b:
Participants of the brand will all agree to a small charge on every kilo of traded avocado. Matching public sector funds will be sought to create a real a public private partnership, in which the public sector will double collected funds. With these funds the brand can be maintained, such as marketing promotions, training and quality control.

No year round supply

Conclusion 4a:
No consistent year round homogenous volume is available

Create virtual avocado orchard

Recommendation 4a:
Create a homogenous year round supply out of the current total available avocado production. This would require a kind of avocado tree identification and labelling campaign, in which an inventory is made of the characteristics of the each tree:

- Which type of avocado (Bo Sap/Bo Nuoc) does a tree produce
- Which shape, skin surface, colour
- In which month the tree normally can be harvested
- Harvested volume

Based on this information an inventory can made of which volumes of homogenous avocado types can collected in each week. This information can be used in attracting large buyers.

Difficult to distinguish between avocado types

Conclusion 5b:
Both traders and consumers have big difficulties to distinguish between Bo Sap, Bo Mo and Bo Nuoc

Avocado type stickers

Recommendation 5b:
Bo Sap, Bo Nuoc and Bo Mo avocados will get a different colour sticker at harvesting so that all actors will know what type of avocado it is. They could even be created into different subbrands.

METRO & Co.Op interested to buy

Conclusion 6:
During the action plan workshop several wholesalers, METRO Cash & Carry and Saigon Co.Op Mart indicated that they would be interested in buying a guaranteed quality avocado.

Start small

Recommendation 6a:
To assure that the Quality Brand program will be successful, start small with only a small number of motivated farmers, collectors and wholesalers and link them to several buyers who will be the first certain buyers for the avocado brand.

7.3 Small orchards

Conclusion 7:
The avocado demand growth has started to make the avocado sector quite a profitable business for all chain actors. From farmers to retailers, all can earn quite some profitable margins on avocado. For most actors in the chain the income derived from avocado is quite a large share of their total income, except for the farmers.

Very few avocado trees per farmer

Although per hectare figures appear to be very lucrative, farmers do not yet benefit from avocadoes substantially because they just have a few trees per farm. Farmers also hardly manage their avocado trees, the only activity which they undertake is to plant the seed. So there are not many avocado farmers, which are farmers who get a considerable share of their income from avocado cultivation.

In the last two years more and more farmers have started to take avocado cultivation more serious. Small orchards are developing and farmers are starting to take care of their avocado trees.

Recommendation 7:
For the avocado sector to become more professional, more farmers should develop into avocado farmers with small orchards. These orchards do not have to be big, 0.5 ha would already be a considerable improvement. With about 75-100 trees farmers have enough supply to fill a complete truck with avocados. This will save a lot of time and transport cost, making the sector more competitive. It would also mean that farmers will get enough volume to supply wholesalers directly.

But in general farmers are still very hesitant to increase the number of avocado trees as they are not sure if the price increase of the last few years is structural and if the market demand will remain stable. Based on previous experiences with volatile markets (fe. Coffee) farmers are more careful, especially with regard to perennial crops.

Conclusion 8:

Potential to increase demand

Our impression is that there is still enough potential for further domestic market oriented growth. Per capita consumption figures of avocado are still low. If one takes Hanoi as an example, with a daily supply of 7 tons of avocados for every day of the year, this means a total consumption of 2,555 tons. With a population of 3 million people this means a per capita consumption of 0.85 kilogram avocado per person per year. This figure is probably an overestimate, as also a significant amount of the avocados which arrive at Long Bien will be sold to other cities in the Red River Delta. But also in other cities like Haiphong, still large markets can be developed.

Recommendation 8:

Monitor avocado exports from Dak Lak

To prevent any oversupply of the market it would be very useful to monitor more precise how much avocados are supplied to the various cities in Vietnam. These data can be used to estimate market saturation points and the related cultivated areas. This information should also be clearly communicated back to the farmers so that they can get a good idea bout which direction the sector is developing in. If farmers start to develop small orchards in combination with a market development program, production increases should be easily absorbed.

7.4 Avocado seedlings

Conclusion 9:

Expected increase in sales of avocado seedlings

Although the sales through the private avocado seedling sector is still very limited, the various governmental seedling providers were all mentioning that there was an increased demand for high quality avocado seedlings. All providers planned to expand their seedling production for 2007.

Recommendation 9a:

Label avocado seedlings

Although the avocado variety testing programs at WASI are still ongoing, already several varieties are sold as grafted seedlings. It is crucial that these seedlings are well labelled with a clear description of their characteristics. Farmers should start to bincrease their variety awareness, otherwise the current chaos will continue.

Recommendation 9b:
Both governmental and private sector seedling producers should be

Check quality of seedlings

checked on the quality of the seedlings which they sell, the documentation of the varieties and administration of sold seedlings. If all records are brought together it will be easy to monitor the yearly increase in planted avocado area.

Too little care for the rootstock

Conclusion 10:
A lot of attention is given to the variety which is grafted on the rootstock. But for the rootstock the cheapest avocados are used.

Recommendation 10:
More care should be taken to select high quality rootstocks.

Involve traders into the variety trials

Conclusion 11:
The variety selection and trials are mostly technically (agronomic) oriented

Recommendation 11:
Involve international traders, wholesalers, retailers from HCMC in an early stage to evaluate the various varieties on their shelf life and market performance. Simple consumer panels and storage tests could be done in addition to the agronomic evaluations.

7.5 Cultivation practices

How to keep current "organic" practices?

Conclusion 12:
Without almost any management and agro-chemical inputs the avocado trees in Dak Lak are quite productive. With avocados becoming a more profitable business more intensive farm practices might develop. Larger scale mono cropped avocado orchards might lead to more pests and disease problems.

Market potential for organic avocado?

Recommendation 12a:
Study the agronomic and market potential for organic avocado production, keeping the current system the same but with better tree and fruit care and use of organic fertilizers. If this is feasible and there for example is a market in Asia for organic avocados, develop a organic training and certification scheme.

Start GAP program

Recommendation 12b:
Before pests and disease problems start to become a serious problem start a Good Agricultural Practices program for avocado. Train farmers how to take well care of their orchards, so that it hopefully can be prevented that farmers will come in a spiral of pesticide over use. There is now an unique opportunity for the Dak Lak avocado sector to keep the sector clean.

7.6 Harvesting

Problem in determining right harvesting moment

Conclusion 13:
Many collectors and farmers have problems in determining the right maturity of the avocado for harvesting, This results in post harvest losses.

Develop maturity index

Recommendation 13:
Development of maturity index indicators which can be used by farmers and collectors.

Bad harvesting practices

Conclusion 14:
Current bad harvesting practices severely shorten the shelf life of the avocados and cause significant financial losses within the chain. Even higher post harvest losses for Hanoi wholesalers cause avocados to be quite expensive in Hanoi which limits the demand.

Introduce simple harvesting tools

Recommendation 14:
Develop and train[17] farmers/collectors in the use of simple harvesting tools. Make a harvesting protocol and train them. For example to harvest the fruit in such a way that a short pedicel (stem) stays attached. Simple to be developed harvesting tools:

- Hand clippers
- Clippers on a picking pole
- Canvas harvesting bag which can be attached on a belt around the hip
- Foldable stair which can be attached to the motor bike
- Start to use special harvesting bins which can be attached to the motorbike

7.7 Sorting, grading, cleaning and packaging

Conclusion 15:
Rough handling, dirty stores and sorting avocados on the ground decreases the shelf life considerably.

Introduce post harvesting protocols

Recommendation 15:
Develop protocols for wholesalers, train and check them. Wholesalers who want to join the program need to make some simple improvements in their stores, such as sorting on tables, clean floors, ceilings, non accessible for dogs, small children etc.

Conclusion 16:
No clear conclusion about the current bamboo baskets, only that the second hand carton within the bamboo basket is not so hygienic. Also the 100 kg weight of the basket makes it difficult to handle, as the baskets have to be carried by hand.

Recommendation 16:
Different packaging solutions should be tested, which also depends on the requirements of the buyer. It could be stackable carton boxes, or smaller bamboo baskets.

[17] Let farmers/collectors undertake experiments to observe the relation between the harvesting technique and shelf life of the avocado

7.8 Cold storage & transport

Conclusion 17:

Uneven ripening and off flavours

From the moment of harvesting to the delivery to buyers in large cities, avocados are exposed to temperatures which stimulate ripening. This results in uneven ripening and off flavours. If avocados can be stored at the right temperature directly after harvest and transported with a cold truck the shelf life will increase dramatically.

Recommendation 17a:

Cost benefit analysis of a simple cold storage system

Test a simple cold storage system which can keep the temperature around 16^0 C. Make a cost benefit analysis of this system. A feasibility study could be done to set up an separate cold storage building, managed by a private service provider in which other wholesalers can rent storage space.

Recommendation 17b :

Simple improvements in transport can be made

If prices in the domestic market does not allow investments in cold storage than still several improvements can be made in the transport. Especially for destinations in the North for which currently passenger busses are used it should be studied if through cooperation between a few wholesalers enough volume can be brought together to fill one truck.

7.9 Avocado oil

Conclusion 18:

Avocado oil is a popular ingredient for the cosmestic industry and can also be developed into a premium cooking oil. The post harvest department of HCMC Agriculture University is currently undertaking a two year project on extracting oil out of avocado.

Recommendation 18:

Undertake a simple feasibility study of avocado oil extraction in Dak Lak. The feasibility will largely depend upon the oil content of the Dak Lak avocados. Link with the program in HCMC Agric. University and contact vegetable oil production companies in Vietnam.

7.10 Partners

The conclusions and recommendations provide first ideas for an intervention plan. But even more important will be the selection of partners in the project, roles, responsibilities and “institutionalisation” of the quality brand.

The idea behind the brand is that individuals still have their own freedom of operation, so it is not like a cooperative. All actors are only required to follow certain procedures. The brand will only make those avocados visible of which serious care is taken. Traders can only use the brand if they buy from collectors and farmers who were certified by the brand. All will benefit from the brand marketing campaign and in the beginning of the project several large clients will be identified and linked to the project. But even in the future the brand could have one sales staff whose only goal is to get as much buyers for the brand as possible.

Within the various agriculture research and development organisations in Dak Lak there is certainly a lot of technical expertise available on the cultivation practices. It would only be advisable to involve a very applied and experienced professional avocado grower in the project.

It also seems that post harvesting and packaging knowledge in Dak Lak is lacking. This gap could be filled by SIAEP in HCMC. For the packaging advise also packaging companies could be involved.

With regards to consumer awareness campaign and the marketing and branding strategies it is also advisable to involve a professional service provider.

8 Literature

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Annex 1 Overview of Tools in the RDA Toolbox

Methods	Purpose/Possible Applications
Dialogical Analysis	***Assessing change through interviews, discussions and oral histories***
Semi-structured interviews - open groups - focus groups - key informants	• local criteria, perceptions, priorities, problems, achievements regarding avocado production and marketing • history of agriculture and land use development trends and changes • existence, performance and interactions of local and external organisations • identification and consultation with various social groups, focus groups and key informants • the beginning and end of every research 'encounter'
Case studies	• document the life story or sequence of events related to an individual, household or organisation involvement with avocado production and marketing
Temporal Analysis	***Assessing change over time - historical, seasonal, daily patterns***
Timelines	• history of social and environmental change at local level • impact of external interventions and local responses and initiatives • history of avocado production and marketing and the main trends and changes • history of economic and environmental shocks and stresses • links between policies and practices, perceived 'effects' and their causes
Seasonal calendars	• frequency and distribution of crop pests and diseases, market demand, avocado supply etc. over a year or more • timing and amount of inputs (agro-chemicals, labour etc.) invested in avocado production • timing and amount of income and expenditure related to avocado production • labour availability
Bar charts and line chars	• fluctuations in prices • fluctuations in supply and demand • trends in cultivation area and production volume of avocado • trends in yields
Spatial Analysis	***Assessing change over space***
Transects	• characterisation of different avocado cultivation zones • location of water sources/points, infrastructure, physical features, etc.
Resource maps	• location of land forms, land and soil types, crops, infrastructure, etc. • land ownership/tenure arrangements • type and intensity of land and water use • erosion and land degradation • surface water and groundwater availability
Product flow maps	• start and end points of avocado flows from production areas to final consumers
Systems Analysis	***Assessing causes and effects, impacts, flows and changes within a system***
Impact diagrams	• impact of extension programmes and projects - positive/negative, expected/unexpected, direct/indirect, tangible/intangible • changes in local livelihoods and well-being before and after these interventions • impact of new technology, new varieties, practice or approach
Systems or flow diagrams	• inputs and outputs through an avocado based farming system • flows of avocadoes in various market channels and identification of all involved actors
Cause-effect diagrams	• perceived causes and effects of different development activities and processes • causes and consequences of changes to the farming system or land use patterns
Problem trees	• complex interactions between various causal factors of negative changes and their impacts, such as environmental degradation or decline in agricultural productivity
Institutional Analysis	***Assessing change in institutional arrangements and interactions***
Venn diagrams	• frequency and intensity of interactions between key local and external organisations and individuals involved in avocado production and marketing • past and present experiences and activities of farmers' associations/groups • local views of the core characteristics of effective farmers' associations/groups • sources of conflict and co-operation between local and external interest groups related to avocado • linkages
Network diagrams	• diversity, frequency and intensity of contact between different social actors (farmers' groups, input suppliers, agricultural marketers, government extension staff, etc.) • perceived importance of social relationships and the reasons for contact • important information sources related to avocado production and marketing
Well-being Analysis	***Assessing changes in social difference & intra- and inter-household wealth and well-bein***
Pile sorting	• identifying and stratifying avocado farmers on the basis of locally-defined criteria (avocado area, relative wealth, farming practices, innovators, etc.)

Methods	Purpose/Possible Applications
	• local criteria/perceptions of relative wealth and well-being • potential focus groups and key informants
Preference Analysis	***Assessing changes in preferences and priorities using locally-defined criteria***
Matrix scoring and ranking	• systematic comparisons of avocado varieties against locally-generated criteria • local priority problems and/or opportunities according to different interest groups
Pair wise ranking	• ranking of options, criteria, technologies, sources, practices, measures, organisations, etc. from best to worst / most to least important • comparison of particular items to draw out important criteria, preferences or priorities
Pie charts	• relative importance of different organisations, actors, sources, technologies, etc. • relative importance of income derived from avocado in the total income • relative importance of certain input items in total production cost

Annex 2 Checklists

Avocado Farmers	
1. Production and production cost	a. Recent changes in local production systems (say over the past 5 years) => cultivated areas, varieties, fertiliser use, yields, production volumes b. Differences across households and ethnic groups => cultivated areas, soil types, technologies, yields, and production volumes c. Types of soil and land where avocado is cultivated d. Avocado land use => mono-cropping, inter-cropping, sequencing of crops e. Varieties planted f. Assessment of different varieties => yield, resistance to pests and diseases, input requirements, taste, price, etc g. Use of external inputs and cost for => e.g. seedlings, inorganic fertiliser, labour (ex: 1 ha) h. Transportation cost i. Seasonality in production => land preparation, planting, mature to give fruit, fertilisation, harvest, etc) j. Gender division of labor in production
2. Utilization	a. Share of avocado production used within the household = > food and feed b. Share of avocado production sold in the market c. Changes in avocado utilization (say over the past 5 years) => food, feed, sold
3. Post-harvest	a. Harvesting practices = > Equipment, method b. Cleaning practices at household level c. Storing practices d. Reasons for storing avocado e. Post-harvest losses => share of production and reasons
4. Marketing	a. Marketing seasons

Avocado Farmers	
	b. Timing of farmer sales and reasons c. Type of avocado buyers and their relative importance d. Advantages and disadvantages of different type of buyers e. Places of sale (farm-gate, village market, commune market, district market, collection centre) and their relative importance f. Advantages and disadvantages of different sale locations g. Incidence of group selling h. Negotiation process => who decides the price and why i. Selling arrangements => cash or barter basis, prompt or delayed payment, contracts, etc j. Buyer requirements => product quality, size, maturity, volumes, place of delivery, homogenious of produce etc k. Embedded service provision by buyers => market information, credit, inputs, technical assistance, contracts, etc l. Major changes in marketing (say over the past 5 years) => buyers, place of sale, selling arrangements, etc
5. Prices	a. Current avocado selling prices => at farm-gate/village, commune and district level b. Differences in price due to variety, outlooking, other factors… c. Degree of price volatility within seasons d. Degree of price volatility between years e. Price trends (say over the past 3 years) and key factors behind price trends f. Perception of future price trends (say over the next 3 years) and key driving factors
6. Access to services	a. Input supply => sources, quality and affordability of inputs, problems, etc b. Market information => sources, reliability, problems, etc c. Technical advice on production, post-harvest and marketing => sources, reliability, problems, etc d. Transport => availability, cost, problems, etc e. Finance => sources, cost, problems, etc f. Other services
7. Problems and constraints	a. Key problems and constraints in avocado production

Avocado Farmers	
	b. Key problems and constraints in avocado marketing c. Proposed solutions to address constraints

Avocado Traders	
1. Background information	a. Location b. Years in operation c. Type of commodities traded d. Other activities apart from avocado trading e. Seasonality in his/her avocado trading activity f. Number of employees (if any)
2. Volumes and sources of avocado	a. Volumes of avocado purchased per week and month (season and off-season) b. Volumes of avocado purchased per annum c. Areas from where avocado is purchased d. Relative importance (in terms of volumes) of different supplying areas e. Differences between supplying areas with regards to quality f. Advantages and disadvantages of different supplying areas g. Type of avocado purchased (varieties) h. Preferences on varieties of avocado i. Differences between varieties of avocado regards to quality j. Major trends and changes in traded volumes and sourcing areas (say over the past 5 years)
3. Suppliers	a. Suppliers of avocado => e.g. farmers, collectors, etc b. Relative importance of different suppliers according to volumes and regularity of supply c. Differences between suppliers with regards to variety, quality, etc

Avocado Traders	
	d. Advantages and disadvantages of different suppliers
4. Buyers	a. Buyers of avocado (e.g. traders, retailers, consumers...) and their location b. Relative importance (in terms of volume and regularity of purchase) of different buyers c. Product requirements of different buyers => volumes, quality, regularity of supply, etc d. Advantages and disadvantages of different buyers
5. Prices	a. Current purchasing prices for avocado b. Current selling prices for avocado c. Factors influencing current avocado purchasing and selling prices => e.g. variety, maturity, outlooking, size... etc d. Degree of price volatility for avocado within the season, and reasons e. Degree of price variation between seasons, and reasons f. Price trends (over the past 3 years) and key factors behind these trends. g. Perception of future price trends (over the next 3 years) and key driving factors.
6. Transactions	a. Places of purchase => farm-gate, village, own store, etc b. Places of sale c. Use of buying agents d. Payment procedures, both when purchasing and selling => cash or barter basis, prompt or delayed payment, etc e. Other terms and condition for purchases and sales f. Negotiation process with suppliers and buyers => who determines prices and other conditions g. Relationship with suppliers and buyers => regularity of transactions, contracts, credit, etc
7. Post-havestment	a. Avocado havesting practices => equipment, capacity, problems b. Packing practices => type of facility, capacity... etc c. Normal storage period, and reasons for storing d. Sorting and grading practices, and reasons for sorting and grading

Avocado Traders	
	e. Loss ratio in havesting and storaging and reasons
8. Support services	a. Transport => means of transport used and capacity; ownership of transport vehicles; availability and cost of rented transport; etc b. Market information => sources; reliability; problems; etc c. Credit => sources and their relative importance; frequency; cost; problems; etc d. Harvesting e. Other support services
9. Marketing costs and risks	a. Main marketing costs => labor, transport, credit, rent, communications, product losses, etc b. Marketing costs per unit of avocado (say 100 kilograms or 1 ton) => handling, transport, cleaning, storage, packaging, product losses, interest on credit, taxes, etc c. Main marketing risks => product losses, availability and quality of produce, contract default, price fluctuations, etc
10. Policies and regulations	a. Key policies and regulations affecting his/her avocado trading business => registration, taxation, credit, subsidies to ethnic minority avocado growers in upland areas, etc b. Impact of policies and regulations on his/her business c. Recommended changes in policy and regulations
11. Key constraints and opportunities	a. Key constraints to the development of the avocado trading business b. Possible solutions to these problems c. Key opportunities to develop the avocado trading business d. Factors that could enable access to these opportunities

Input Providers	
1. Background information	a. Location b. Years in operation c. Type of inputs and other products traded
2. Procurement and sale of inputs	a. Volumes of inputs traded (especially avocado seedlings, fertiliser) per month and year b. Type of seedlings and price c. Seasonality in input sales d. Suppliers of inputs and their location e. Buyers of inputs and their location f. **Current wholesale and retail prices for seedlings and fertilisers**
3. Trends	a. Trends in sales of avocado seedlings (all types of seedlings) and fertiliser (say over the past 3 years) and reasons behind these trends b. Perception of future demand trends for these inputs (say over the next 3 years) and key driving factors c. Trends in prices of these inputs (say over the past 3 years) and reasons behind these trends d. Perception of future price trends (say over the next 3 years) and key factors that are likely to drive these trends
4. Transactions	a. Buying arrangements/conditions for inputs: e.g. purchases on credit, prompt cash payment, etc b. Selling arrangements/conditions for inputs: e.g. sales on credit, prompt cash payment, payment in kind, etc
5. Policies and regulations	a. Key policies and regulations affecting the input trading business (**subsidies policies**)
6. Constraints and opportunities	b. Key constraints to the development of the input trading business c. Solutions to these problems d. Key opportunities to develop the input trading business e. Factors that could enable this development f. Recommendations for improving access to inputs by farmers

Staff from Government Agencies and Mass Organisations
1. Role/function of the institution related to avocado production, trading and processing
2. Data for the past five years ▸ number of households involved in production of avocado at commune/district/provincial level; ▸ areas under avocado at commune, district and province level; ▸ types of avocado varieties planting within district and province ▸ production volumes
3. Strategies, policies, regulations and programmes for the avocado sub-sector ▸ On paper: objectives, responsible/implementing agencies, activities, etc ▸ Quality of enforcement (policies and regulations) and implementation (programmes) ▸ Impacts on production, trading and processing
4. Key constraints to the development of the avocado sub-sector (production, trading and processing) in the district and province
5. Key opportunities regarding the development of the avocado sub-sector (production, trading and processing) in the district and province