FINAL

ENHANCEMENT OF COFFEE QUALITY THROUGH PREVENTION OF MOULD FORMATION

Targeted Study of the Arabica Coffee Production Chain in North Sumatra (The Mandheling Coffee)

NATIONAL CONSULTANT REPORT

Wayan R. Susila

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FOREWORD

This is the report of the social economic study of Term of Reference (TOR) No. GCP/INT/743/CFC entitled Enhancement of Coffee Quality through Prevention of Mould Formation. The activities and report was made under the supervision of the Food Quality and Standard Service, Food and Nutrition Division, FAO and in collaboration with national project staffs and *Centre de coopération internationale en recherche agronomique pour le développement* (CIRAD).

This socio economic report consisting of three studies, namely,

1. Targeted Investigation of Robusta Coffee Processing and Marketing Chain in Lampung;
2. Investigation of the Feasibility of Wet Processed Robusta by Smallholder farmers in East Java;
3. Targeted Study of the Coffee production Chain in North Sumatra Arabica (Mandheling Coffee).

This report is concerned about the third social-economic study, that is, **Targeted Study of the Arabica Coffee Production Chain in North Sumatra (The Mandheling Coffee).**

Bogor, April 2005

Dr. Wayan R. Susila, APU.

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EXECUTIVE SUMMARY

Targeted Study of the Arabica Coffee production Chain in North Sumatra (The Mandheling Coffee)

North Sumatra Province is known as one of the Arabica producing center with the production of 15000 tons/year, accounting to 33.3% of the Indonesian Arabica production. There are three main districts in North Sumatra producing the coffee, namely Humbang Hasundutan, Tapanuli Utara and Toba Samosir. The North Sumatra coffee harvest, trading and processing season occurs during the wet season. As a result, coffee is initially traded from farmer to local trader at very high moisture content (MC), between 40 to 50 per cent. This condition causes a dilemma; on one hand, coffee produced by this system produces a unique coffee typically described as having complex body and low acidity (Mandheling coffee). This coffee is appreciated for its organoleptic characteristics with a significant price premium. On the other hand, the processing and trading system that yields coffee with very high moisture contents, theoretically is very risky associated with coffee quality, mould formation, and OTA contamination.

The best solution for this dilemma is to develop processing and trading systems that maintain the organoleptic characteristics of the coffee and at the same time minimize the risks associated with physical coffee quality and mould formation. In response to this problem, a study to identify the systems was conducted. The objectives of the study are: (1) to define, describe and verify the key steps in the processing and trading system of typical Mandheling coffee; (2) to identify points in processing and trading system where there is risk of OTA contamination (3) to propose further studies and sampling which will help identify areas to reduce the risk of OTA occurrence, but retain the specialized flavor developed by this wet process and trading system. This study is preliminary study and the comprehensive studies are conducted by the Indonesian Coffee and Cocoa Research Institute (ICCRI).

A survey in three Districts namely, Humbang Hasundutan, Tapanuli Utara and Toba Samosir District, was conducted to describe and verify key steps in the processing and trading system. Discussions and observations were conducted at farmer, collector, trader, and exporter level.

Coffee processing techniques applied for Mandheling coffees in North Sumatra are varied, basically depending on the regions. There are three main groups of the production based on regions/locations, namely North Tapanuli, Humbang Hasundutan and Toba Samosir system. Besides their differences, all systems basically consist of nine steps, i.e.: picking, floating, pulping, fermentation, washing, drying, wet hulling, re-drying, and storing. Following the valuations/perceptions of collectors and traders in the region, the coffee processing system in Humbang Hasundutan district is considered 'the best'.

The variation of processing techniques applied by farmers can be explained by some factors. Following the main stakeholder of coffee industry in the districts (farmers, collectors, and traders) there are five main determining factors affecting the selection of processing technique, namely, (i) market demand (ii) tradition; (iii) demand for cash money; (iv) limited family labor; (v) wet weather condition.

According to the perceptions of exporters, traders, and collectors, good Mandheling coffee is characterized by its (i) strong aroma; (ii) big bean size; (iii) clean and bright; and (iv) gray to blue color. The valuation of exporters, traders, and collectors indicated that coffee from Dolok Sangul and Lintong Sub-district of Humbang Hasundutan district are perceived as the best coffee in the three districts. Coffee from Siborong-Borong (North Tapanuli), Pangribuan (North Tapanuli), and Gurgur sub-districts (Toba Samosir) are perceived to have medium grade and coffee from Muara (North Tapanuli) and Paguluran (Toba Samosir) are perceived to have the lowest grade.

Considering that OTA contaminations are likely to occur when the MC is higher than 19 per cent (a_w 0.8), it can be inferred that drying, storing, and marketing of coffee in the area are risky steps to OTA contamination. During the drying, storing, and marketing, the coffees are still very wet with 40-50 per cent MC. This implies that during these steps, the condition of coffee is favorable for moulds to grow and to OTA contaminations. However, based on interview with 4 exporters in Medan, they have not been aware of OTA contaminations. Japan as one of the most critical countries on coffee qualities has not showed any complaints associated with OTA contaminations so far. It seems that these four exporters have not perceived the contamination is an urgent problem.

There is no wide variation in marketing system and channel. The main actors in each region basically consist of farmer, collector, traders, and exporters. System of

payment is mostly cash and carry so that the interlocked market conditions are not as a common feature in the marketing system.

Marketing system of Mandheling coffee in North Sumatra is rather unique, compared to that in other coffee producing regions in Indonesia. This is characterized by (i) the transactions are mostly done at Sub-district or district market; (ii) Mandheling coffee traded are wet bean (wet parchment) with MC ranging from 40-50 per cent; (iii) coffee bean is measured in term of volume (liter) not in terms of weight (kg); and (iv) market day for coffee is fixed and regular for each sub-district.

Although there are so many farmers (sellers) and buyers in the market and farmers can freely market their coffee, the position of farmers tend to be price taker. The prices of coffee are mostly determined by exporters in Medan through their traders and collectors as price determining agencies. In general, this market structure is very close to olygopsony market. The prices of coffee vary depending on the quality. Based on processing technique applied and origin, collectors and traders distinguish coffee qualities and coffee prices.

Market performance is relatively efficient as indicated by the relatively fair profit margin gained by collectors, traders, and exporters and high farm gate price. By using marketing margin analysis in each actor, the profit margins range from 2.0 – 2.1 per cent of FOB price while farm gate price is around 86.4 per cent.

Latitude, soil properties, humidity, and processing technique are perceived as the main determining factors of Mandheling coffee. However, this is just perceptions of main stakeholders that have not been supported by scientific evidences yet.

Based on the results of the study, three recommendations are proposed:

1. Since coffee processing techniques applied in the regions are varied amongst sub-districts, the best techniques perceived (Dolok Sanggul and Lintong Nihuta system in Humbang Hasundutan) could be promoted to be adopted or adapted by other regions. One key factor to realize this is by providing higher price incentives for coffee produced in Dolok Sangul and Lintong Nihuta. One reason for the coffee from those regions has a better quality is the application of floating of red cherries before pulping to remove inferiors. Thus, the coffee output has less defectives; consequently the coffee price is higher compared to the coffee from other regions. To realize this, the local government of North Sumatra has to stipulate quality standards for Mandheling coffee using Dolok

Sangul and Lintong Nihuta coffee as references. The prices received by farmers in Dolok sanggul and Lintong Nihuta are higher about Rp 750 - Rp 1750 per kg, compared to that of other sub-district. Thus, markets provide an appreciation/incentive to better coffee quality. As a results, farmers in these two sub-districts maintain their processing technique to gain a better price.

2. Since the factors affecting the quality, especially on organoleptic characteristics, have not been identified scientifically, further research to identify the factors must be prioritized. Organoleptic characteristics are the competitive advantages of Mandheling coffee. Latitude, soil properties, humidity, processing techniques, storing, and marketing could be used as the hypothesis factors that have to be scientifically proven.
3. In more specific, further research focused on processing techniques are crucial. This research must be focused on development of processing techniques that can keep the organoleptic characteristics of Mandheling coffee, while OTA contamination can be minimized. Seven main steps of the processing techniques need to be studied in order to find out the key steps (picking, floating, pulping, fermentation, washing, drying, and storing) that have significant influences on organoleptic characteristics and OTA contaminations.

CHAPTER 1
INTRODUCTION

1.1. Background

With total production of around 45,000 tons, Arabica coffee production accounts for approximately 8.0 per cent of Indonesian coffee production in the last five year. The exports of Arabica are around 38,000 tons, accounting for 9.7 per cent of total export volume and 30.0 per cent of total export value of Indonesia coffee. With increasing support from the government, the roles of Arabica coffee in Indonesia are predicted to increase (*Direktorat Jenderal Bina Produksi Perkebunan,* 2005).

North Sumatra Province is known as one of the Arabica producing center with the production of 15,000 tons/year, accounting to 33 per cent of the Indonesian Arabica production. There are six main districts in North Sumatra producing the coffee, namely Humbang Hasundutan, North Tapanuli, Dairi, Simalungun, Samosir, and Toba Samosir. Those districts are located surrounding lake Toba (Figure 1).

Figure 1. Map location of districts producing The Mandheling coffee

Compared to the other coffee producing centers in Indonesia, such as Lampung and East Java, processing and trading system of Arabica coffee in North Sumatra are unique. The North Sumatra coffee harvest, trading and processing season occur during the wet season, the same as in Aceh where also producing Arabica coffee. Besides economic reasons, it is likely that the system of wet trading and wet processing have evolved due to difficulty in drying coffee at farmer level. As a result, coffee is initially traded from farmer to local trader at very high moisture content (MC), between 40 to 50 per cent MC. This condition causes a dilemma; on one hand, coffee produced by this system produces a unique coffee typically described as having complex body and low acidity, such as coffee produced in Southern Sulawesi (Kalosi or Toraja coffees). This coffee, known as Mandheling (or Lintong) coffee, is well known in the international specialty coffee markets. Regions where these coffees are now derived have expanded significantly and the consistency of these unique flavors now varies considerably. This coffee is appreciated for its organoleptic characteristics with a significant price premium.

On the other hand, the processing and trading system that yields coffee with very high moisture contents, theoretically is very risky associated with coffee quality and mould formation. Moreover, under this high MC, this coffee is also very risky to OTA contamination. This can threat the future of this coffee if a higher standard of the coffee traded in the international market is imposed.

The best solution for this dilemma is to develop processing and trading systems that maintain the organoleptic characteristics of the coffee and at the same time minimize the risks associated with physical coffee quality and mould formation. By now, none technical solutions could be proposed since the determining factors to obtain this special quality have not been identified yet. In response to this knowledge gap, a study to identify the factors was conducted. The study should involve fine analysis (chemical contents and sensorial analysis) of each step of the coffee.

1.2. Objective:

The objectives of this preliminary study are:

(1) To define, describe and verify the key steps in the processing and trading system of typical Mandheling coffee.

- Describe why the wet trading system has evolved.

- Identify how wide the variation in process / trading techniques is in the Mandheling system

(2) To identify points in processing and trading system where there is risk of OTA contamination and compare these with the ongoing drying and storage trials done by ICCRI.

(3) To identify points in the processing and trading system where the specialized cup quality characteristics may be produced and compare these with the ongoing drying and storage trials (cup taste, chemical, and physical analysis)

(4) To propose further studies and sampling which will help identify areas to reduce the risk of OTA occurrence, but retain the specialized flavor developed by this wet process and trading system.

This study is preliminary study that is focused on the first objective, part of the second and the forth objective. The comprehensive studies are conducted by ICCRI.

CHAPTER 2

RESEARCH METHOD

As mentioned before, the focus of this study is to define, describe and verify the key steps in the processing and trading system of typical Mandheling coffee. This objective covers describing why the wet trading system has evolved and identifying how wide the variation in process / trading techniques is in the Mandheling system. Thus, this study is basically an explorative study to identify processing and trading system of Mandheling coffee.

To describe and verify key steps in the processing and trading system, a survey was conducted in three Districts namely, Humbang Hasundutan, North Tapanuli and Toba Samosir District. Discussions and observations were conducted at farm, collector, trader, and exporter level. The descriptions of the samples are presented in Table 1.

Table 1. Number of the Sample in Four Districts of Madheling Coffee Producer

	District (Sub-district)			
Actor	Tapanuli Utara (Siborong-Borong, Pangribuan)	Humbang Hasundutan (Lintong Nihuta, Dolok Sanggul)	Toba Samosir (Muara)	Medan
Farmer	10	8	8	0
Collector	3	3	2	0
Trader	3	2	1	0
Exporter	0	0	0	4

To get these data and information related to processing and marketing of the coffee in the regions, interviews were conducted to all stake holders, namely, farmers, farmer groups, local extension service, government officers (*Dinas Perkebunan*), collectors, traders, and exporters. For farmer, 26 samples were chosen using stratified random procedure on the basis of district and farm size. Three farmer groups were interviewed. The interview was focused on their role related to harvesting, and processing method adopted by farmers, marketing system, and constraint to adopt new processing techniques, and solutions to overcome the constraints.

For collector, traders, and exporters, the focus on the interview is on some aspects of marketing systems, such as, contract (formal/informal), story about coffee chains, interlock the market, price formulation/negotiation, control/criteria of quality and how to measure, access of credit for each chains, period of holding coffee, type of processing they do (re-drying, sorting, grading).

CHAPTER 3

DESCRIPTION OF COFFEE PROCESSING/TECHNIQUES OF MANDHELING COFFEE, NORTH SUMATRA

Coffee is traditional crops cultivated in North Sumatra, such as in North Tapanuli, Dairi, Simalungun, Toba Samosir, and dan Humbang Hasundutan districts. Come from Sidikalang sub-district (Dairi), locally called *Kopi Arab* (Arabica coffee) was the main variety. However, since 1970, the new coffee variety, known as *Lasuna* or *kopi Jember* (Line-S), has been introduced. The development of this coffee in the regions has been increasing until 1990. At the beginning of 1990th, a new coffee variety, called kopi *Ateng* (*Aceh Tengah*) has been introduced. More recently a new variety is developed in the regions namely Sigararutang. Currently the last variety is dominating the coffee plantation in the regions, especially in the new orchards. The local extension officers stated that this coffee is now dominant in North Sumatra because it is relatively quick yielding (1-2 years) and producing coffee through out the year. Because of these characteristics, this coffee is called *'sigararutang'*, stands for *segera membayar hutang*, meaning quickly repay loan. Following results of interview with the farmers and the local extension officers, the maintenance of this variety is also considered to be easier at minimum uses of inputs. Farmers frequently confused using the last two names, even actually distinguishable from their flush colour and bean size. *Ateng* has green flush and smaller bean while *Sigararutang* has brown flush and bigger bean size. Clearly, farmers prefer the brown flush-bigger bean size variety, that is *Sigararutang* (which sometimes also called *Ateng* by some farmers).

3.1. Processing Techniques of Mandheling Coffee

The general features/steps of coffee processing of Mandheling coffee in North Sumatra are varied, basically depending on the regions. With some variations, there are three main groups of the processing based on locations, namely Tapanuli Utara System (Taput System), Humbang Hasundutan System (HumBasa System) and Toba Samosir System (TobaSa System). Besides their differences, all systems basically consist of seven steps, i.e.: picking, floating, pulping, fermentation, washing, drying, and storing.

3.1.1. Picking

Most farmers in all districts apply selective picking rather than stripe picking; they only pick red or yellow cherries. They harvest every week or every two weeks, depending on their size of coffee plantation. Farmers that have more than 1.5 ha coffee plantations tend to harvest their coffee every week. Coffee can be harvested throughout the year, but the peaks of harvesting seasons are August to September and February to March. Picking days differ in each region, depending on the marketing days (*hari pasaran*). In General, Farmer in HumbaSa , such as in Dolok Sanggul Sub-district, starts picking at Thursday and sells their coffee at the marketing day, that is Friday. Farmers in Lintong Nihuta (HumbaSa), Gur-gur Aek Raja/Balige (TobaSa), and Siborong-borong (TapUt) start picking at Saturday and sell their coffee at Monday. Farmers in Muara (TapUt) start picking at Saturday or Wednesday and sell their coffee at Monday or Thursday.

After picking, most farmers directly pulp the cherries, using traditional pulping machines (wooden type pulper) in their own plantations. Only few of farmers store cherries in opened basket made from bamboo within 24 hours before pulping because they wait until all cherries having been harvested.

3.1.2. Floating

While farmers in Dolok Sanggul and Siborong-Borong float the cherries before pulping, other farmers do not. However, no defect analysis was done related to this difference. According to farmers in Dolok Sanggul and Siborong-Borong , the purpose of the floating is to separate good cherries and bad cherries, a kind of sorting technique. Bad cherries will be floated and good cherries will be sunk down. Good cherries are pulped with traditional machine. Farmers in Dolok Sanggul dispose the bad cherries, while farmers in Siborong-Borong process bad cherries separately. Due to the step of processing coffees from these regions are known better in quality (less defects and higher yields), hence have better price compared to coffees from other regions.

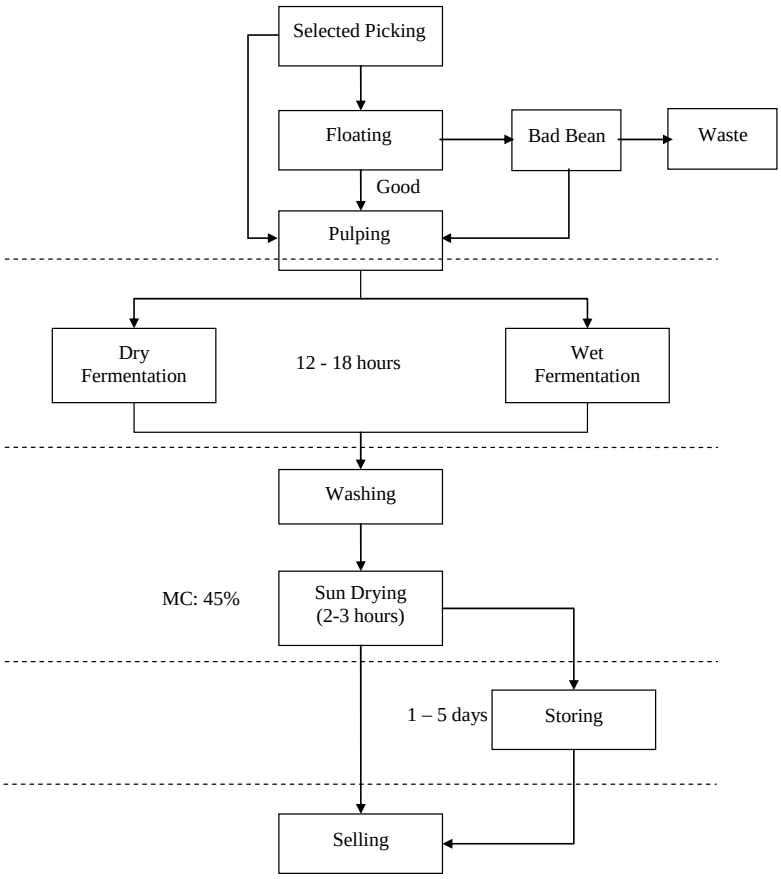

Figure 2. General coffee processing at farmer level in North Sumatra

3.1.3. Pulping

Pulping is a process to separate outer skin with bean. Cherries are pulped with traditional pulping machines (wooden type) that are operated manually. Mostly cherries are pulped directly after harvesting in the farmer coffee plantation; only few farmers pulps cherries at their home. The technique applied for this step is very similar for all system.

3.1.4. Fermentation

Farmers bring their fresh and wet coffee parchments are to home after pulping. At home, coffee beans are fermented for 12-14 hours (one night). There are two fermentation techniques applied by farmers, i.e.: dry and wet fermentation. Dry fermentation is done by storing wet parchment in a plastic bag for around 12-14 hours. On the other hand, wet fermentation is done by soaking parchment in plastic pails for around 12-14 hours and then are stored in plastic bags. Most farmers apply

dry fermentation, especially in Muara and Gur-gur Aek Raja, and few farmers in Siborong-borong.

All farmers in Dolok Sanggul and few farmers in Lintong Nihuta and Siborong-Borong apply wet fermentation. For this purpose, coffee beans are put in water for one night (12-18 hours). According to farmers, collectors, and traders, fermentation is a critical step that has an important impact on the taste of Mandheling coffee. Wet fermentation is known to produce a better taste, compared to that of dry fermentation. For this reason, Dolok Sanggul, Lintong Nihuta, and Siborong-Borong are perceived by collectors and traders to produce a better coffee quality, compared to other regions.

3.1.5. Washing

In the morning, farmers wash their parchment coffee to remove the mucilage and to separate remaining pulp from coffee parchment. Fermented coffees are brought to rivers or swamps and skin residue separated from parchment with hand. During washing process, farmers' separate good and bad coffee (by floating).. They place in different baskets and process separately. No variation was found in this step. This sorting step is present even in the case of farmers who did a floating step. For farmers in Dolok Sangul and Lintong Nihuta, the 'bad beans' are removed while for other sub-districts, the 'bad beans' are marketed with lower price.

3.1.6. Drying

After washing, coffee beans are directly dried under the sun by laying the bean in their home yard, mostly on the tarpaulin. However, it was also found that some farmers dry their coffee in coffee plantation. Drying time depend on sun-beam, around 2-3 hours. Drying is started at 08.00 am and finished at 10.00 or 12.00 am. Moisture Content (MC) of the coffee bean around 40-50 per cent. If during drying process is rainy, farmer will bring the coffee to the house and laying coffee on the floor.

3.1.7. Storing

Most farmers directly sell their coffees to the local collectors after pre-drying. Usually they put the wet parchment in woven plastic bags. In the local collectors, generally coffee will be stored for one day to wait marketing days. Farmers are very seldom to store coffee in their home. Most farmers, except farmers in Muara, harvest their cherries three days before marketing day. The first two days are allocated to

process their cherries. Only some farmers in Muara village some times store coffee in their home. They start picking along Wednesday to Sunday and directly sell their coffee to local collectors on Friday to Monday. Then the collectors will market the coffee on Monday or Tuesday.

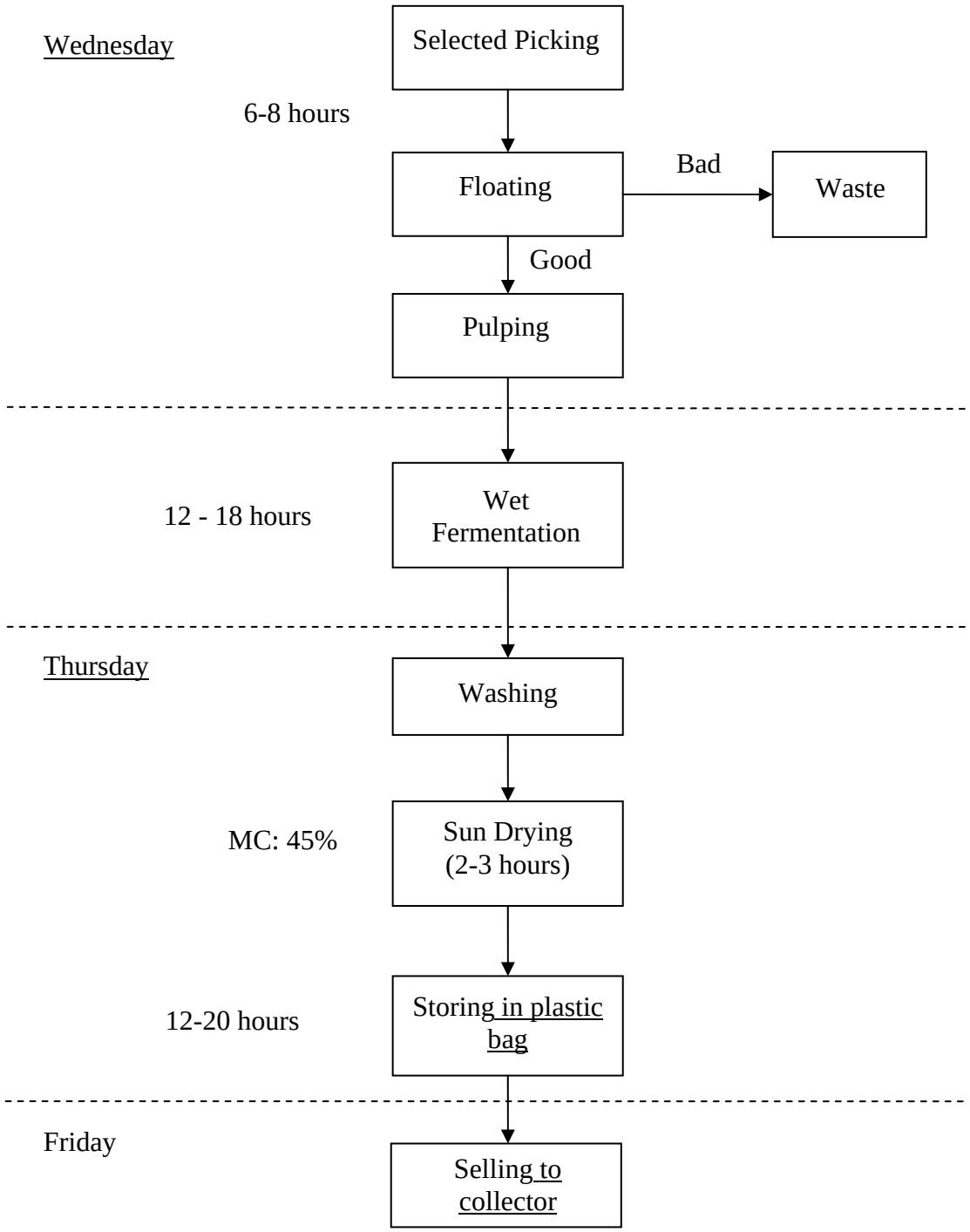

Figure 3. Coffee Processing in Dolok Sanggul, Humbang Hasundutan

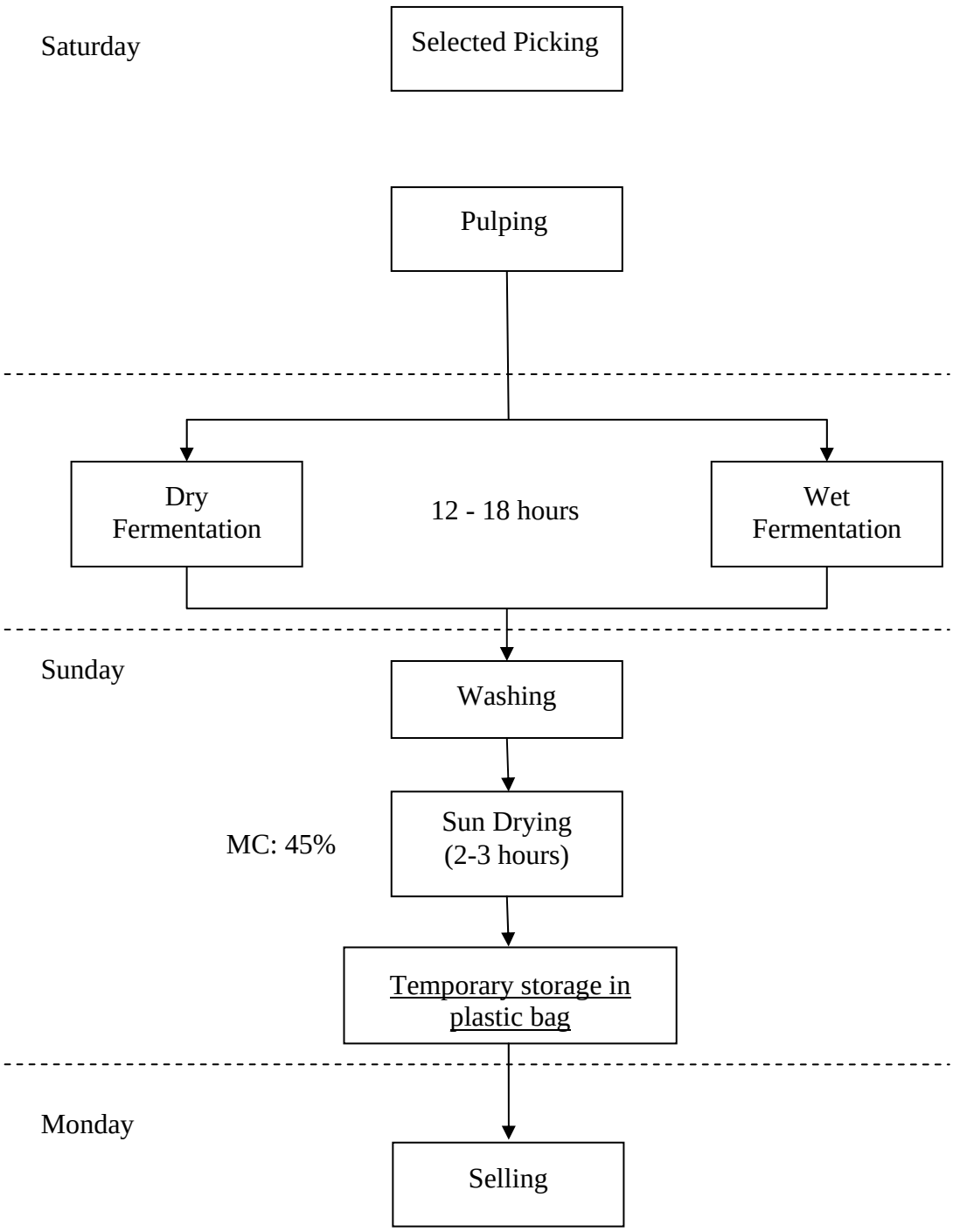

Figure 4. Coffee Processing in Lintong Nihuta, Humbang Hasundutan

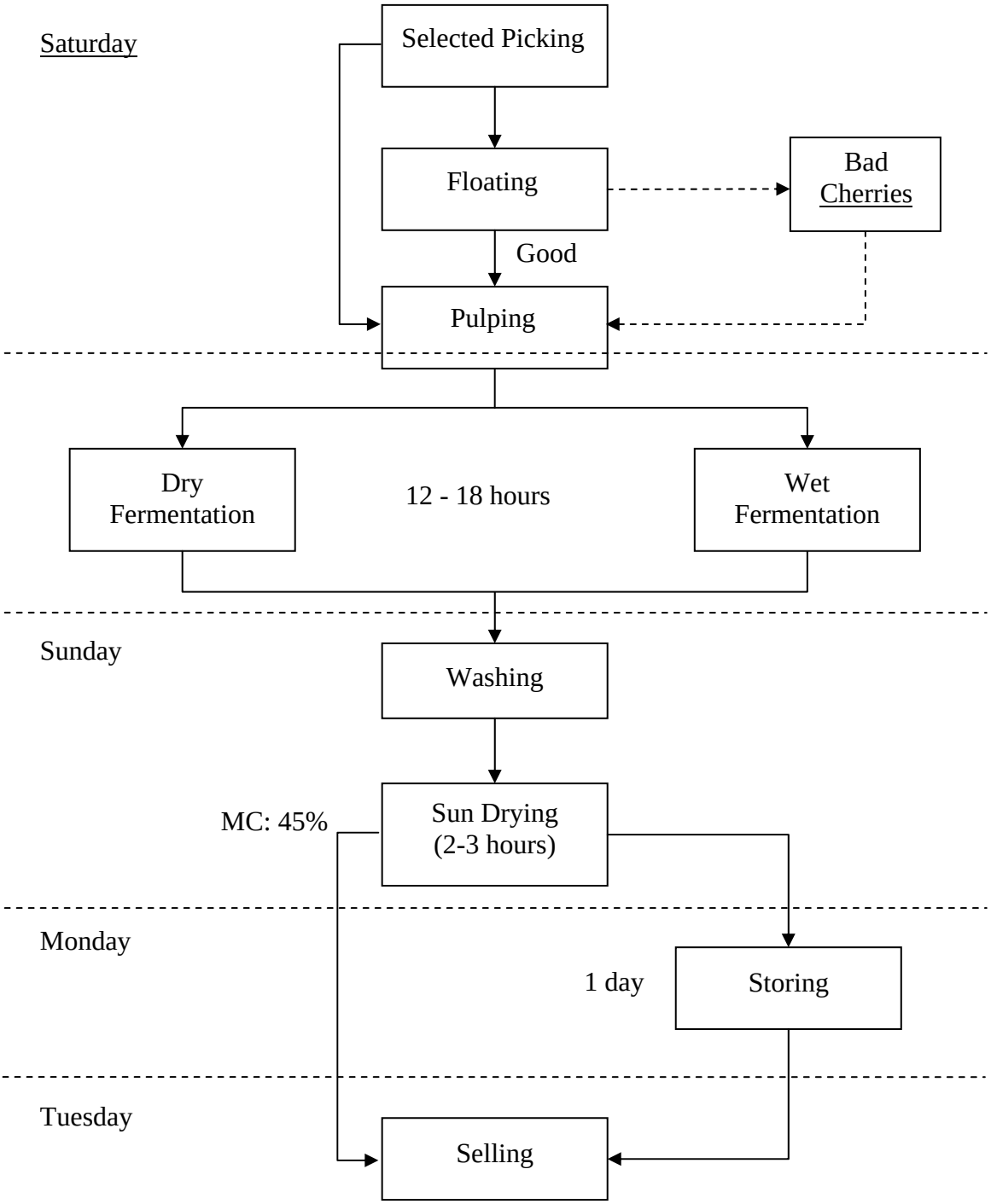

Figure 5. Coffee Processing in Siborong-borong, Tapanuli Utara

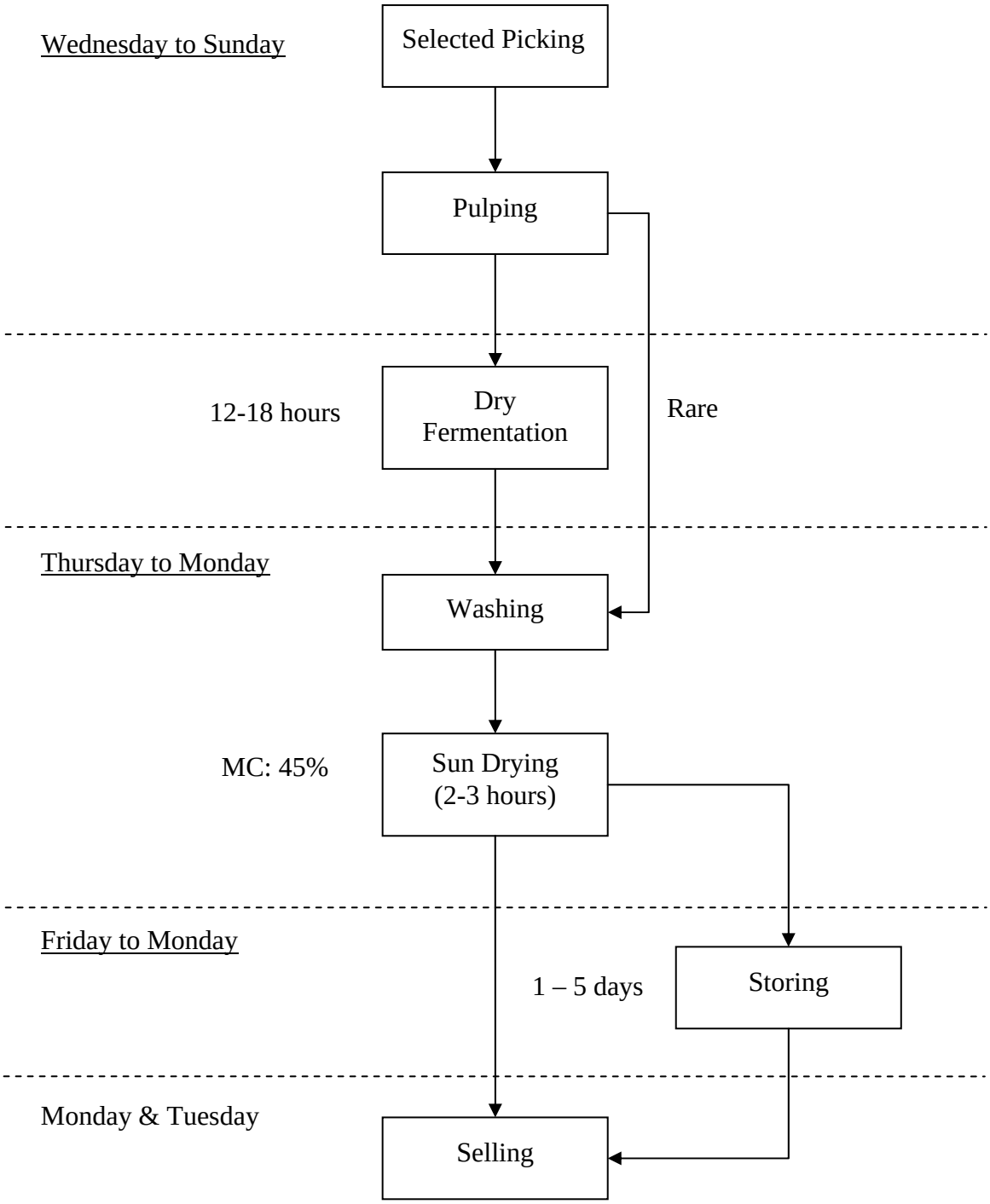

Figure 6. Coffee Processing in Muara, Toba Samosir

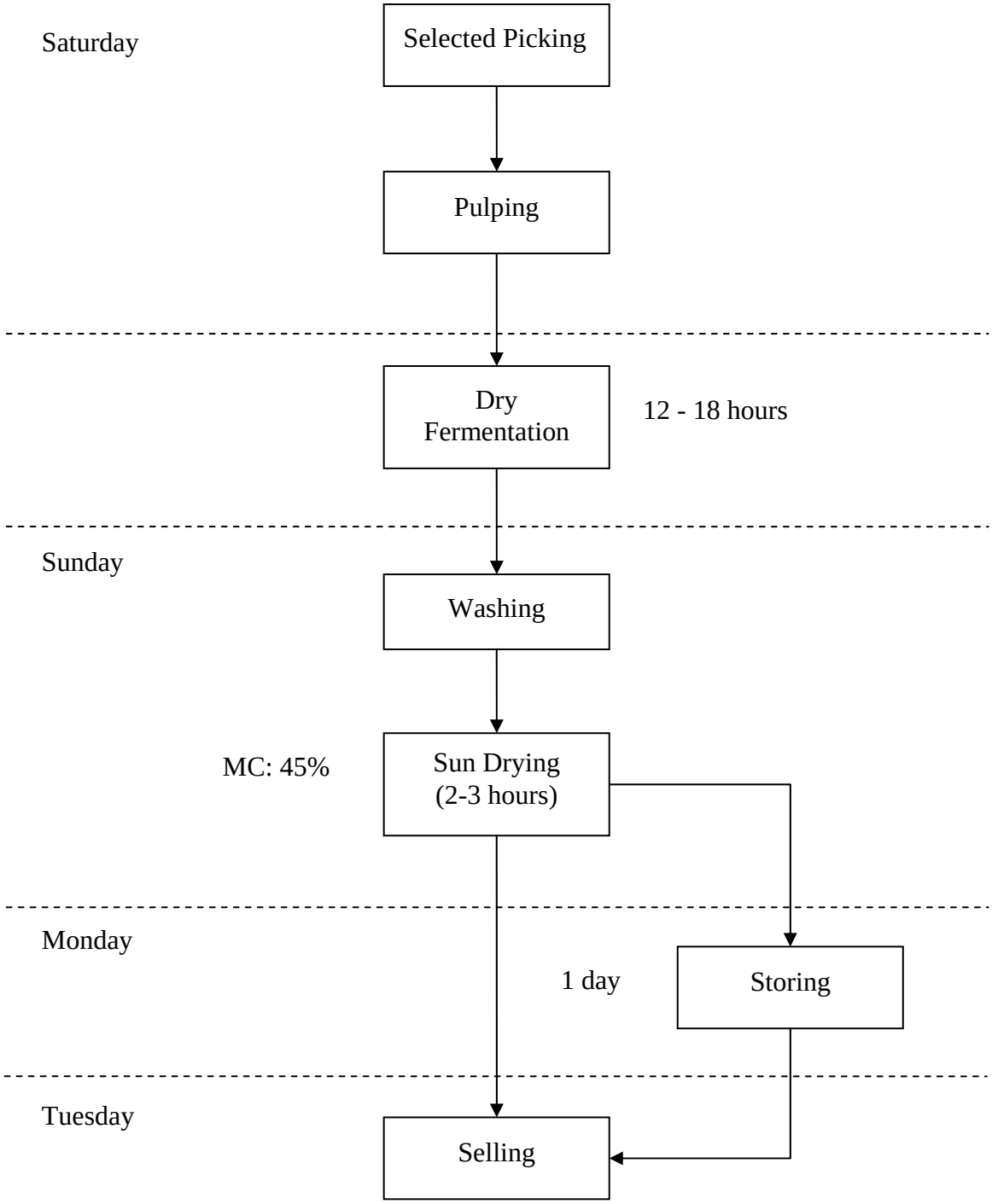

Figure 7. Coffee Processing in Gur-gur Aek Raja, Tapanuli Utara

There are five main determining factors affecting farmers in applying processing technique namely, (i) market demand (ii) tradition; (iii) demand for cash money; (iv) limited family labor, and (v) wet weather condition. According to exporters, under the current market situation, demands for Mandheling coffees that are processed using those techniques are relatively constant. Therefore, they just produce coffees that are demanded by the market, mainly determining by exporters. By this technique, it seems that coffee quality (flavor) to be unique and this has traditional markets in international trade.

Some farmers applied a certain technique because they just follow what their ancestors did and other farmers do. They cannot precisely explain why a certain technique applied; they just follow the existing technique. Other farmers explain that the main reason for applying the existing technique is that they want cash money quickly. If the applied technique that produce dry bean, not wet parchment, they have to wait for 2-3 week to get cash money since coffee has to be dried for 2-3 weeks.

Since coffee is treated as a cash crop and most farmers use the money from coffee selling to fulfill their daily basic needs (foods, transportations, educations), then the farmers are forced to get money from their coffee as soon as possible. One of the most practical ways is by shortening the time of processing activities. Marketing days in these three districts are fixed (every week) so that they have to get money within a week. As a result, they tend to not dry their coffee properly because it will take more than one week. This tendency, in the long term, changed to be a habit/tradition that has been followed by their successors.

Limited family labor is another reason proposed by some farmers. The existing systems require less labor compared to technique that produce dried coffee (DP). Since they have many activities besides as coffee farmers, the existing techniques give better use of family labor for non-coffee related activities.

Finally, some farmers and extension officers stated that the wet weather condition through out the year is also an important factor that forces farmers to store and sell their coffee in wet condition. It take long time to dry coffee under that wet weather conditions so that they consider to be inefficient if they has to dry their coffee to attain low MC (below 20 per cent). They believe that the drying process will be more efficient to be conducted by traders and exporters because traders and exporters have much better drying facilities.

3.2. Critical Steps Related to OTA Contaminations

Observing seven steps of processing techniques applied in the three districts, it is hard to determine which steps are risky to OTA contaminations. Considering that OTA contaminations will occur when the MC is higher than 19 per cent (aw 0.8), it can inferred that drying, storing, and marketing are risky steps to OTA contamination. During the drying, storing, and marketing, the coffees are very wet with 40-50 per cent MC. This implies that during these steps, the condition of coffee is favorable to OTA contaminations.

However, exporters in Medan have not been complaint due to OTA contaminations. Japan, as one of the most critical country on coffee qualities has not showed any complaints associated with OTA contaminations. Therefore, exporters in Medan have not aware about the contaminations.

Investigations on OTA contaminations of Mandheling coffee are now undertaken by ICCRI. Hopefully, this studies can reveal the level of the contaminations so that some necessary actions can be proposed to minimize the risks associated with OTA contaminations.

3.3. Factors Affecting Coffee Quality

As mentioned before, Mandheling coffee has been known as good coffee. According to the perceptions of exporters, traders, and collectors, good Mandheling coffee is characterized by:

(i) aroma is strong (at dry parchment stage)
(ii) the bean size is big;
(iii) it is clean and bright;
(iv) the color is gray to blue

Using these criteria and based on the valuation of exporters, traders, and collectors, the quality of Mandheling coffees can be differentiated based on their origin. The rank of coffee quality based on origin is presented in Table 2. Coffee from Dolok Sangul and Lintong Sub-district (District Humbang Hasundutan) is perceived as the best coffee in the three districts. Dolok Sanggul coffee is considered slightly better than coffee from Lintong.

Coffee from Siborong Borong (North Tapanuli), Pangaribuan (North Tapanuli), and Gurgur Sub-districts (Toba Samosir) are perceived to has medium grade (B). In more detail, the first two are considered to be slightly better compared to the last. Coffee from Muara (North Tapanuli) and Panguluran (Samosir) are perceived to has the lowest grade (grade C). Again, this grading is basically based on valuation of collectors, traders, and exporters using the four criteria mentioned before.

Table 2. Coffee qualities and the latitude of coffee plantation in North Sumatra

No.	Location of Coffee Plantation	Coffee Quality (Grade)*	Latitude
1.	Dolok Sanggul (Humbang Hasundutan)	A	1400
2.	Lintong (Humbang Hasundutan)	A^-	1300
3.	Siborong-borong (North Tapanuli)	B	1300
4.	Pangaribuan (North Tapanuli)	B	1200
5.	Gur-gur (Toba Samosir)	B^-	1100
6.	Muara (North Tapanuli)	C	900
7.	Panguluran (Samosir)	C	900

Note: * : Based on perception of collectors, traders, and exporters

There has been no any study that can convincingly identify factors determining the good quality of Mandheling coffee especially on organoleptic aspects. Therefore, this study tried to identify these factors on the basis of perception of main stakeholders, especially exporters, traders, and collectors, as the main marketing agents. Following their perceptions, latitude is perceived as one of the main factor determining the coffee quality. As seen in the table, the higher the location of the coffee plantation, the better coffee quality. For example, Dolok Sanggul that produces the best coffee quality is located at the highest latitude, that is 1400 above sea level. On the contrary, Panguluran that is located at 900 above sea level (the lowest latitude), has perceived the lowest coffee quality.

The second important factor that is guessed to determine coffee quality is processing technique. Farmers in Dolok Sangul and Lintong that are perceived to produce 'the best coffee quality', apply a better processing techniques that are also perceived to be the best. For example, farmers in the regions are perceived to apply the best selective picking. Moreover, they removed unqualified cherries by floating

or during washing so that only the best coffees are processed. Moreover, fermentation and sorting are also conducted in a proper way (clean and timely). However, there is no any conclusion about the optimum time of fermentation to get the best coffee quality. In general, the mucilage is easy to remove.

According to the perceptions/valuations of the main stakeholders, soil and humidity are also considered as the determining factors of coffee quality, although their influence is relatively lower compared to that of latitude and processing technique. Of course, this perceptions have not been statistically analyzed. This argument is explained by the fact that there are some correlations between latitude and soil properties and between latitude and humidity. For example, in general the higher the latitude, the higher the temperature that will affect soil properties. Thus these three factors are perceived to be inter-related in affecting the coffee quality. This perceptions have to be scientifically tested.

CHAPTER 4

DESCRIPTION OF MARKETING SYSTEM OF THE MANDHELING COFFE

Mandheling coffee from North Sumatra has been well known as specialty coffee since the colonial era. Since its specialty, it has traditional markets with relatively a higher price premium, compared to other Arabica coffees produced in Indonesia. Its market destination is international markets, such as USA, Japan and Europe. In North Sumatra, these coffees are produced and marketed in Humbang Hasundutan district, such as in Dolok Sanggul and Lintong Nihuta sub-district, Tapanuli Utara district, mainly in Siborong-Borong sub-district and Muara, and Toba Samosir district mainly in Gurgur Sub-District.

4.1. Market Structure

Marketing system of Mandheling coffee in North Sumatra is rather unique, compared to that in other coffee producing regions in Indonesia, such as Lampung and East Java. In other regions, the transactions between farmers and collectors takes place in village market, while in North Sumatra, the transactions are mostly done at sub-district or district markets. In other regions, coffees traded are dry bean with MC ranging from 14-20 per cent. On the contrary, Mandheling coffee traded in North Sumatra are wet parchment with MC ranging from 40-50 per cent. In addition, coffee mass is measured in term of volume (locally called "Tumba"), assuming that 1 Tumba (= 2 liters) is around 1.05 - 1,1 kg. Although this was not systematically checked during the survey, farmers and collectors have had a long common understanding about this measurement.

The other unique characteristic of the coffee marketing in North Sumatra is that the market day for coffee is fixed and regular for each sub-district (Table 3). For Subdistrict Lintong Nihuta in Humbang Hasundutan District and Sipahutar sub-district in North Tapanuli district, the market day is every Monday. The market day for Siborong-Borong as one of the biggest market in the region, is every Tuesday.

Table 3. The unique characteristic of the coffee marketing in North Sumatra

No.	Market	Day
1.	Lintong Nihuta (Humbang Hasundutan)	Monday
2.	Sipahutar (Tapanuli Utara)	Monday
3.	Siborong-borong (Tapanuli Utara)	Tuesday
4.	Pangaribuan (Tapanuli Utara)	Wednesday
5.	Dolok Sanggul (Humbang Hasundutan)	Friday
6.	Tarutung (Tapanuli Utara)	Saturday

Farmers usually directly market their coffee during the market day. For some farmers whose location is relatively remote from the market location and their coffee volume is relatively small, they tend to sell their coffee to collectors in the village. Then, the collectors will sell the coffee to the market.

In a market, there are around 200 – 300 collectors so that the market structure is very close to a competitive market. Farmers try to find out collectors who give the highest price. On the other hand, collectors try hard to find farmers who sell coffee in the market. Our observations indicated that with so many collectors in a market, the level of competition to get coffee is very tough. Collectors use various approach, from the soft (persuade) to rude one.

The prices of coffee vary, depending on the quality. Based on processing technique applied, collectors and traders distinguish coffee qualities based on the origin. As discussed before, processing techniques vary according to the origins of coffee (Table 4). Coffee from Dolok Sanggul is perceived to have the best quality (Grade A) so that its price basis was Rp 14,000/kg (December 2004). The actual price will be around that figure with variation around Rp 250/kg. The second best coffee quality come from Lintong with price around Rp 13,750/kg. The coffees come from Muara and Paguluran sub-district are perceived to have the lowest coffee quality so that the prices for these coffee were around Rp 12,000/kg.

Table 4. Coffee Origin, Grade, and Price in North Sumatra

No.	Origin of Coffee /Sub-district	Grade	Price (Rp/liter)*)
1.	Dolok Sanggul	A	14,000
2	Lintong	A-	13,750
3	Siborong-borong	B	13,000
4	Pangaribuan	B	13,000
5	Gur-gur	B-	12,500
6	Muara	C	12,000
7	Paguluran	C	12,000

*) Prices on 15- 24 December 2004

In relation with farmers, there two types of collector. The first type that is the most dominant (70-90 per cent), is collector that has no any "business relationship" with farmers, except coffee marketing. Under this condition, farmers and traders act as sellers and buyers under a competitive market. The second type is collectors that have business relationships with farmers. These collectors may lend some money, basic needs, or production inputs (fertilizer) to farmers. Under this condition, farmers tend to sell their coffee to these collectors. Farmer look like under interlocked market situation; however, the degree of the interlocked market is much lower compared to the situation in Lampung. For example, farmers can return their loan using cash money so that the farmers do not have to sell their coffee to the collector lending money to them.

In each market (sub-district), there will be 5-10 traders who wait to buy coffee from local collectors. A trader usually has 10-20 collectors that regularly supply coffee to them. This is indicated by a strong relationship between collectors and the traders. Traders usually lend some money to collector (Rp 10 – 20 millions) per collector that is used as capital to buy coffee from farmers. Under this situation, collector acts as a agent of trader. Price is determined based on farm gate price plus some operational cost (handling) and some profit margin. If collectors have no any loan received from traders, then they will act as free collector. They will search for traders that give the highest price. There will be a bargain between collectors and traders in determining the quality and price of the coffee. The number of agent and

free collector is almost the same that is round 45 per cent and 55 per cent of total colector, respectively.

Traders market their coffee to exporters in Medan, the capital city of North Sumatra. In Medan, there are 143 registered exporters but the there are only 29 active exporters in Medan that regularly buy coffee from traders in North Sumatra.

There are two exporters directly operating in Siborong-Borong. They mainly 'manage' some collectors and traders that buy coffee from farmers. The collectors generally act as agents of the exporters. These exporters determine the standard coffee quality and the price. There are three main benefits of the presence of exporters in Soborong-Borong. Firstly, their presence tends to promote the improvement of coffee quality through a kind of quality standardization. They only buy coffee that qualifies the standard stipulated by the exporters. This measure has increased awareness of farmers and collectors on coffee quality. Secondly, their presence in the region has increase market competition that tends to benefits farmer. Collectors that are not the agent of the exporters have to compete with the agents to buy coffee from farmers, leading to better farmgate prices. Thirdly, the exporters introduce price transparency related to quality. These exporters regularly announce the prices based on coffee quality so that farmers will have clear information on coffee prices. However, the presence of the exporters in Siborong-Borong put high pressure to collectors and traders that are not 'agent' of these exporters. The bankruptcy of some collectors and traders in the region, to certain extent, is related to their direct presence in the region.

Although there are so many farmers (sellers) and buyers in a market in, and farmers can freely market their coffee, the position of farmers tend to be price taker. The prices of coffee are mostly determined by exporters in Medan. They send this price information to traders and collectors. Based on this price then collectors will use this as a price reference in buying coffee in a market. In general, this market structure is very close to olygopsony market.

4.2. Market Conduct

The marketing channel/systems of Arabica coffee in North Sumatra are almost homogenous. There is no any significant difference market channel between one market to another. The general feature of the marketing channel can be described as seen in Figure 7. Farmers sell their coffee directly to the collectors in market at sub-

district level. At this level, there are some important characteristics of marketing system in North Sumatra, namely:

1. Traded coffee between farmers with collector is wet parchment with very high MC, around 40 – 50 per cent.
2. Since the coffee is very wet, then the measurement unit is volume (liter/Tumba), not weight (kg). One Tumba (2 liter) coffee is equivalent to around 1.05 – 1.1 kg.
3. Bargain between farmers and collectors is not only about price, but also quality.

Collectors directly sell their coffee to trader. In other words, they do not conduct any treatment to the coffee. On the other hand, before selling to exporters, traders do some treatment, such as re-drying, sorting, hulling, blowing (to remove light impurities) to meet standard determined by exporters. A collector generally hold the wet coffee for 6-24 hours while traders around 3-4 days. Traders sell their coffee to exporters in Medan. Most traders are given cash money by exporters so that these traders are expected to sell their coffee to the exporters lending money to them. However, there are also some independent traders who do not receive any loan from exporters. These traders freely sell their coffee to exporters that give the highest price.

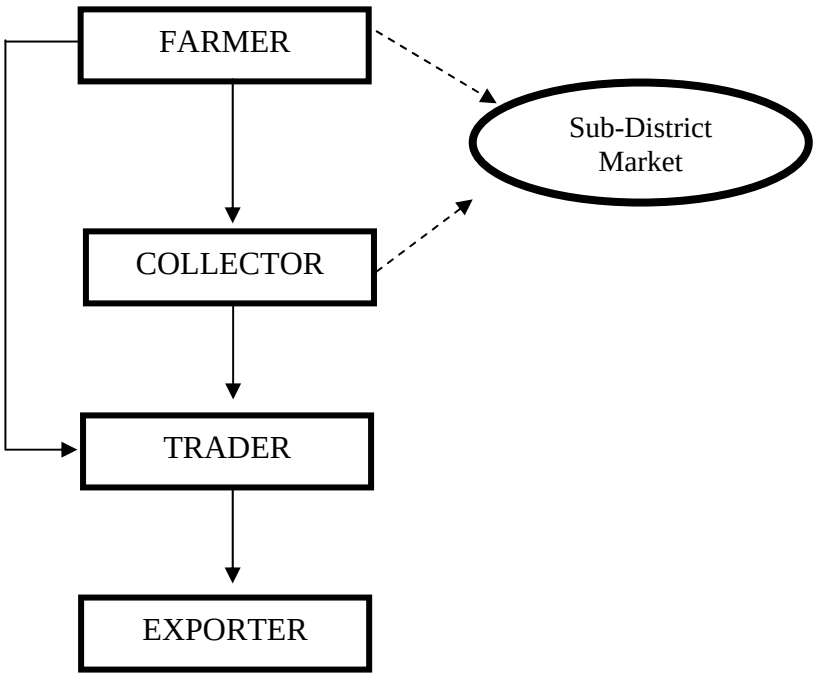

Figure 8. Coffee marketing flowchart in North Sumatera

Collectors and traders do not buy coffee only on a single market; they are very mobile from one market to another, following the orders of exporters and traders. A collector usually buys coffee around 3.5-5.5 tons per month, while that of traders is between 35 – 150 ton per month.

Following that exporters control traders and traders control collectors by lending cash money, the prices at farm gate level has strongly been determined by exporters in Medan. Although there are also some independent traders and collectors, they tend to follow the prices determined by big exporters in Medan. In international market, Mandheling coffee has its traditional markets such as Europe, North America (USA) and Asia, mainly Japan.

4.3. Market Performance

In this discussion, market performance is focused on market efficiency by evaluating marketing costs and margins for each level. By taking the average grade (Siborong-Borong), the price at farm gate was Rp 13000 or farmer received around 86.4 per cent of FOB price (Table 5). This farm gate price is relatively good compared to that in the other region. In Lampung for example, our study found that the farm gate price was around 75.9 per cent. In Indonesia, farm gate price above 85 per cent is considered as an indicator that marketing is fairly efficient.

Table 5. Processing and Marketing Costs of Coffee in North Sumatra

Level	Cost (Rp/kg)		Margin (Rp/kg)		Price at (Rp/kg)	Proportion (%)
	Average	Range	Average	Range		
Farmer					13,000	86.4
Collector	91	75 - 325	306	136 - 414	13,397	89.1
Trader	669	425 - 720	323	123 - 861	14,389	95.7
Exporter	250	200 - 300	400	200 - 500	15,039	100.0

At collector level, the average marketing cost is Rp 91/kg coffee bean with a range between Rp 75 - Rp 325/kg or around 0.6 per cent of FOB Price (Table 6.). Since collectors do not conduct any treatment, then the cost is basically transportation cost. The average marketing margin for collector is between Rp 136 – 414 with the average of Rp. 306/kg or around 2.0 per cent of FOB price. This again indicates that the market at collector level is also relatively efficient.

Table 6. Proportion of Processing and Marketing Costs of Coffee in North Sumatra

Level	Cost (%)	Margin (%)	Price at
	Average	Average	(%)
Farmer			86.4
Collector	0.6	2.0	89.0
Trader	4.4	2.2	95.7
Exporter	1.7	2.7	100.0

Since coffee bought by traders are still very wet (wet parchment), then traders do some processing such re-drying, blowing, and sorting to meet the standard quality required by exporters. Generally, these processes will convert wet parchment to be coffee with 13-16 percent MC. Total cost for all these treatments were estimated around Rp 669/kg (Table 7) with range between Rp 425 – Rp 720/kg. This cost contributes to around 4.4 per cent of FOB price. The average profit margin a trader level was estimated around Rp 333 or around 2.1 per cent o FOB price. However, the profit margins are highly fluctuated as indicated by its range (Rp 123 – Rp 862 per kg). The profit margin received by traders is almost the same as those collectors.

Table 7. Cost Structure of Coffee Processing at Traders' Level

No.	**Activities**	**Cost (Rp/kg)**
1.	Transport and handling	369
2	Parchment drying	33
3	Hulling	67
4	Bean drying	125
5	Blowing and sorting	33
6.	Others	42
	Total marketing cost	669

CHAPTER 5

CONCLUSIONS AND SUGGESTIONS

5.1. Conclusion

1. Coffee processing techniques applied for Mandheling coffees in North Sumatra are varied, basically depending on the regions. There are three main groups of the processing based on regions/locations, namely Tapanuli Utara, Humbang Hasundutan and Toba Samosir system. Besides their differences, all systems basically consist of nine steps, i.e.: picking, floating, pulping, fermentation, washing, pre-drying, wet parchment hulling, re-drying and storing. The collectors, traders, and extension officers perceive that the 'best systems' was found in Humbang Hasundutan where almost all processes are perceive to be properly conducted.
2. There are five main determining factors affecting the selection of processing technique, namely, (i) market demand (ii) tradition; (iii) demand for cash money; (iv) limited family labor; and (v) wet weather condition.
3. According to the perceptions of exporters, traders, and collectors, good Mandheling coffee is characterized by its (i) strong aroma; (ii) big bean size; (iii) clean and bright; and (iv) gray to blue color. No clear explanation the basis of organoleptic judgment of the coffee.
4. The valuation of exporters, traders, and collectors indicated that coffees from Dolok Sangul and Lintong sub-district are perceived as the best coffee in the six districts. Coffee from Siborong Borong, Pangribuan, and Gurgur Sub-districts are perceived to has medium grade and coffee from Muara and Panguluran are perceived to have the lowest grade.
5. During the drying, storing, and marketing for around 3-5 days, the coffees are very wet with 40-50 per cent MC. This implies that during these steps, the conditions of coffee are favorable to OTA contaminations. However, exporters in Medan have not been complaint due to OTA contaminations. Japan as one of the most critical country on coffee qualities has not showed any complaints

associated with OTA contaminations. Therefore, exporters in Medan have not aware about the contaminations.

6. There is no wide variation in marketing system and channel. The main actors in each region basically consist of farmer, collector, traders, and exporters. System of payment is mostly cash and carry so that the interlocked market conditions are not as a common feature in the marketing system.
7. Marketing system of Mandheling coffee in North Sumatra is rather unique, compared to that in other coffee producing regions in Indonesia. This is characterized by (i) the transactions are mostly done at Sub-district or district market; (ii) Mandheling coffee traded are wet bean (wet parchment) with MC ranging from 40-50 per cent; (iii) coffee bean is measured in term of volume (locally called "Tumba"= 2 liters), not in terms of weight (kg); and (iv) market day for coffee is fixed and regular for each sub-district. Moreover, some 'bad beans/not qualified beans' are removed while some are sold to collectors with a lower price.
8. Although there are so many farmers (sellers) and buyers in the markets and farmers can freely market their coffee, the positions of farmers tend to be price taker. The prices of coffee are mostly determined by exporters in Medan through their traders and collectors as price determining agencies. In general, this market structure is very close to olygopsony market.
9. The prices of coffee vary depending on the quality. Based on processing technique applied and origin, collectors and traders distinguish coffee qualities and coffee prices.
10. Market performance is relatively efficient as indicated by the relatively fair profit margin gained by collectors, traders, and exporters and high farm gate price. The profit margins range from 2.8 – 3.8 per cent of FOB price while farm gate price is around 86.4 per cent.
11. Latitude, soil properties, humidity, and processing technique are perceived as the main determining factors of Mandheling coffee. However, this is just perceptions of main stakeholders that have not been supported by scientific evidences yet.

5.2. Suggestions

1. Since coffee processing techniques applied in the regions are varied amongst sub-districts, the best techniques (Dolok Sanggul and Lintong Nihuta System in Humbang Hasundutan) could be promoted to be adopted or adapted by other regions. One key factor to realize this is by providing higher price incentives for coffee processed using Dolok Sangul and Lintong Nihuta. To realize this, the local government of North Sumatra has to stipulate quality standards for Mandheling coffee using Dolok Sangul and Lintong Nihuta coffee as references.
2. Since the factors affecting the quality, especially on organoleptic characteristics, have not been identified scientifically, further research to identify the factors must be prioritized. Organoleptic characteristics are the competitive advantages of Mandheling coffee. Latitude, soil properties, humidity, processing techniques, storing, and marketing could be used as the hypotheses factors that have to be scientifically tested.
3. In more specific, further research focused on processing techniques are crucial. This research must be focused on development of processing techniques that can keep the organoleptic characteristics of Mandheling coffee, while OTA contamination can be minimized. Seven main steps of the processing techniques need to be studied in order to find out the key steps (picking, floating, pulping, fermentation, washing, drying, and storing) that have significant influences on organoleptic characteristics and OTA contaminations.