FINAL

ENHANCEMENT OF COFFEE QUALITY THROUGH PREVENTION OF MOULD FORMATION

Investigation of the Feasibility of Wet Processed Robusta by Smallholder Farmers in East Java

NATIONAL CONSULTANT REPORT

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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 second social-economic study, that is, **Investigation of the Feasibility of Wet Processed Robusta by Smallholder farmers in East Java**.

Bogor, April 2005

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Investigation of the Feasibility of Wet Processed Robusta by Smallholder Farmers in East Java

With total area of 92,741 Ha, East Java has been on of the main coffee production center in Indonesia. Malang and Jember Sub-District are two main coffee regions in East Java. The government of East Java has placed coffee industry as one of main agribusinesses in the region. Garahan Village is one of main coffee producing centers in Jember Sub-District. Unfortunately, farm income of coffee farmers in Garahan is not optimum due to low productivity (840 kg coffee bean /ha) and inefficient and imperfect market situation causing farm gate price is only around 70-85 per cent or around Rp 4800 – Rp 5600 per kg. As a result, most farmers' income is relatively low, around Rp 4.5 – 11.6 million/household.

A strategic measure to overcome these complex problems is by changing the coffee processing system/technique, from dry process (DP) to wet process (WP). This measure is considered to be strategic because its direct impact on farm gate price and income. The idea of changing on processing was inspired by the success story of coffee farmers in Pupuan, Bali. The farmers in Pupuan under supervision of ICCRI and local government institutions, made a contract with a buyer, to improve their coffee quality to gain a higher prices. The prices of WP coffee gain a 50 percent higher price compared to coffee processed using dry process. Moreover, the declining export of Robusta WP from East Java, from 10,306 tons in 2001 to be only 6,848 tons in 2004, indicates a declining production of Robusta WP by large estates in East Java. This inability of the large estates to meet the demand can be replaced by smallholders.

Before this idea can be implemented, a study to assess the feasibility of this change is crucial. This study is intended to assess the feasibility from some aspects, such as technical, management and organization, market, and financial aspects. The results of this feasibility study could be used as basis whether the change from dry to wet process can be implemented in Garahan.

Following this, the objective of this study is to assess the feasibility of implementing wet process of coffee in Garahan, East Java. The feasibility is assessed

based on technical, management and organization, market opportunity, and financial aspects.

The method used in this study is basically financial analysis. However, to get more comprehensive features of the coffee industry in Pupuan and Garahan, some technical, coffee quality and processing and marketing aspects were also elaborated. For this reasons, coffee quality analysis, processing techniques, and marketing performance were also analyzed. Coffee samplings were taken from farmers and collectors/traders and interviews were conducted with almost all stakeholders of coffee industry (farmers, traders, collectors, government officers).

The results of the study show that wet process has been successfully adopted by coffee farmers in Pupuan, Bali. Five key factors were identified as the key success factors of the adoption, namely, (i) market access and fair price guarantee, (ii) intensive and consistent supervisions, (iii) effective farmer organization; (iv) strong and effective leadership, and (v) local government supports. By now, there are four types of coffee processing techniques in Pupuan, namely, dry process, semi-wet process, wet process, and wet process without washer.

Coffee qualities produced by farmers in Pupuan are medium, as indicated by its defect value and MC. The average defect value at farm level was about 99 with coefficient variation of 43 per cent. This implies that the variation of defect is relatively high. Around 35% of sample has defect value to be less that 80, while 41 per cent having defect between 80-120. Around 23 per cent have high defect value of more than 120.

MC of coffee produced by DP technique in Pupuan indicates that the MC is moderate; it is better than that in Lampung (19 per cent) but worse compared to that in East Java (13 per cent). The average MC was of 14.7 per cent with low coefficient of variation of 9.7 percent. Although collectors claimed that they do some processing activities (re-drying and sorting), the results are marginal. Their activities only reduced MC from 14.71 to 13.50 with defect values are almost the same. Thus, the quality of coffee has been strongly affected by processing technique applied by farmers.

Six samples of DP coffee and 4 samples of WP coffee in Pupuan were analyzed. The results of analysis show that OTA contamination of DP coffee is very low with the average of 0.14 ppb. The highest OTA contamination is 0.31 ppb while the lowest is 0.01

ppb. For WP coffee, no OTA contamination was found. This means that OTA contamination for WP and DP coffee in Bali still below the standard stipulated by the EU.

The adoption of wet process has a significant impact on coffee industry in Pupuan. The adoption has caused an improvement on coffee quality, indicated by lower moisture content, defect, and no OTA contamination. With price guarantee of Rp 7,500/kg in 2004 harvesting season, which was around 50% higher that of DP coffee, farm income has increased, although some farmers still perceived that this price incentive is not sufficient yet.

Coffee quality in Garahan is relatively good. In terms of defect, the average value was 64.2, much lower than 80 as an indicator of good coffee quality. More than 55 per cent of coffees have defect value to be less than 80, while around 44.4 per cent have defect value ranging from 80-120.

Similarly, the average MC is also low, that is 13.04 per cent, very close to the good coffee standard of 12 per cent. Around 22.2 per cent of samples have MC to be less than 12 per cent, while the rest are more than 12 per cent. However, coffee quality in the regions is varied, indicated by its high coefficient of variation of defect value of 50 per cent.

OTA contamination is not found in coffee samples of Garahan, East Java. The results of OTA analysis shows that all samples have zero OTA contamination. Thus, various DP techniques applied by the farmers in East Java have no any problems related to OTA contamination.

With similar characteristics, coffee farmers in Garahan, East Java have indicated a high interest to adopt wet process (WP). To evaluate the feasibility of the adoption, four aspects of the adoption were assessed, namely technical, managerial and organization, market, and financial aspects. Technically, the adoption of WP in Garahan is feasible. Farmers in general have a high interest and sufficient skills, although their skills related to WP process need to be improved. However, the specification (type) of the machinery that is suitable to the farmers is not determined yet. In other words, technically will be feasible if ICCRI, local private equipment manufacturers, and farmers can develop types of machinery that are suitable to be applied in the region.

From managerial and organization perspective, the adoption of WP in Garahan is likely to be successful. Similar to farmer organization in Pupuan Bali, the existing farmer

organizations have functioned well by incorporating financial, social, and religious values in laws and rules. However, their capacity in planning and reporting has to be improved.

From market perspective, the adoption of WP in the region is likely to be constrained by market size with price guarantee. Under the current prices, the potential supply was estimated around 1,800 tons; based on ICCRI estimates and negotiations with exporters, the potential demand was estimated 5,000 – 20,000 tons per annum.

Financially, the adoption of WP in Garahan is feasible. Under the current price of WP coffee and some price scenarios, financial feasibility indicators (B/C of profit margin) indicate that the adoption of WP in Garahan is feasible. The potential problem related to financial aspects is of capital and cash money.

Some policy implications that can be derived from this study are as follows:

1. Based on technical consideration and farmers aspirations, the most likely WP machineries to be adopted by farmer group in Garahan have the following characteristics: (i) *medium size* (ii) *mobile*; (iii) *using a motor as source of power*; and (iv) *integrated pulper and huller*. Moreover, the capacity of farmers in terms of quality improvement technology has to be improved. Technical feasibility of development WP process in the region will be strongly depending on the availability of the machineries that have those characteristics. ICCRI should have a critical role in developing these machineries and increasing farmers' skills on technology improvement.
2. In term of management and organization, the farmers in Garahan still need some training and supervision, especially on planning, reporting and effective leadership.
3. Considering the potential supply and demand of WP coffee in Garahan, it can be concluded that there is a significant market opportunity for the DP coffee. However, the development of production has to be managed carefully to avoid over supply. In other words, the production schedule has to follow the real market that has been clearly identified.
4. Since there are significant potential markets, then efforts to realize these markets are key factors to improve coffee quality in Indonesia. Individual farmer and farmer organization generally have no capacity to create and access the markets. Under this circumstance, mediator institutions, such as ICCRI and government institutions and private institutions could have a better access to these markets.

5. In negotiating price of WP coffee in Garahan, two price scenarios are proposed. The first is called break-even + cost of family labor. This scenario is basically used firm approach so that all costs, including family labor costs, are considered as costs. Under this scenario, the premium price is 33 per cent. The second scenario is called break-even + cost of family labor + quality premium. This scenario is based on firm approach and considering the risk of applying new technology (appreciation of applying new technology). Under this scenario, the prices premium range from 37-52 per cent.
6. Insufficient cash money has caused most farmers are in an interlocked market situation that block the farmers to improve their coffee quality. To break this in vicious circle, credit availability is a determining factor. Under the new government that is likely to have a higher attention to agriculture in general, the provision of soft loan for farmers is expected to increase.

CHAPTER 1
INTRODUCTION

1.1. Background

With total area of 92,741 Ha, East Java has been on of the main coffee production center in Indonesia. Malang and Jember Sub-District are two main coffee regions in East Java. Total coffee production in the region was 8,977 tons in 2004, contributing to 1.31 per cent of Indonesian coffee production (Direktorat Jenderal Bina Produksi Perkebunan 2003). In the region, there are around 168,910 farmers whose main income comes from coffee business. The government of East Java has placed coffee industry as one of main crops in the region that is given a high priority by the local government, such as in terms of soft loan and input subsidy.

In developing coffee industry in the region, the main actor, namely coffee farmers, still face some problems, from technical to marketing problems. Due to inadequate crop maintenance and cultivation, they yield is considered to be low, that is 610 kg/ha which is lower than the national average of 705 kg/ha. Coffee quality is also low with moisture content (MC) around 14-18 per cent. Inefficient and imperfect market situation cause farm gate price is only around 70-85 per cent. As a result, most farmers' income is relatively low with the average of around Rp 4.5 – 11.6 million/household. Unless this problem can be solved, development of coffee industry in the region could not be realized.

A strategic measure to overcome these complex problems is by changing the coffee processing system/technique, from dry process (DP) to wet process (WP). This measure is considered to be strategic because its direct impact to farm gate price and income. In other words, there will be no a significant time lag between the action and the impacts. Other improvements, such as on cultivation or rehabilitation will not have a quick yielding impacts because there will be a significant lag between the improvement and the impacts.

It has been known since some decades a ago that East Java is the main producer of wet processed Robusta (and Arabica) coffee, which known as WIB (*West Indische Bereiding*) coffee. The coffee has produced by big plantations own by Government and

private companies, and marketed under the brand of Java WIBs. The production of WP Robusta (and Arabica) in East Java has declined recently, mostly due to the the low price of coffee and high production cost in big plantation.

Currently, total export of WP coffees (Robusta and Arabica) from East Java has declined significantly due to the lower of production. Export of WP Robusta has declined from 11,166 tons in 2000 to only 6,848 tons in 2004. The decline is likely being continued if the price of coffee remain low and cost of production in the big plantation is increased. In order to replace the shortage, it is required such programme to convert production of coffees belong to farmers from dry process into wet process. The programme will not only improve the quality, but also improve the price and income of farmers.

The idea of changing on processing was inspired by the success story of coffee farmers in Pupuan, Bali. In the region where Robusta coffee grows well, the farmers under the supervision of ICCRI and local government institution, made a contract with buyer, to improve their coffee quality to gain a higher prices. This is a kind of direct market where the sellers directly meet traders to determine price and quality. The improvement of coffee quality is done by changing the coffee processing, from dry to wet process. The prices of WP coffee gain a 50 percent higher prices compared to coffee processed using dry process. For example, when the price of dried-processed coffee is Rp. 5,200, that of wet-processed coffee is around Rp 7,500/kg. Moreover, the declining export of Robusta WP from East Java, from 10,306 tons in 2001 to be only 6,848 tons in 2004, indicates a declining production of Robusta WP by large estates in East Java. This inability of the large estates to meet the demand can be replaced by smallholders.

Considering some similarities between coffee farming and processing in Pupuan, Bali with those in Garahan Sub-district in East Java, the farmers in Garahan are considered to have capacity and capability to change their processing technique, from dry to wet process. Before this can be implemented, a study to assess the feasibility of this change is crucial. This study is intended to assess the feasibility from some aspects, such as technical, labor availability, and financial aspect. The results of this feasibility study could be used as basis whether the change from dry to wet process can be implemented in Garahan.

1.2. Objectives

The objective of this study is to assess the feasibility of implementing wet process of coffee in Garahan, East Java. The feasibility is assessed based on technical, management and organization, market opportunity, and financial aspects. The specific objectives of this study are:

1. Define, describe and verify the key steps in the existing processing and trading system of smallholder Robusta in East Java and the pilot system for Robusta processing being implemented by ICCRI.
2. To identify the major technical and socio-economic constraints / opportunities to transforming the traditional processing and trading system to the pilot washed Robusta system proposed by the ICCRI.
3. Propose a set of conclusions to produce washed Robusta, improve the economic viability and sustainability of wet process Robusta coffee production, as well as to reduce the risk of OTA occurrence by small farmers in East Java.

CHAPTER 2
RESEARCH METHOD

The three main objectives of the study have different method of sampling and data analysis. Therefore, the sampling and data analysis that are applied are described separately.

2.1. Research Method for Objective 1

The objective 1 is to define, describe and verify the key steps in the existing processing and trading system of smallholder Robusta in East Java and the pilot system for Robusta processing being implemented by ICCRI. Variation in harvesting, processing and trading techniques is in each system, such as, quality of harvest (cycle, maturity % of ripe) drying (period, turning, base).

The data were collected from two locations, namely Pupuan Village in Tabanan Bali as a reference and Garahan Village in Jember East Java. In Pupuan 2 farmer group, called *Subak abian* (SA) adopting the wet Robusta technique (SA Batur Dayang and SA Batur Pendem and 2 SAs non-adopting the wet process; 5 farmers by each SA (chosen randomly) and 4 subak staffs. Interview also *subak* staffs of one of newly involved SA applying the new system.

Sampling:

Chain 1 (existing): Farmers (5 samples x 2 SA, analyze for physical characters, and OTA, cluster when it is possible) > collector level 1 or 2 (5 collector choose randomly, take 5 sample each and analyze physical parameters and OTA, clustered when it is possible) > Big trader (take 5 samples analyze physical characters and OTA independently).

Chain 2 (new wet process): Farmers (2 *subak abian* adopting "Batur Dayang" and "Batur Pendem", take 5 samples each SA analyze physical characters each and 2 clustered samples for OTA) > "Sekar" Cooperative (in Jember) (take 10 stratified samples based on pulping process (metal vs. wooden pulpers) analyzed each for

physical characters and 2 clustered samples for OTA) > Exporter (E-Com, no sample will be taken since the coffee is same as taken from "Sekar" Cooperative).

Study in Garahan Village – East Java

There will be ±25 farmers involving in the programme, using 4–5 hands pulpers.
Interview: (similar questionnaires being used in Pupuan - Bali):
Selected (10–15) farmers who involved in the programme
Selected (10–15) farmers who has not involved in the programme
Chief (or other staff) of 2 farmer groups involved in the project
Chief (or other staff) of 2 farmer groups not involved in the project

Coffee sampling:
Similar sampling procedures like in Pupuan - Bali.

Measurement of MC, defect for sample (20 samples), OTA for 10 clustered samples (with intention of "story" of sample like under splitting, heaping, etc.).

2.2. Research Method for Objective 2

The objective 2 is to identify the major technical and socio-economic constraints / opportunities to transforming the traditional processing and trading system to the pilot washed Robusta system proposed by the ICCRI. Constraints may cover a range of factors such as price, exporters' buying policy, farm economics, social factors, education, infrastructure, communication, pest and disease in coffee. Opportunities might be linked to reduced defect levels associated with improved handling/processing practices, the possibility of shortening the marketing chain, greater acceptability in case of more stringent application of OTA limits internationally, market demand for better quality Robusta.

To get these data and information, interviews were conducted to all stake holders, namely, farmers, farmer groups, government officers (*Dinas Perkebunan*), middleman, and other exporters). Three farmers group (FG) or rural production organization (RPO) were interviewed. The interview was focused on their role, decision making process, harvesting,

and processing method adopted by farmers, marketing system, constraint to adopt new system (wet Robusta), sources of information, and solutions to overcome the constraints.

There is only one type of middlemen or collector that is, collector that buys *asalan* coffee. The focus on the interview is on some aspects of marketing system, 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). However, some other issues such as the constraints, technology harvesting and processing are also discussed.

An extension services from *Dinas Perkebunan* were interviewed. The interviews were focused on general policy, services, constrains on dissemination, benefit of the service, future program, source of information, and method/media in the transfer of information/knowledge. For quality test, sample taken 500 g each of farmer, collector, and trader.

2.3. Research Method for Objective 3

The third objective of the study is to propose a set of conclusions to produce washed Robusta (feasibility study) to improve the economic viability and sustainability of wet process Robusta coffee production, as well as to reduce the risk of OTA occurrence by small farmers in East Java. These are derived based on the results and synthesis of the first two objectives.

CHAPTER 3
ADOPTION OF WET PROCESS IN PUPUAN SUB−DISTRICT, BALI

3.1. Description of Pupuan

Pupuan sub-district is one of sub-districts in Tabanan Subdistrict, Bali Province. Well-known as the center of Robusta coffee in Bali, Pupuan is about 70 km form Denpasar, the capital city of Bali. Pupuan sub-district consists of 11 villages with total population of 39,824 people and 12,222 household. Total area of the sub-district is around 17,907 ha (Dinas Perkebunan Kabupaten Tabanan, 2004).

Because of the suitability of the agro-ecosystem, the most dominant crops in the regions have been cash crops. The region is located on 450-800 m above seal level with rainfall and rainy day to be 2,288.15 mm and 128 days, respectively. The cash crops are in the region accounts for 12,154 ha or 68 per cent of the total area in the region. Among the cash crops cultivated in the region, coffee plantation is the most dominant, contributing to 8,059 ha or 66 per cent of cash crop area. Total Robusta coffee production in 2003 was 5,787 tons and yield around 788 kg coffee bean/ha. Other cash crops are cocoa, coconut, and vanilla.

All coffee plantations in the region are cultivated by smallholders, heritage from their successor. Most coffee plantation consists of high yielding coffee clone, locally known as *kopi unggul* or *kopi top*. This clone was introduced in 1978 as an effort of farmers to replace their old clone. Bangalan, Tugusari, Malangsari, are three other clones that have been cultivated in the region.

Farmer organization in Pupuan, Bali in general is known as *Subak*. The unique characteristic of a *subak* is that the organization combines three values, namely technical/economical, cultural/social, and religious aspects underlining the performance of the organizations. Thus, vision, mission, and the goals of the subak are established based on these three values. For rain-fed area, the subak is called as *subak abian*, meaning farmer organization for rain-fed area.

There are 24 *subak abians* and two *subak abians* adopting wet process (WP) and two *subak abians* not adopting were selected for the study (Table 1). *Subak abian* Batur

Dayang and Amerta Karya have adopted the WP since 2002 while *Subak abian* Teja Pala Merta and Batur Kelamba still apply dry process (DP) in processing their coffee.

Table 1. Selected *Subak abian*, the number of household, and the land description.

No	*Subak abian* and Village	Number of Household (HH)	Total Area (Ha)	Average land holding (Ha/HH)	Coffee Processing
1	Batur Dayang, Munduk Temu	241	562.10	2.33	WP
2	Amerta Karya, Pajahan	505	542.91	1.07	WP
3	Teja Pala Merta, Bantiran	438	853.45	1.95	DP
4	Batur Kelamba, Munduk Temu	253	571.67	2.29	DP

Source: *Laporan Tahunan UPP-PP PRPTE Kecamatan Pupuan*, 2004

Note : HH = Household

3.2. Coffee Farming and Processing

Basically, there are four types of coffee processing techniques in Pupuan, namely, DP, semi-WP, WP, and WP without washing. DP is a traditional technique that mostly applied by farmers. Moreover, the technique is standard one, except that heaping is a common practice in the process (Figure 1).

The second technique is WP that has been applied by a farmer group. This technique is basically WP; however, there is no washing in this technique (Figure 2). Two types of pulper are used, namely, hand pulper and electric pulper. Semi WP and WP without washing are presented in Appendix 1.

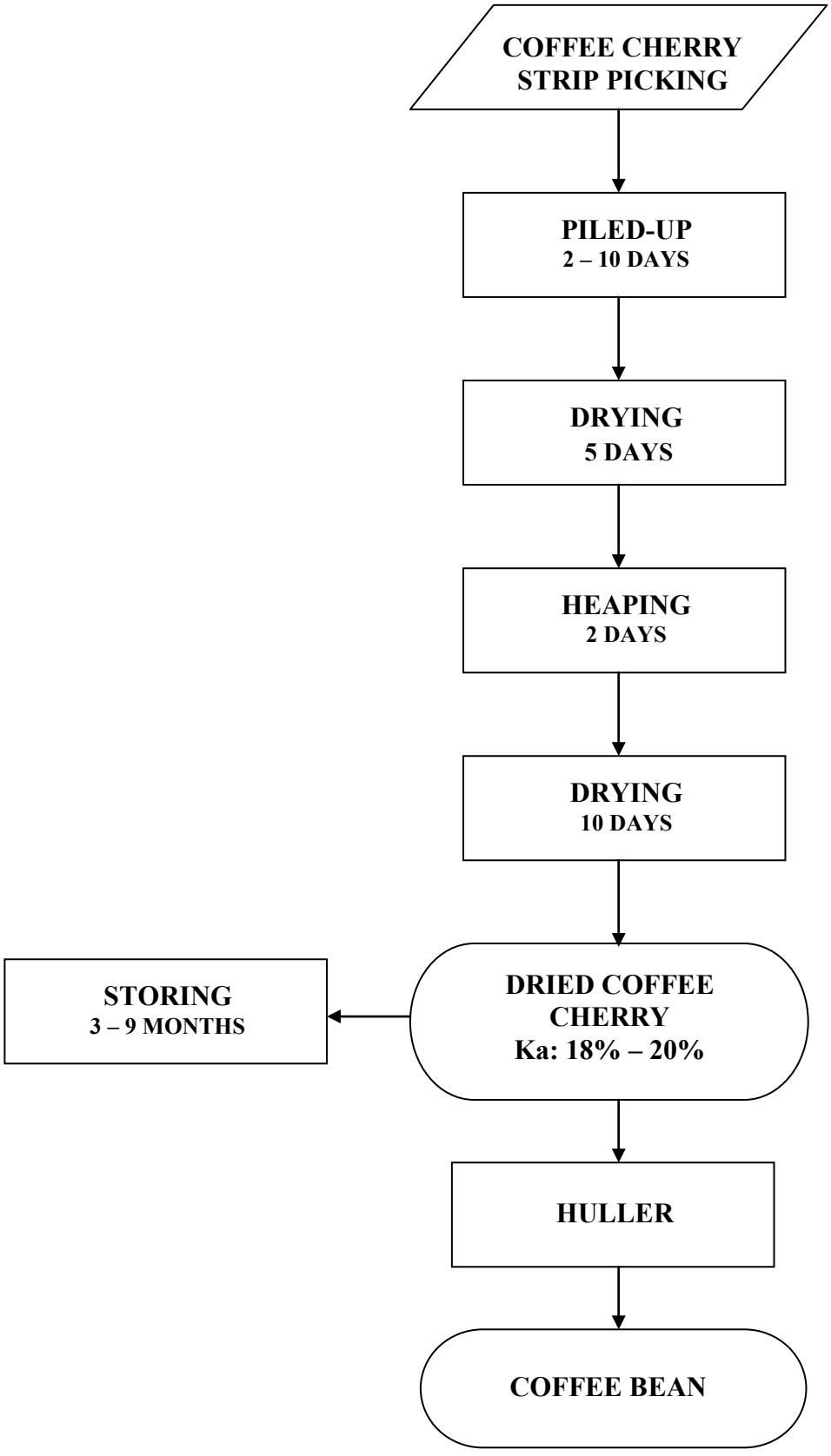

Figure 1. Dry Processing

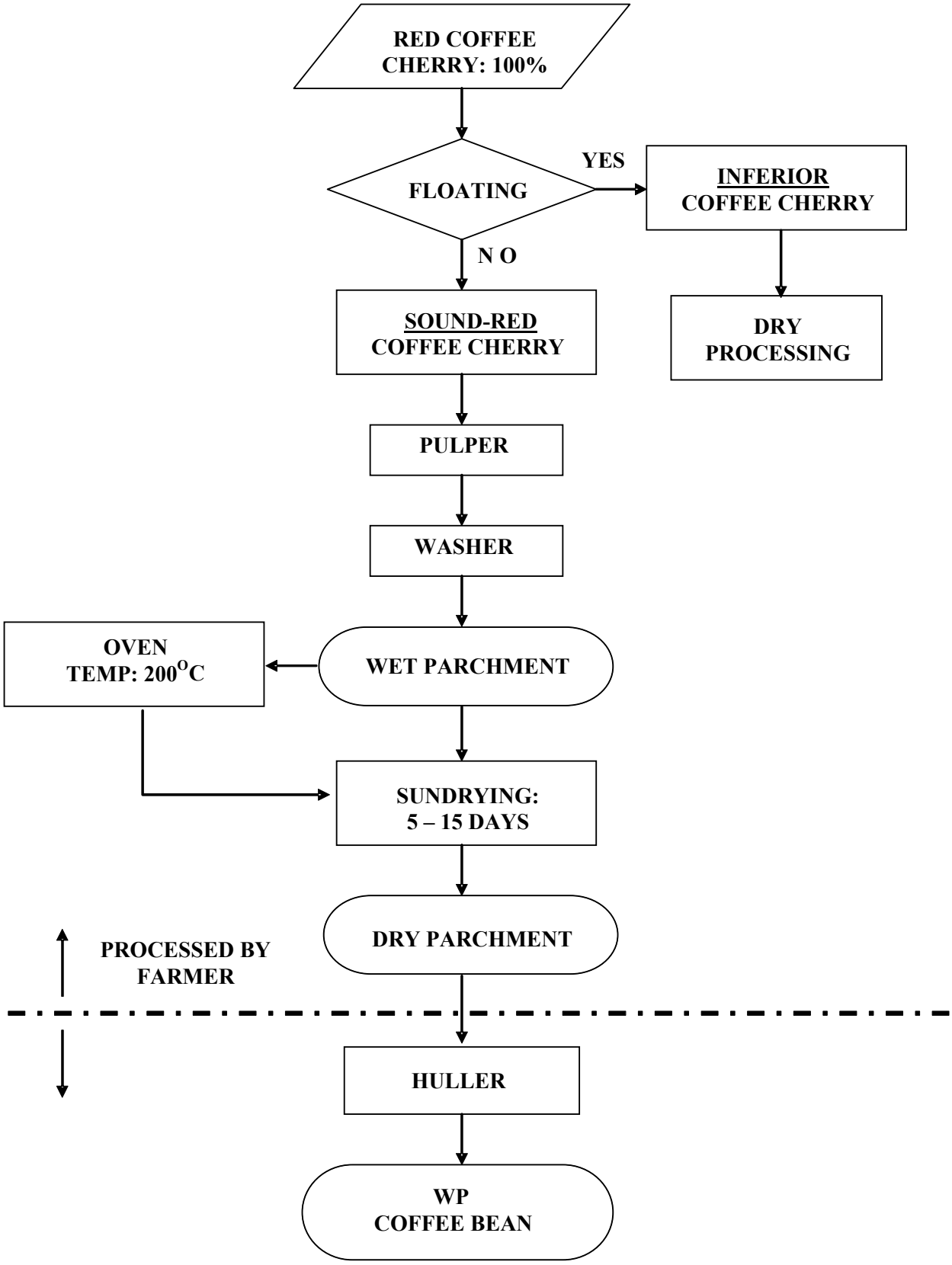

Figure 2. Wet Processing

3.3. Labor Allocation

Based on data recorded by tree crop local officer of Pupuan sub-district, each household has 3 productive family labors or around 75 man-days per month per household. This family labor is the main source of labor, allocated for coffee cultivation and processing. Some households also raise pigs and goats to increase their income. In SA Batur Dayang, for example, 10 percent of household rise pigs and 12% rise goats. On average, each household raises 6 pigs and 2 goats.

The labor allocation for coffee cultivation and processing is mainly determined by the picking technique. Farmers apply selective picking generally need more labor compared to those apply strip picking. The labor productivity for selective picking is 50-60 kg red cherries per 5 hours, while for strip picking is around 100-150 kg mixed coffee cherries. In general, most farmers in Pupuan apply selective picking; only in the last harvest they apply strip picking. On average, farmers apply selective picking require 185 man-days for harvesting and processing for each household with 1.9 ha coffee plantation, while those apply strip picking require 139 man-days. Moreover, average total use for the farmer is 462 man-days per year while the latter is 412 man-days (Table Appendix 1.).

Table 2. Monthly Labor use for coffee cultivation and processing, Selective Picking

Month	**Activities**	**Labor Use (man-day)**		
		1.9 Ha	Cattle	Total
July	Harvesting and Drying	76	15	91
August	Harvesting and Drying	109	15	124
September	Pruning after Harvesting	29	15	44
October	Fertilizing I	29	15	44
November	Digging	19	15	44
December	Weeding and Pruning 1	57	15	72
January	-	-	15	15
February	-	-	15	15
March	Weeding and Pruning 2	57	15	72
April	Fertilizing 2	29	15	44
May	-	-	15	15
June	Weeding-3	57	15	72
Total		**462**	**180**	**642**

The labor use distribution is an important factor in determining the adoption of new technology. For farmers adopting WP, total labor use is around 642 man-days, while those adopting DP is 596 man-days per household (Table 2 and Table 3). As seen in the tables, August, July, December, and March are considered as the busy seasons. During these periods, most farmers hire labor to conduct their activities. Therefore, in adopting WP, farmers have to enough cash money to finance hired labors. One main reason of farmer for not adopting the WP is lack of cash money to hire labor.

Table 3. Monthly Labor use for coffee cultivation and processing, Strip Picking

Month	**Activities**	**Labor Use (man-day)**		
		1.9 Ha	Cattle	Total
July	Harvesting and Drying	59	15	74
August	Harvesting and Drying	80	15	95
September	Pruning after Harvesting	29	15	44
October	Fertilizing I	29	15	44
November	Digging	19	15	44
December	Weeding and Pruning 1	57	15	72
January	-	-	15	15
February	-	-	15	15
March	Weeding and Pruning 2	57	15	72
April	Fertilizing 2	29	15	44
May	-	-	15	15
June	Weeding-3	57	15	72
Total		**416**	**180**	**596**

3.4. Coffee Marketing

In general, coffee marketing systems in Pupuan can be seen as depicted in Figure 3. Farmers producing *kopi asalan* sell their products to local collectors in their villages. Some collectors do some treatments, such as re-drying and sorting, while some others directly

sell to their products to traders. The traders sell their *kopi asalan* to the big traders in Singaraja or coffee powder industry in Denpasar, the capital city of Bali Province.

For farmers producing WP coffee, under management of *subak abian*, they collectively sell their coffee to a company, based on their contract. Under the contract, the volume, quality, and prices have been determined in the contract. Koperasi Sekar (Sekar Cooperative) of ICCRI plays an important role in bridging farmer groups and the company (exporter). Koperasi sekar behaves as a mediator between farmer groups and the exporter for almost all aspect, technical, financial, and legal. Moreover, Koperasi Sekar does some processing, such as hulling and sorting, to meet the standard stipulated by the exporter.

For farmer producing DP coffee, there are two common payment systems, namely, cash and carry and loan system. The first system will probably adopted when there is no any kind of cooperation between the parties involve in the coffee trade (farmer➔collector; collector➔trader; trader➔exporter).

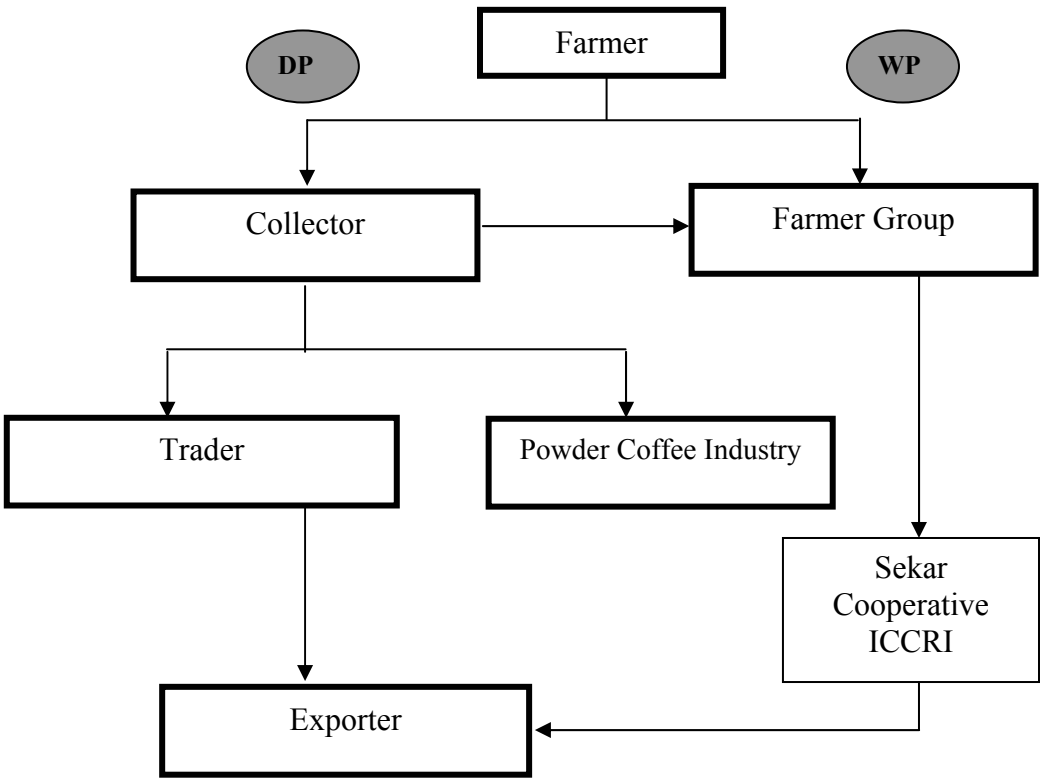

Figure 3. Coffee Marketing Channels in Pupuan

Loan system is selected for the two main reasons. Around 20 per cent of farmers admitted that they have to borrow some money to collector. Under this system, the collectors give some loans to seller before coffee trade is realized. Before harvesting seasons, most seller, especially farmers, need cash money to satisfy their need such as for fertilizer, food, education, health, and ceremonial activities. The easiest way to get cash money is from the collectors because there is no any administrative procedure to borrow money from them. On the other hand, by lending money to seller, the buyers have supply guarantee because the sellers have to sell their coffee to the buyers lending money to them. Under this cooperation, the sellers, especially farmers, are locked so that they actually have no choices to sell their coffee to other buyers. In marketing jargon, this situation is called as an interlocked market. The sellers generally have a weak bargaining position in quality and price determination

Traders also do some processing such as sorting and re-drying, handling, and marketing to exporters or Nestle in Bandar Lampung. Total cost for those activities was estimate around Rp 300 - 400/kg. The margin gained by traders are varied, depending on world coffee prices and situation of the demand and supply of coffee in the region. The higher the world coffee prices and the higher supply relative to demand, the higher margin gained by trader. The average net margin at trader level was around Rp 200 – 500 per kg or around 1 – 7 per cent of FOB price.

As traders, exporters also do some processing and handling activities to make the exported coffee meet the quality standard required by importers (buyers). These activities include sorting, polishing, fumigation, storing, and transportation with total cost around Rp 200 per kg. Margins gained by exporter are also fluctuated, mainly depending on the price of the contract between exporters and importer and price at trader level. In general, the profit margins range between Rp 100 – Rp 500 per kg or around 2 – 7 per cent of FOB price.

3.5. Coffee Quality

Coffee qualities produced by farmers in Pupuan are relatively good, as indicated by low defect value and MC. The average defect value at farm level is about 99 with coefficient variation of 43 per cent (Table 4). This implies that the variation of defect is

relatively high. Around 35% of sample has defect value to be less that 80, while 41 per cent having defect between 80-120. Around 23 per cent have high defect value of more than 120.

Table 4. Defect value and MC of DP Coffee in Pupuan, Bali

Farmer Level		
Descriptive Statistics	**Defect**	**MC**
Average	99.71	14.71
Minimum	32.80	11.14
Maximum	220.30	17.91
CV	43.41	9.79
Defect Classification	**(%)**	
< 80	35.29	
80 – 120	41.18	
> 120	23.53	
MC Classification	**(%)**	
<12%	2.94	
>12%	97.06	

Collector And Trader Level		
Descriptive Statistics	**Defect**	**MC**
Average	101.25	13.50
Minimum	55.00	10.59
Maximum	165.60	15.44
CV	43.40	9.76
Defect Classification	**(%)**	
< 80	25.00	
80 – 120	37.50	
> 120	37.50	
MC Classification	**(%)**	
<12%	12.50	
>12%	87.50	

MC : Moisture Content
CV : Coefficient of Variation

MC of coffee produced by DP technique indicates that the MC is moderate; it is better than that in Lampung (19.43 per cent) but worse compared to that in East Java (13.04 per cent). The average MC was of 14.7 per cent with low coefficient of variation of 9.7 percent. MC of WP coffee produced by farmers is determined by ICCRI as 12% or less. If the MC higher than the value the coffee would not accepted by Sekar Cooperative; hence the farmer must dry their coffees until less than 12% MC. They measure the MC by using a moisture tester available in the Subak's processing unit provided by Local Government. Practically, the DP coffee never measured its MC or measured by traditional judgement (by sound or bite). In general local trading system of DP coffees based on the moisture content of 18%. The coffee is priced based on the value, and discount or insentive is given by local traders as percent of differential, although the system is not very strict. Coffees with MC around 15–18% very common have a same price, while coffee with MC higher

than 18% penaltied by the percent differential. The prevailing condition discouraged the farmer to produce coffee with less MC.

Although collectors claimed that they do some processing activities (re-drying and sorting), the results are marginal. Their activities only reduced MC from 14.71 to 13.50 with defect values are almost the same (Table 4). Thus, the quality of coffee has been strongly affected by processing technique applied by farmers.

OTA content of 6 samples of DP coffee and 4 samples of WP coffee were analyzed. The results of analysis show that OTA contamination of DP coffee is very low with the average of 0.14 ppb (Table 5). The highest OTA contamination is 0.31 ppb while the lowest is 0.01 ppb. For WP coffee, no OTA contamination was found. This limited sampling implies that OTA contamination for WP and DP coffee in Bali still below the limit stipulated by the EU (Table 5).

Table 5. Results of OTA Analysis of Coffee in Pupuan, Bali

Sample	Origin of Sample	OTA Contamination (ppb)	Processing Technique
	Trader		
1	B.Jeri,	0.01	DP
2	Komang Rita	0.24	DP
	Farmer		
3	G. Suteja Petani	0.07	DP
4	Kt. Japa Petani	0.11	DP
5	Pt.Teken Petani	0.11	DP
6	Gede W. Petani	0.31	DP
7	Suwarno Sd.Mulyo	0.00	WP
8	Hartono Silo	0.00	WP
9	SA Amertha K Pajahan	0.00	WP
10	SA Batur Dayang Kebun Jero	0.00	WP

The current problem with (physical) quality of WP coffee produced by farmers in Pupuan (also in Silo-East Java) is the adherence of the silver skin on the bean. Although it is not classified as a defect in the National coffee standard, it only causes the appearance not really like the traditional Java WIB Robusta which is clean from the silver skin. In the traditional WIB processing, the application of mechanical drying with high air temperature (around 80-90°C) make the silver skin loosen and will be removed during the hulling

process. The simple wet process done by farmer only applying the sun drying, hence the silver skin of Robusta coffee is not loosen, and hardly removable by the hulling process. Polishing of the coffee was bit improve the appearance. ICCRI will try to improve the appearance by applying the North Sumatra system e.g. the wet hulling of coffee parchment and followed by sun drying of beans. Robusta coffee produced by the system in North Sumatra has good appearance and free of silver skin.

3.6. Key Success Factors of WP Adoption in Pupuan

Although coffee farmers in Pupuan have faced some constraints, some of them have succeeded in adopting WP technique. This study identified five key factors considered as the key success factors, namely, (i) market access and fair price guarantee, (ii) intensive and consistent supervisions, (iii) effective farmer organization; (iv) strong and effective leadership, and (v) local government supports. These four factors are inter-related in supporting the adoption of WP Technique in Pupuan.

Market access and fair price guarantee is one of the most important factor. All farmers stated that the market access to and price guarantee provides by PT. INDO CAFCO (ECOM) is one of the most important factor influencing them to adopt WP. While the DP coffee price was around Rp 5,200/kg, the guarantee price was Rp 7,500/kg. Using simple benefit-cost analysis, chaired by their leaders, they evaluate the implementation of WP, given price guarantee. They concluded that that price was sufficient to compensate the additional cost incurred due to the adoption of WP. Based on this, they expect to maintain the adoption of WP and to get a higher price in the future by consistently producing WP coffee. They realized that that guarantee price did not give a significant profit increase, just to compensate the additional cost (break-even). Moreover, since family labor is one os a main costs, then the level of profitability will be very sensitive to the change on quantity and costs of family labor. A ten per cent increase of costs of family labor will cause B/C decrease by 12 per cent (WP process is infeasible).

ICCRI has an important role in creating and improving market access and price guarantee. While introducing and supervising the adoption of WP, ICCRI actively made contact to buyers that provide market access and price guarantee for the WP coffee as a new coffee quality. ICCRI finally managed to make a kind of contract with ECOM, a

coffee trading company in Lampung that provided market access and price guarantee for the WP Coffee.

Intensive and consistent supervisions by ICCRI since 2002 are key factors of the adoption. Through regular meetings, trainings, and supervisions, the ICCRI team has gradually created a conducive condition of the coffee farmers in Pupuan to adopt the new technology (WP). Firstly, ICCRI supervisions create a new hope or way of thinking that coffee quality improvement is a realistic way to get better prices and income. In other words, ICCRI team has succeeded to convince the farmers that they will gain better prices if they improve their coffee quality. Before the ICCRI supervisions, most farmers thought that low price and price fluctuation are fate and they had to get used to this situation. Although they improved their coffee quality, these risks are unavoidable. Secondly, intensive and consistent supervisions have caused the technology transfer can be effectively achieved. Moreover, ICCRI's approach that optimally used the local knowledge and culture make the processes of technology transfer smoothly managed.

The contribution of effective farmer organization in supporting the adoption of WP process in Pupuan is also substantial. As mentioned before, *subak abian* uses technical/economical, cultural/social, and religious value in managing their activities. These values were translated into their vision, called *Tri Hita Karana*. Basically, *Tri Hita Karana* guides the member to have a good/harmony relationship with God, society (human being), and the nature with its all creatures. To implement this, the values and the vision are translated to the rules and law of the organization locally called *awig-awig*. Under these situations, the *awig-awig* can be effectively used to direct their activities in achieving their goals.

As technical/economical, cultural/social and religious values are the main substances of the *awig-awig*, then there will be three types of punishment, i.e.; economic/monetary, social, and religious punishments, to who does not obey *awig-awig*. For Balinese people, social and religious punishments are considered to be the most painful ones that have to be avoided. One of the most painful forms of social and religious punishment is the exclusion of a member from social and religious activities. Therefore, the members of subak abian generally obey the role so that it can be effectively used to achieve the objective of the farmer organization, such as to improve coffee quality.

A strong and effective leadership has also a significant contribution to the adoption of WP in Pupuan. The head of the *subak abian* adopting WP has industrious personality, long run vision, and sufficient technical and managerial skill. The industrious personality of the head of *subak abian* cause he is always decisive and work hard to realize his believe/dream. He will make use any opportunity and his network to realize his dream. He also has long run vision believing that coffee quality improvement is a way to increase coffee price and income and to reduce price risk. Although in the short run this improvement only yields a marginal income increase, they believe that in the long run, the income increase will be substantial and stable. Sufficient technical and managerial skills are indicated by his serious effort to increase their knowledge through training, discussions with experts and supervisors, and reading. With these three capacities of the head of *subak abian*, he can manage *subak abian* effectively to achieve its objective, namely, to adopt WP.

The last important key success factor is consistent government support to improve coffee quality and farm income. The most significant government support is in term of provision of equipment and building for applying WP. The local government provided grant for equipment and building in two *subak abian* Batur Dayang and Amertya Karya. In 2003, total grant for the two subak was estimated to be around R 160 millions or US$18,000. Moreover, the local government also gives strong supports to the ICCRI team in supervising and implementing the activities. The actual investment costs could be lower. In general, the investment costs stipulated by the government tend to be higher than the real ones because the government includes some 'administrative costs' that can attain to 15-30 per cent of real cost. In addition, the investment costs can be reduced if the construction of the machinery is done by local equipment manufacturers.

One of main problems of the adoption of the wet process by farmers is the availability of the appropriate equipment, especially for small scale pulper and washer. ICCRI has currently developed the equipment suitable for the process. The simple metal variant of North Sumatra wooden pulper is developed combined with the vertical type washer expectedly would solve the problem. By such equipment adoption of the system would be easier and wider.

For 2005 crop, all *subak abian* which adopted the system have agreed to produce about 500 tons of WP Robusta or more, while another exporter is going to involve namely

PT. Indokom Citra Persada (ICP) in addition to the existing exporter (PT Indo Cafco). ICP has agreed to absorb all the WP coffee as much as farmers can produce, if the quality meets to the requirement. Hence ICCRI is expected to supervise the production in order to get good quality coffees.

CHAPTER 4
FEASIBILITY OF ADOPTION OF WP IN GARAHAN, JEMBER, EAST JAVA

4.1. Coffee Processing in Garahan

Traditionally, farmers in Garahan apply dry process (DP) to process their coffee cherries. In 2004 ICCRI and Estate Crop Local Authority introduced WP to the farmers through field school under an integrated pest management program (PSL-PHT). Two farmer groups from two villages of Silo sub-district, namely *Kelompok Tani Sangkuriang* in Garahan village and *Kelompok Tani Sidomulyo* in Sidomulyo village were involved. In 2004, about 13.2 tons or 33 per cent of coffee production in Sangkuring were applied WP while that in Sidomulyo was around 7.5 tons or 37 per cent (Table 6)

Table 6. Profile of farmer Group in Garahan and Sidomulyo, 2004

Description	Farmer Group	
	Sangkuriang	Sidomulyo
1. Number of Member (person)	25.0	30.0
2. Productive Area (ha)	51.0	30.0
3. Total Production (ton dry bean)	40.0	20.0
4. WP Coffee (ton), 2004	13.2	7.4
5. Coffee Bean Grade 2 and 3 (%)	55.0	45.0

DP without fermentation is the most common practice in the two farmer groups so hat the taste of the coffee produces is neutral. There are two main reasons for applying this technique. Firstly, this technique is relatively simple and requires less labors that is a limiting factor in the region. Secondly, the coffee produced in the regions is used as a blender that requires neutral taste.

Selective picking that pick mostly red and yellow cherries is the most common practice, although some farmers also applied strip picking. Harvesting is conducted three to four times a year during July to September. After harvesting, the cherries are split using a simple splitter, locally known as *knuezer* (Figure 4). The splited cherries then are dried for

about 4 - 5 days on concrete or cement floor (drying floor). After the moisture content attaining 13% - 15%, the cherries then are processed in a portable huller to be converted to coffee bean. The cost of hulling is Rp 150/kg coffee bean. These coffee beans are sorted and stored (Figure 1).

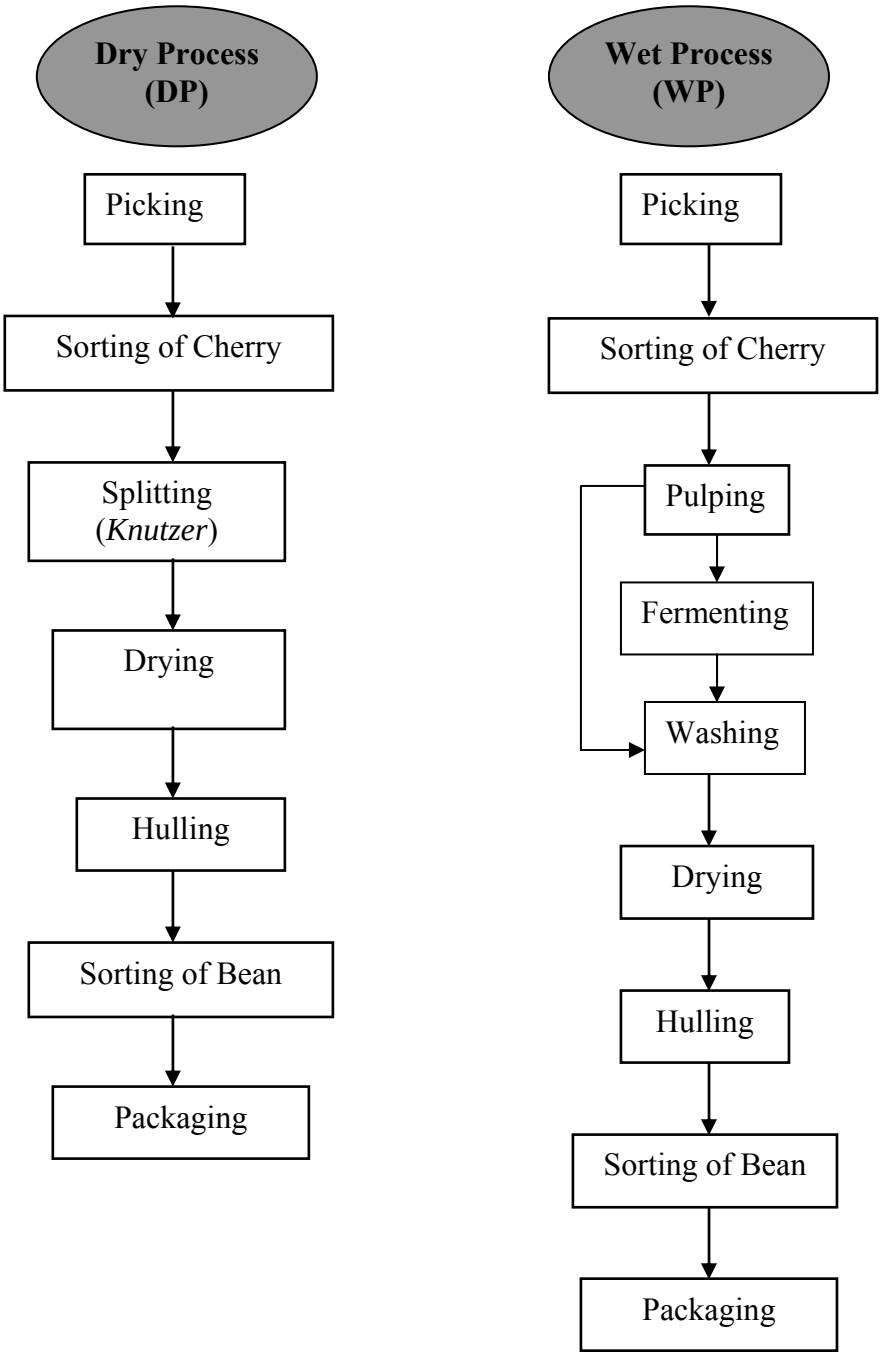

Figure 4. Coffee Processing System in Garahan

For WP, farmers applied selective picking to harvest their coffee cherries. The cherries are selected and the qualified cherries are pulped. After pulping, the parchment is fermented for around 36 hours in a kind of container. The next process is washing, followed by drying process for around 7-10 days to achieve MC of 12% or lower. The peachment coffees are hulled. After that, the processes are very similar to DP (Figure 4).

Processing costs of DP and WP are presented in Table 7 and Table 8. The costs are varied based on the infrastructure and water sources availability in the villages. The processing costs for DP ranges from Rp. 955 to – Rp. 962 per kg, while those for WP range from Rp. 2,200 to Rp. 2,265 per kg. The significant differences of the processing costs due to differences in pulping, 'fermentation' including cost of water, and sorting cost. Due to lacking of a washing machine, so far farmers applied fermentation followed by hand washing instead of mechanical mucilage removal. For the next crop ICCRI suggests to apply the mechanical system by using the equipment developed by ICCRI.

Table 7. Processing Cost of Dry Process in Garahan and Sidomulyo Village

Activities	**Cost of Processing (Rp/kg)**			
	Garahan		Sidomulyo	
	Cherries	Bean	Cherries	Bean
1. Harvesting	130.0	565.5	130.0	565.5
2. Transportation	20.0	87.0	15.0	65.3
3. Pulping	15.0	65.3	15.0	65.3
4. Drying	27.5	119.6	25.0	108.8
5. Hulling	28.7	125.0	34.5	150.0
Total	**221.2**	**962.4**	**219.5**	**954.8**

Note: Conversion factor from coffee cherries to coffee bean for DP is 23%. (would be better calculated based on 22%).

Higher cost of the wet process compared to the dry process is mainly due to the higher cost of harvesting, sorting of coffee cherries, pulping and washing after fermentation. Higher cost of harvesting for the wet process is common, due to the selective method which yields less coffee compared to the strip one. The additional cost for cherries sorting together with pulping and washing is unique to wet process while absent in dry process. Cost of water use is not considered, instead cost of transport to bring the coffee to the water source or taking the water to the processing site is considered as fermentation cost.

Table 8. Processing Cost of Wet Process in Garahan and Sidomulyo Village

Activities	Cost of Processing (Rp/kg)			
	Garahan		Sidomulyo	
	Cherries	Bean	Cherries	Bean
1. Harvesting	225	1125	215	1075
2. Transportation	20	100	20	100
3. Sorting	50	250	50	250
4. Pulping	100	500	100	500
5. Fermentation	4	20	5	25
6. Drying	24	120	15	75
7. Hulling	20	100	25	125
8. Sortation of bean	10	50	10	50
Total	**453**	**2265**	**440**	**2200**

Note: Conversion factor from coffee cherries to coffee bean for WP is 20%.

4.2. Coffee Quality and OTA Contamination

In general, quality of DP coffee produced by farmers is relatively good, compared to that produced in other regions, such as in Lampung. In terms of defect, the average value was 64.2, much lower than 80 as an indicator of medium grade (Table 9). More than 55 per cent of coffees have defect value to be less than 80, while around 44.4 per cent have defect value ranging from 80-120. DP coffee with defect value that is more than 120 has not been found. The 2 samples of WP coffee from Pupuan had less defect numbers 12.5 and 58.3 respectively

Similarly, the average MC was also low, that is 13.04 per cent, very close to the good coffee standard of 12 per cent. Around 22.2 per cent of samples have MC to be less than 12 per cent, while the rest are more than 12 per cent. However, as seen in the table, coffee quality in the regions is varied, indicated by its high coefficient of variation. High variation indicates by their high coefficient of variation, especially on defect value, reaching to more that 50 per cent.

Table 9. Coffee Quality at Farm Level

Descriptive Statistics	Defect	MC
Average	62.42	13.04
Minimum	5.30	11.45
Maximum	117.40	15.98
CV	75.90	10.80
Defect Classification	**(%)**	
< 80	55.56	
80 – 120	44.44	
> 120	0.00	
MC Classification	**(%)**	
<12%	22.22	
>12%	77.78	

MC : Moisture Content
CV : Coefficient of Variation

Although collectors claimed that they do some processing activities (re-drying and sorting), the results are marginal. Their activities only reduced defect value from 64.2 to be 44.3. Surprisingly, most coffees in collectors have MCs that are higher than in farmer level. This implies that storing in collector level is done improperly that causes the increase of MC. In addition, this could be related to situation where collectors tend store their coffee to achieve a optimum volume, before they sell to the traders.

Table 10. Coffee quality at collector level

Traders		
Code	Defect	MC
JT-14	44.30	16.07
JT-15	45.00	14.41
Average	44.65	15.24

The results of analysis show that there is no any OTA contamination found in coffee samples of East Java. From 20 coffee samples of farmers (500 gr) and randomly re-

grouped to be 4 samples, the results of OTA analysis shows that all samples have zero OTA contamination (Table 11). Thus, various DP techniques applied by the farmers in East Java have no any problems related to OTA contamination. This is also supported by the fact that MC as the key element associated with OTA contamination, is low in Garahan that prevent the OTA contamination.

Table 11. Results of OTA Contamination

Sample Code	Description	OTA Contamination (ppb)
JT-PT-SH-05	Farmer	0.00
JT-PT-SH-06	Farmer	0.00
JT-PT-SH-07	Farmer	0.00
JT-PT-CA-03	Farmer	0.00

4.2. Coffee Marketing System

Since most farmers produce DP coffee and WP just introduced, then existing marketing system in the region is mainly for DP Coffee. The marketing channel for DP and WP coffee can be seen in Figure 5. Farmers producing WP coffee sell their coffee through farmer group of directly to Sekar Cooperative, a cooperative belonging to ICCRI.

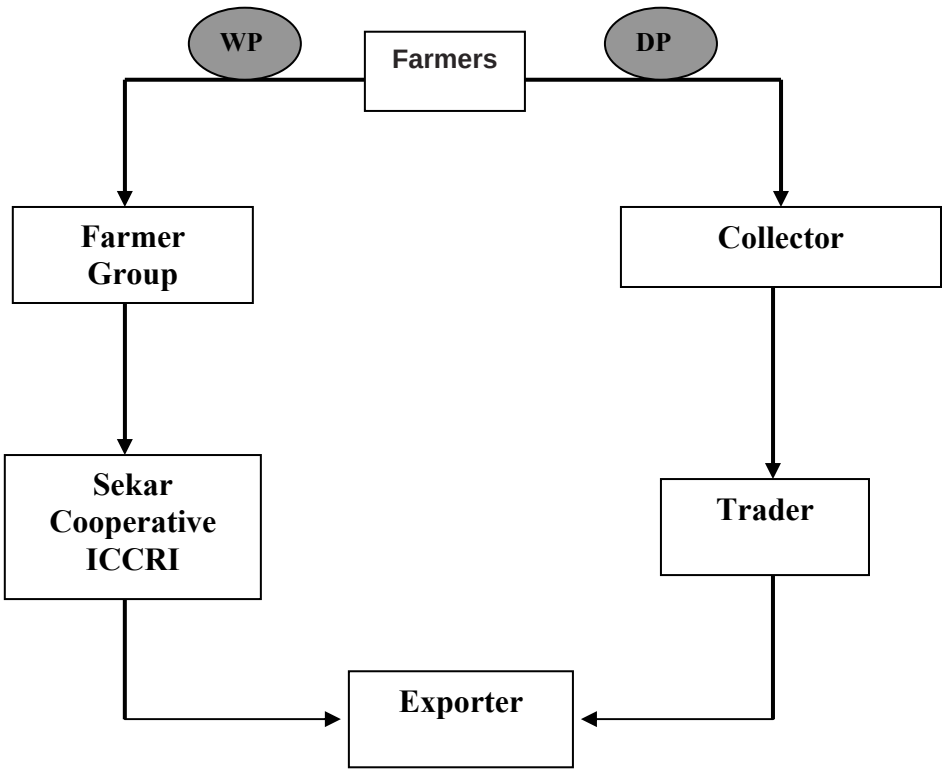

Figure 5. Coffee Marketing Channel in Garahan, East Java

For farmers producing DP coffee sell their coffee to collectors in their village. In each village, there are around 5-7 collectors. Depending on their capability, the collectors buy around 3-20 tons coffee bean per month. Payment system varies, depending on the agreement between farmers and collectors. The most common payment system is cash and carry and around 10%-20% of the transaction using payment in advance. During the observation, the prices of *asalan* coffee bean range from Rp 4,500 – Rp 5,000 per kg. However, if farmers sell good coffee quality (grade 2, 3, 4), the prices were higher (Table 12) with price premium between Rp 200- Rp 600 per kg.

Table 12. DP Coffee Prices at farm Level, 2004

Coffee Quality	**(Rp/kg))**		
	July	**August**	**September**
Asalan	5,000	5,000	4,800
Grade 2-3	5,600	5,600	5,300
Grade 4	5,400	5,400	5,100

Before selling to the traders, collectors usually do some drying and sorting to meet the quality demanded by the trader. Similarly, traders also re-dry, sort, and grade coffee bought from collectors.

Most farmers in Garahan are interested to produce WP coffee; however there are some factors that can inhibit the interest of the farmers, as follows:

Competition with local processors and traders. Local processors still apply DP and local traders have had no any access for WP coffee market. Since they buy coffee cherries and DP coffee from local farmers, then local processors and traders tend to persuade and even to force farmer to apply DP. On the other side, farmer groups direct farmers to apply WP. Therefore, there will a strong competition between farmers/farmers group producing WP coffee and the local processor and traders in directing farmers whether they apply DP or WP. Local processors and traders have better access, networks, and more capital that force the farmers/farmers group producing WP coffee in less competitive position.

Insufficient price incentives. Based on the negotiation with the buyer, WP coffee price was determined Rp 7,000/kg. Most farmers perceived that that price is not enough to attract farmers producing WP coffee. Based on their calculations and assuming no government assistance to cover some initial costs, the minimum price for WP coffee is Rp 8,000/kg .

4.3. Feasibility Studies Analysis

As mentioned in the research methodology, four aspects of feasibility, namely, technical, managerial/organizational, market, and financial feasibility will be applied in this study.

4.3.1. Technical Feasibility

Unlike farmer groups in Pupuan, Bali, that have well defined machinery and equipments for WP (WP machinery), farmers/farmers groups in Garahan still work hard to determined the machinery and equipments. For example, hand pulper/splitter that is widely adopted in North Sumatra, is not suitable to the need of them. Based on their experiences, they stated that the capacity of hand pulper is too small for them. Additionally, pulping Robusta coffee is harder compared to Arabica coffee, hence an electric or motorized pulper would more suitable for them. It will be inefficient and labor use will be intensive. Considering that opportunities cost of labor in the region is relatively high (more than Rp 20,000/day), the use of hand pulper will not be technically and economically feasible.

WP machineries that are applied by the farmer groups in Pupuan are also not be feasible to be applied in Garahan, due to mainly to lack of water source. These types of equipments need a lot of water that will not be easy to be fulfilled in Garahan. The locations of the processing equipments (pulpers) are in the village, while sources of the water, mainly rivers, are far away from the villages. As a result, costs of water for fermentation and washing are high that significantly increase the processing costs. On average, the cost for water is around Rp 40/kg coffee bean.

Based on technical consideration and farmers aspirations, the most likely WP machineries to be adopted by farmer group in Garahan have the following characteristics:

Medium size and mobile. Considering the long distance between water source and the villages and between coffee plantations, then the WP machineries should be relatively smaller compared to those in Pupuan but bigger that that in North Sumatra. The capacity of the machinery is expected to be around 250 kg cherries/hour that will be used to process cherries from around 40-60 ha coffee plantation. Moreover, the machinery is expected to be mobile that can accommodate the disperse location of coffee plantation.

Using a motor as source of power. Since opportunity cost of labor in the region is relatively high, the machineries have to use motor as source of power. The capacity of the motor could be ranges between 5.5 - 8 HP.

Integrating pulper and washer. The machineries have to be designed that integrate between pulper and washer as an integrated machine. Besides it is more efficient, it will satisfy the need of most farmers in the region.

Moreover, the feasibility of farmer group in implementing WP will also be affected by the farmers and farmer group's capacity to control the threat of thieves. If farmers want to produce WP coffee, then they have to apply selective picking. This situation increases the risk of being stolen because the harvesting periods become longer. This risk is significant especially for the farmers' that has coffee plantation that is remote from their village.

To conclude, the feasibility of development WP process in the region will be strongly depend on the availability of the machineries that have those characteristics. ICCRI should have a critical role in developing these machineries. In addition, farmers groups and a private equipment manufacturer are now working hard to develop the machinery. Currently, ICCRI has developed a pulper and washer, that expectedly workable in farmers' community. Once tested and technically reliable the machines will be provided to farmers who want to produce WP coffee. PT ICP (exporter) will provide pre-investment to make the machine and farmers will paid by their products.

Beside the pulper and washer, there is another equipment being required if the North Sumatran system will be applied, namely wet parchment huller. The machine is a bit different with the normal huller. Since the machine is relatively expensive, the exporter is expectedly provide the investment for the community.

4.3.2. Management and Organization

Since the implementation of WP requires well organized activities, the sufficient capacity on management and organization will play an important role. Although capacity the farmer groups in Garahan is not as good as that in Pupuan, they indicate that they can manage well the process through some trainings and supervisions. Basically, the farmer groups have functioned well in most farmer groups (??). These indicated by some criteria. Firstly, each farmer group has a kind of structure of organization with clear job descriptions. For example, there are clear job descriptions for the head, secretary, and treasury. Secondly, there are some scheduled meetings (monthly-regular meetings) and incidental meetings in respond to emergency problems.

Thirdly, similar to the farmer group in Bali, farmer groups in Garahan also incorporate cultural and religion (Moslem) values to their organization. As the case of Pupuan, this phenomenon will strengthen the implementation of farmer group roles. They believe that members who break the roles will suffer from not only economic penalties, but also from social and religion penalties. In other words, this will make the organization will be more effective in managing their activities to achieve their goals. This is a strong point from management and farmer organization perspective that could be considered as social capital to support the implementation of WP in the region.

However, to succeed in managing WP in Garahan, the capacity of farmer group in the region should be increased through training and consistent supervisions. Referring from the similar study in Ngarip, Lampung and Pupuan, Bali, and the condition of farmer group in Garahan, the contents of the training and supervisions should focused on following aspect:

Improving quality to increase price and income. The results of analysis of the study in Ngarip, Lampung and Pupuan, Bali, suggests to improve coffee quality, farmers must have a believe that this improvement will increase coffee price and farmer income. Thus, the trainings and supervisions have to be consistently strengthening farmers' perception that changing from DP to WP is an avenue to increase coffee price and farm income.

Planning and Reporting. Based on interview with the leaders of farmer groups, the main weaknesses of the organization are in planning and reporting aspects. For example, they have no experiences to develop working plan, proposal,

and report. Because changing from DP to WP will expose the leaders of farmer group to wider business communities, their capacity in these respects have to be increased. Moreover, the increase in this capacity will also lift their self-confidence when they interact with their business partners (big traders, exporters, bankers, high-rank government officers). Furthermore, the adoption of WP system in a cooperative bases requires a good coordination among the member, especially if they using common machineries in the group. Good planning of harvest for instance is strictly needed to meet the machine capacity that used communally.

Effective leadership. A strong and effective leadership has been a key success of the adoption of WP in Pupuan. The head of the *subak abian* adopting WP in Pupuan, Bali, has industrious personality, long run vision, and sufficient technical and managerial skill. To some degree, some leader of farmer group, such as Sangkuriang and Sidomulyo, has this qualification. However, their capacity should be lifted so that they can effectively manage the adoption of WP in their village.

4.3.3. Market Opportunities

When WP is technically feasible, the next question is the market opportunities of the WP coffee. Based on production potential of coffee cherries, current price of WP coffee (Rp 7,000/kg), and interest of farmers to shift from DP to WP, the potential supply was estimated around 1800 ton. This estimate was based on the assumption that 75 per cent of farmers will produce WP coffee.

Based on the statistic, there is a shortage of supply of WP Robusta coffee since the decline of production of big plantation in East Java (see Table 13). During the last 5 years, the shortage is estimated about 4000 tons. Market of WP (WIB) Robusta has traditionally not very open. Usually the producer (big plantations) sell the product directly to their traditional buyers. However, experienced by production and marketing of "new" WP Robusta from Pupuan and Tirtoyudo-Malang has developed by ICCRI-ECOM since the last 2 years, the coffee is easily absorbed by buyers. In the future the capacity is expected

to increase due to the market channel has been established and the new involvement of another exporter(s) like PT ICP.

The market opportunities for WP coffee are difficult to estimate because the markets for WP Robusta coffee have not well developed. The markets for the coffee are mostly through direct market in sense that buyer and seller directly make a contract. This condition raises difficulties in estimating market potential, either using quantitative and qualitative approach. The method left is only based on perceptions of the actors, especially buyer and mediator, such as ICCRI.

Another aspect related to the production and marketing of WP coffee is quality. Traditionally, WP (WIB) coffees are classified as a specialty coffee with high quality standard. Thus for the "new" coffee produced must have the same criteria. Maintaining the production of good quality coffees throughout individual farmer would not very easy. ICCRI is expected to supervise the production to get the correct quality.

It has been known since some decades a ago that East Java is the main producer of wet processed Robusta (and Arabica) coffee, which known as WIB (*West Indische Bereiding*) coffee. The coffee has produced by big plantations own by Government and private companies, and marketed under the brand of Java WIBs. The production of WP Robusta (and Arabica) in East Java has declined recently, mostly due to the low price of coffee and high production cost in big plantation.

Currently, total export of WP coffees (Robusta and Arabica) from East Java has declined significantly due to the lower of production. Table 1 showed that export of WP Robusta has declined from 11,166 tons in 2000 to only 6,848 tons in 2004. The decline is likely being continued if the price of coffee remain low and cost of production in the big plantation is increased. In order to replace the shortage, it is required such programme to convert production of coffees belong to farmers from dry process into wet process. The programme will not only improve the quality, but also improve the price and income of farmers.

Table 13. Total export of WP coffee from East Java (in metric tons)

Coffee Type	2000	2001	2002	2003	2004
Robusta	(37,159)	(30,794)	(32,686)	(33,098)	(32,967)
R/WP	**11,166**	**10,306**	**9,035**	**8,590**	**6,848**
R/DP	25,993	20,488	23,651	24,508	26,119
Arabica	(7,640)	(8,444)	(6,266)	(6,801)	(9,109)
A/WP	3,303	3,153	2,647	2,683	2,041
A/DP	4,337	5,291	3,619	4,118	7,068
Total	**44,799**	**39,238**	**38,952**	**39,899**	**42,076**

Source: AICE-East Java (2005)

ICCRI stated that farmers can fulfill WP Robusta market left by large estate. In 2001 Robusta WP exported from East Java was 10,306 tons and decline to significantly to be 6,848 tons in 2004. This decline are due to inability large estate to meet the demand. This opportunity can be captured by smallholders. Moreover, a negotiation between ICCRI and exporters in April 2005 was successful in providing WP Robusta market of around 5,000 tons. ICCR estimated that market potential was between 4,500 - 20,000 ton per year.

Considering the potential supply and demand of WP coffee in Garahan, it can be concluded that there is still market for the coffee, but the potential is still difficult to estimate. This implies that the development of production has to be managed carefully to avoid over supply. In other words, the production schedule has to follow the potential market that has been clearly identified.

Related to marketing aspect, for some farmers interlocked market could be a problem. Before harvesting seasons, most farmers need cash money to satisfy their need such as for buy agricultural inputs and labors, food, education, health, and ceremonial activities. They don not have enough money to finance these expenditures. The easiest way to get cash money is from the buyer (collectors) because collectors are the only access to get cash money in the villager. Moreover, there is no any administrative procedure to borrow money from the collectors. On the other hand, by lending money to farmers, the

collectors have supply guarantee because the farmers have to sell their coffee to the collectors lending money to them. Under this cooperation, the farmers, are locked so that they actually have no choices to sell their coffee to other collectors. Around 30 percent of farmer stated that they are under interlocked market situation. The farmers generally have a weak bargaining position in quality and price determination. Under this situation, the farmers will only obey the orders of the collectors, including the coffee quality produced by the farmers. For the collector, opportunity to gain value added is higher if they buy *asalan* coffee because it is less transparent, either in quality or process. Thus, the farmers will be forced to produce *asalan*.

4.3.4. Finance

Financial analysis is intended to assess the financial feasibility of adoption of WP in Garahan. This financial analysis is based on the following assumptions:

- The machineries used are medium scale, mobile, with production capacity of 200 kg fresh fruit per hour; the economic life of the machineries is about 15 years;
- the cost of the machineries is assumed to be Rp 7.5 millions/unit;
- Price of WP coffee is Rp 7,000/kg, while that of DP is Rp 5,250/kg;
- WP and DP coffee yield (proportion of coffee bean that can be extracted from coffee cherries) for each is 23 % and 22 %

Based on these assumptions, the cost structure of WP and DP process are presented in Table 14. Total investment cost for WP process for 20 farmers was estimated around Rp 7.5 millions (Table 15). Considering the financial capacity of farmers and farmers groups relative to high investment cost, they need some credits as complementary financial source. According to the head of Garahan and Sidomulyo farmer group, they have cash money around 30% - 40% of the total investment.

Table 14. Cost structure of WP and DP per kg cherries in Garahan

Description	DP (Rp per kg cherries)	WP (Rp per kg cherries)

Harvesting	130	200
Splitting/Pulping	20	75
Fermentation and Washing	0	75
Drying	25	15
Hulling	40	25
Sorting	0	40
Packing	10	10

As seen in the table, operational cost of WP is significantly higher 95% compared to that of DP. The operational cost of WP and DP is Rp 440/kg and Rp 225/kg cherries, respectively. This is because WP requires a higher cost for harvesting, sorting of cherries, fermenting and washing, but lower cost for drying and hulling (Table 14).

Under the existing condition, WP is more profitable than DP, although the difference is quite small. Because of the current WP price just gives marginal price incentive to he farmers producing WP, then the following scenarios were developed to elicit some price alternatives that are relatively fair for them (Table 16)

Table 15. Cash flow of WP in Garahan (Rupiah)

Year	Operational Cost	Credit Repayment	Current Loan	Interest (9%/year)	Machine Maintenance	Total Cost	Revenue	Profit Margin	Profit Margin per Ha*
0									
1	86,467,040	750,000	6,750,000	607,500	750 000	88,574,540	273 308 962	184,734,422	5,433,365
2	86,467,040	750,000	6,000,000	540,000	750 000	87,757,040	273 308 962	185,551,922	5,457,409
3	86,467,040	750,000	5,250,000	472,500	750 000	87,689,540	273 308 962	185,619,422	5,459,395
4	86,467,040	750,000	4,500,000	405,000	750 000	87,622,040	273 308 962	185,686,922	5,461,380
5	86,467,040	750,000	3,750,000	337,500	750 000	87,554,540	273 308 962	185,754,422	5,463,365
6	86,467,040	750,000	3,000,000	270,000	750 000	87,487,040	273 308 962	185,821,922	5,465,351
7	86,467,040	750,000	2,250,000	202,500	750 000	87,419,540	273 308 962	185,889,422	5,467,336
8	86,467,040	750,000	1,500,000	135,000	750 000	87,352,040	273 308 962	185,956,922	5,469,321
9	86,467,040	750,000	750,000	67,500	750 000	87,284,540	273 308 962	186,024,422	5,471,307
10	86,467,040	750,000	-	-	750 000	87,217,040	273 308 962	186,091,922	5,473,292
11	86,467,040	-	-	-	750 000	86,467,040	273 308 962	186,841,922	5,495,351
12	86,467,040	-	-	-	750 000	86,467,040	273 308 962	186,841,922	5,495,351
13	86,467,040	-	-	-	750 000	86,467,040	273 308 962	186,841,922	5,495,351
14	86,467,040	-	-	-	750 000	86,467,040	273 308 962	186,841,922	5,495,351
15	86,467,040	-	-	-	750 000	86,467,040	273 308 962	186,841,922	5,495,351

Note: Investment Cost = Rp. 7.5 million
* excluding cost of maintenance of coffee plantation
Note: number of farmer 20; average coffee plantation 1.7 Ha/farmer; yield = 9,825 kg cherries / 1.7 Ha

Table 16. Break-even point Analysis of the Application of WP in Garahan, Jember for some scenario

Scenario	Price (Rp/kg bean)	Price premium for WP Coffee	
		(Rp/kg bean)	%
DP Coffee	5,250	-	-
WP Coffee:			
1. Break-even	6,969	1,719	33
2. Break -even with technology incentive of 5 %	7,216	1,966	37
3. Break -even with technology incentive of 10 %	7,463	2,213	42
4. Break -even with technology incentive of 15 %	7,710	2,460	47
5. Break -even with technology incentive of 20 %	7,958	2,708	52

Scenario 1. Similar profit margin as producing DP quality (break-even including cost of family labor), Jember.

This scenario is basically used firm approach so that all costs, including family labor costs are considered as costs. Under this scenario, the premium price is 33 per cent (Table 16). For example, if the price of DP coffee is Rp 5250/kg, then the price of WP has to be given a price premium of Rp 1719/kg.

Scenario 2. Break-even + cost of family labor + quality premium.

This scenario is based on firm approach and considering the risk of applying new technology of appreciation of applying new technology. New technology is generally bear technical, economic, and social risks so that industry applied new technology is generally place this risk in the production costs. Under this assumption, then the prices premium are ranges from 37 - 52 per cent, depending on the level of the magnitude of the incentive (Table 16). Based on the results discussion with farmers and their leaders, the optimum premium price is around 50%.

As in Pupuan, Bali, the financial feasibility is sensitive to change in the quantity and cost of family labour. A 10 per cent increase in family labour cost will cause a 13 per cent decrease in B/C ratio. To compensate this cost increase, the guarantee price has to be increased by 3 per cent. A 30 per cent increase of fuel/gas price in 2005 requires around 4 per cent in crease in price guarantee.

Payment system to farmers is also an important factor that should also be considered. Discussions with farmers and traders insisted that the maximum time lag between delivery of coffee and repayment has not exceeded 14 days. Farmers cannot afford any delay in payment to be more than 14 days because they have to use their money for various purposes. In the case of payment is too late, then the farmers will borrow from collectors and we come up with interlocked market situation.

CHAPTER 5
CONCLUSIONS AND POLICY IMPLICATIONS

5.1. Conclusion

Pupuan, Bali

1. Wet process has been successfully adopted by coffee farmers in Pupuan, Bali. Five key factors were identified as the key success factors of the adoption, namely, (i) market access and fair price guarantee, (ii) intensive and consistent supervisions, (iii) effective farmer organization; (iv) strong and effective leadership, and (v) local government supports. By now, there are four types of coffee processing techniques in Pupuan, namely, dry process, semi-wet process, wet process, and wet process without washer.
2. In terms of coffee quality, the average defect value of DP coffees is 99.7. More than 35 per cent of coffees have defect value to be less than 80, while around 41.2 per cent have defect value ranging from 80-120.
3. The average MC is 14.7 per cent, and around only 3 percent of samples have MC to be less than 12 per cent, while the rest are more than 12 per cent
4. The results of analysis show that OTA contamination of DP coffee is very low with the average of 0.14 ppb. The highest OTA contamination is 0.31 ppb while the lowest is 0.01 ppb. For WP coffee, no OTA contamination was found. This implies that OTA contamination for WP and DP coffee in Bali still below the standard stipulated by the EU. However, coffee quality in the regions is varied, indicated by its high coefficient of variation of defect value of 43 per cent
5. The adoption of wet process has a significant impact on coffee industry in Pupuan. The adoption has caused an improvement on coffee quality, indicated by lower moisture content, defect, and no OTA contamination. With price guarantee of Rp 7500/kg for 2004 harvesting season, which is around 50% higher that of DP coffee, farm income has been increased, although some farmers still perceived that this price incentive is not sufficient yet.

Garahan, East Java

6. DP Coffee quality in Garahan is relatively good. In terms of defect, the average value is 64.2, much lower than 80 as an indicator of god coffee quality. More than 55 per cent of coffees have defect value to be less than 80, while around 44.4 per cent have defect value ranging from 80-120.

7. Similarly, the average MC is also low, that is 13.04 per cent, very close to the good coffee standard of 12 per cent. Around 22.2 per cent of samples have MC to be less than 12 per cent, while the rest are more than 12 per cent. However, coffee quality in the regions is varied, indicated by its high coefficient of variation of defect value of 50 per cent.

8. No OTA contamination found in coffee samples of East Java. The results of OTA analysis shows that all samples have zero OTA contamination. Thus, various DP techniques applied by the farmers in East Java have no any problems related to OTA contamination.

9. With similar characteristics, coffee farmers in Garahan, East Java has indicated a high interest to adopt wet process (WP). To evaluate the feasibility of the adoption, four aspects of the adoption were assessed, namely technical, managerial and organization, market, and financial aspects.

10. Technically, the adoption of WP in Garahan is feasible providing that ICCRI or private equipment manufacturers succeed to develop machinery suitable to the farmers in Garahan. Farmers in general have a high interest and sufficient skills, although their skills related to WP process need to be improved. However, the specification of the machinery that is suitable to the farmer is not identified yet. ICCRI is expected to provide such model of machineries that required by farmers.

11. From managerial and organization perspective, the adoption of WP in Garahan is likely to be successful. Similar to farmer organization in Pupuan Bali, the existing farmer organizations have functioned well by incorporating financial, social, and religious values in laws and rules. However, their capacity in planning and reporting has to be improved.

12. From market perspective, the adoption of WP is also feasible. Under the current prices, the potential supply was estimated around 1,800 ton, while the potential demand was estimated around 5,000 – 20,000 tons per annum.

13. Financially, the adoption of WP in Garahan is feasible. Under the current price of WP coffee and some price scenarios, financial feasibility indicators (B/C of profit margin) indicate that the adoption of WP in Garahan is feasible. The potential problem related to financial aspects is of capital and cash money.

5.2. Policy Implication

7. Based on technical consideration and farmers aspirations, the most likely WP machineries to be adopted by farmer group in Garahan have the following characteristics: (i) *medium size*; (ii) *mobile*; (iii) *using a motor as source of power*; and (iv) *integrated pulper and washer*. Moreover, the capacity of farmers in terms of quality improvement technology has to be improved. Technical feasibility of development WP process in the region will be strongly depending on the availability of the machineries that have those characteristics. ICCRI should have a critical role in developing these machineries and increasing farmers' skills on technology improvement.

8. In term of management and organization, the farmers in Garahan still need some training and supervision, especially on planning, reporting and effective leadership.

9. Considering the potential supply and demand of WP coffee in Garahan, it can be concluded that there is a significant market opportunity for the DP coffee. However, the development of production has to be managed carefully to avoid over supply. In other words, the production schedule has to follow the real market that has been clearly identified.

10. Since there are significant potential markets, then efforts to realize these markets are key factors to improve coffee quality in Indonesia. Individual farmer and farmer organization generally have no capacity to create and access the markets. Under this circumstance, mediator institutions, such as ICCRI and government institutions and private institutions could have a better access to these markets. In

negotiating price of WP coffee in Garahan, two price scenarios are proposed. The first is called break-even + cost of family labor. This scenario is basically used firm approach so that all costs, including family labor costs, are considered as costs. Under this scenario, the premium prices range between 33 per cent. The second scenario is called break-even + cost of family labor + quality premium. This scenario is based on firm approach and considering the risk of applying new technology (appreciation of applying new technology). Under this scenario, the prices premium range from 37-52 per cent.

11. Insufficient cash money has caused most farmers are in an interlocked market situation that block the farmers to improve their coffee quality. To break this in vicious circle, credit availability is a determining factor. Under the new government that is likely to have a higher attention to agriculture in general, the provision of soft loan for farmers is expected to increase.

APPENDIX

APPENDIX 1. Semi WP Processing and Wet Processing Without Washer, Pupuan

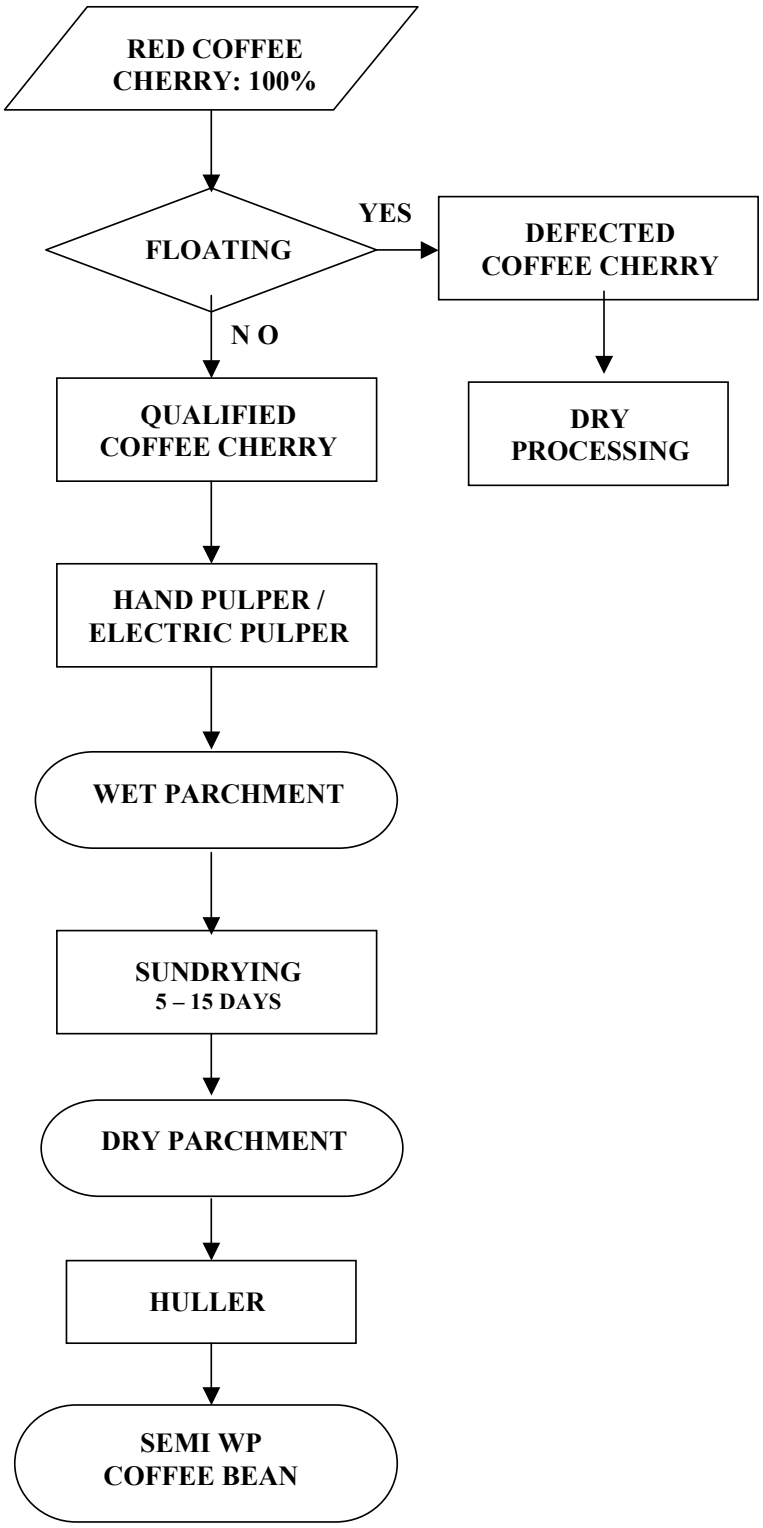

Figure 6. Semi WP Processing

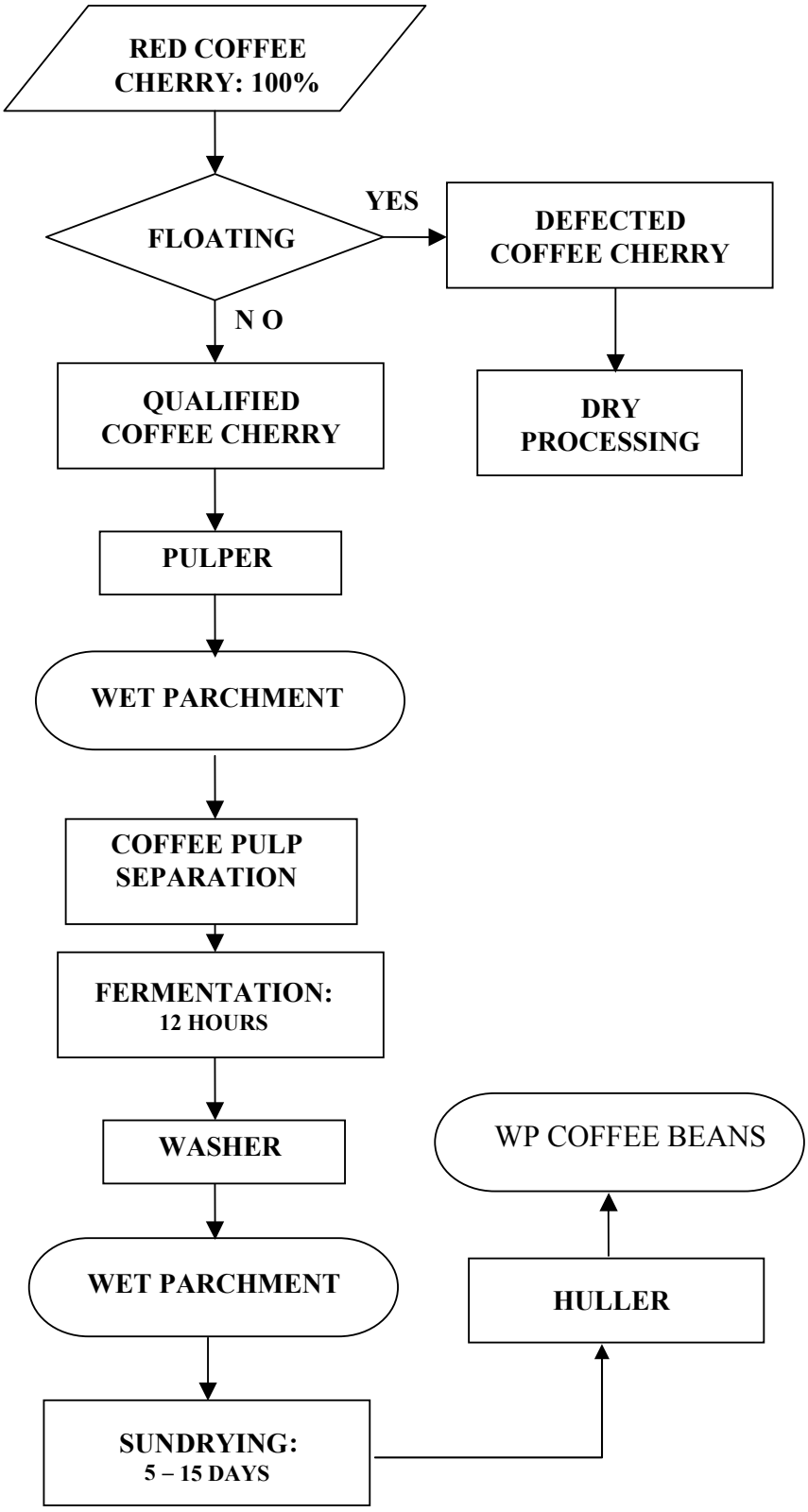

Figure 7. Wet Processing Without Water

APPENDIX 2. Labor Use for Strip and Selected Picking

Table Appendix 2.1. Labor use for coffee cultivation and processing, Strip Picking

No.	Activities	Labor Use (Man-days)	
		1 Ha	1.9 Ha
1	Harvesting and Processing	73	139
2	Pruning after Harvesting	15	29
3	Fertilizing I	15	29
4	Fertilizing II	15	29
5	Digging	10	19
6	Weeding and Pruning 1	30	57
7	Weeding and Pruning 2	30	57
8	Weeding-3	30	57
Total Labor Use/year		218	416

Table Appendix 2.2. Labor use for coffee cultivation and processing, Selected Picking

No.	Activities	Labor Use (Man-days)	
		1 Ha	1.9 Ha
1	Harvesting and Processing	97.5	185
2	Pruning after Harvesting	15	29
3	Fertilizing I	15	29
4	Fertilizing II	15	29
5	Digging	10	19
6	Weeding and Pruning 1	30	57
7	Weeding and Pruning 2	30	57
8	Weeding-3	30	57
Total Labor Use/year		242.5	462

APPENDIX 3. Comparison of Cash flow.

Table Appendix 3.1. Comparison of Cash flow between DP and WP in Garahan (Rupiah).

Year	DP		WP							
	Revenue (R1)	Cost (C1)	Revenue (R2)	Cost (C21)	Credit Repayment (C22)	Rest of Credit (C23)	Interest (9%/yr) (C24)	Machine Maintenance (C25)	Depreciation (C26)	Total Cost (C2)
0					7,500,000					
1	229,268,182	29,718,980	273,308,962	71,291,187	1,500,000	6,000,000	540,000	750,000	500,000	74,581,187
2	229,268,182	29,718,980	273,308,962	71,291,187	1,500,000	4,500,000	405,000	750,000	500,000	74,446,187
3	229,268,182	29,718,980	273,308,962	71,291,187	1,500,000	3,000,000	270,000	750,000	500,000	74,311,187
4	229,268,182	29,718,980	273,308,962	71,291,187	1,500,000	1,500,000	135,000	750,000	500,000	74,176,187
5	229,268,182	29,718,980	273,308,962	71,291,187	1,500,000	-	-	750,000	500,000	74,041,187
6	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
7	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
8	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
9	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
10	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
11	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
12	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
13	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
14	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187
15	229,268,182	29,718,980	273,308,962	71,291,187	-	-	-	750,000	500,000	72,541,187

Table Appendix 3.1. Continued…

Year	Incremental Revenue of WP (R2-R1)	Incremental Cost of WP (C2-C1)	Incremental Benefit of WP (R2-R1)-(C2-C1)	10%	25%	Net Present Value (DF=10%)	Net Present Value (DF=25%)
0							
1	44,040,780	44,862,207	(821,427)	0.909	0.800	(746,677)	(657,142)
2	44,040,780	44,727,207	(686,427)	0.826	0.640	(566,989)	(439,313)
3	44,040,780	44,592,207	(551,427)	0.751	0.512	(414,122)	(282,331)
4	44,040,780	44,457,207	(416,427)	0.683	0.410	(284,420)	(170,735)
5	44,040,780	44,322,207	(281,427)	0.621	0.328	(174,766)	(92,308)
6	44,040,780	42,822,207	1,218,573	0.564	0.262	687,275	319,266
7	44,040,780	42,822,207	1,218,573	0.513	0.210	625,128	255,900
8	44,040,780	42,822,207	1,218,573	0.466	0.168	567,855	204,720
9	44,040,780	42,822,207	1,218,573	0.424	0.134	516,675	163,289
10	44,040,780	42,822,207	1,218,573	0.385	0.107	469,151	130,387
11	44,040,780	42,822,207	1,218,573	0.350	0.086	426,501	104,797
12	44,040,780	42,822,207	1,218,573	0.319	0.069	388,725	84,082
13	44,040,780	42,822,207	1,218,573	0.290	0.055	353,386	67,022
14	44,040,780	42,822,207	1,218,573	0.263	0.044	320,485	53,617
15	44,040,780	42,822,207	1,218,573	0.239	0.035	291,239	42,650
Total	660,611,700	651,183,105	9,428,595			2,459,446	(216,098)
	B/C IRR NPV (10%)	1.01 23.68 2,459,446					