

**The “Sweet Desire”
Cacao Cultivation and its Knowledge Transfer
in Central Sulawesi, Indonesia**

Maria Abbate

**STORMA Discussion Paper Series
Sub-program A on
Social and Economic Dynamics in Rain Forest Margins**

No. 17 (May 2007)

Research Project on Stability of Rain Forest Margins (STORMA)



**Funded by the Deutsche Forschungsgemeinschaft through the SFB 552
„STORMA“**

www.storma.de

ISSN 1864-8843

**SFB 552, Georg-August-Universität Göttingen,
Büsgenweg 1, 37077 Göttingen**

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Summary

The aim of this paper is to figure out how Sulawesi cacao¹ farmers gain access to valued knowledge and how they acquire, reproduce, utilise, transfer such knowledge, as well as the interaction among the different actors in the global cacao business. For this purpose a case study has been carried out in the village Sintuwu, Donggala Regency, Central Sulawesi, Indonesia. Cacao farmers have been interviewed about their knowledge of cacao cultivation, processing practices and how information or data about the cash crop cacao are communicated among cacao farmers. Further the Agriculture Department, different NGOs, Cacao Traders in Palu/Central Sulawesi and the Coffee and Cocoa Research Institute Jember, East Java/Indonesia have been visited as interviewed.

The extreme expansion of Indonesian cacao production in the last ten years was mainly caused by large production increases by Sulawesi smallholders.

¹ Cacao or Cocoa? *Theobroma cocoa* - Spanish explorer Cortez (1519) tasted a drink called “Cacahuatl” made by the Aztecs. In the Aztec’s Nahuatl language xocoatl or cacahuatl means “bitter water” (with atle or atl for water). A related Nahuatl word, cacao (source of the English word cocoa) refers to the bean itself, and is also used today to designate the ever-popular hot drink made from chocolate powder (Rust, 2006). STORMA decided to use the name cacao.

Sintuwu's cacao farmers understandable wish to improve their economic status and the protection of the Lore Lindu National Park has led to a conflict between the aims of environmental and socio economic development. The size of the cacao plantations in Sintuwu still increases. The knowledge about cacao cultivation is not only transferred through educational programs of the Indonesian government or of NGOs. The outreach of the cacao trainee programs and technical assistance supported by the Indonesian Government and different NGOs, were currently stopped. The dissemination of knowledge, has only been partially successful. The acquisition of cacao cultivation knowledge in Sintuwu is mostly supported by the family, or by friends as well as neighbours and other cacao farmers of the village. The exchange of information and the cooperativeness between the cacao farmers is very vivid and they work in different ways together. The family, friends or other farmers have been the main source of knowledge for those who start new cacao plantations in Sintuwu. The adoption of cacao cultivation knowledge by seeing and hearing and by working together, should also be recognised as an important way to receive knowledge about this new adapted cash crop.

The problem of the boom and bust cycle of cacao production is, that in this cycle, pioneer planters commonly benefit from early forest rents, experiencing a boom period which is then followed by declining production due to loss of soil fertility and the infestation of pests and diseases. While the climate and soil in Sulawesi as well as the entrepreneurial attitude of the smallholders were vital for this development, a relative lack of support interventions in sustainable agriculture and marketing distribution arose.

In the last decade pest and disease problems lead to a strong earning decline in production and losses of income that smallholders often try to compensate this by extension of land under cultivation, in many cases on cost of the rain forest.

Due to increasing cacao world market trends, it can be expected that the forest exploitation around the Lore Lindu National Park will go ahead however, tolerated by the Indonesian government or not. To face this challenge, it is of great importance to guide the cacao farmers on their way to sustainable agriculture systems. Conclusively it can be pointed out that it is necessary for the future to increase the field productivity through improved plantation management to guarantee smallholders a higher income without the need for extended cultivation area. Transfer of knowledge is the basis to improve cacao-farming profitability, thus technological progress resulting in higher yields would mean less land in agriculture and more in forest. A proper guidance by involved organisations who can show new possible sustainable modes of land use and disseminate the therefore necessary knowledge is going to play an important role for future coexistence of the National Park and the local people who live at its margins.

1. Introduction

1.1. Research Background

Indonesia is now the third largest producer of in the world after Ghana and the Ivory Coast. 610,000 t of cacao have been produced by 400.000 smallholder farmers and their families in 2005. On the island of Sulawesi, smallholders working on plots ranging from 0.5 to 1.5 hectares produce over 80% of the cacao exports from Indonesia. (FAO Database, January 2006; Cacao Report USAID, 2004)

The problem of the boom and bust cycle of cacao production is well known and described in reports performed by Francois Ruf (Ruf and Yoddang 1999; Ruf et al., 1996;). In this cycle, pioneer planters commonly benefit from early forest rents, experiencing a boom period which is then followed by declining production due to loss of soil fertility and the infestation of pests and diseases. The knowledge about cacao cultivation is relatively new, therefore experiences with this new adopted crop have to be made. The dissemination of know-how are considered to have a great impact on the expansion of cacao production in Sulawesi.

The aim of my research is to figure out how Sulawesi cacao farmers gain access to valued knowledge and how they acquire, reproduce, utilise, transfer such knowledge, as well as the interaction among the different actors in the cacao business. For this purpose a case study has been carried out in March and April 2006 in the village Sintuwu, Donggala Regency, Central Sulawesi, Indonesia. Cacao farmers have been interviewed about their knowledge of cacao cultivation, processing practices and how information or data about the cash crop cacao are communicated among cacao farmers.

Further the Agriculture Department, different NGOs, Cacao Traders in Palu/Central Sulawesi and the Coffee and Cocoa Research Institute Jember, East Java/Indonesia have been visited and interviews were carried out with special regard on knowledge transfer among these different groups who all deals with cacao as a crop or commodity, somehow.

1.2. Research Area

Indonesia has the world's second largest tropical forest area, after Brazil, and accounts for about 10 % of the world's remaining tropical forest, approximately 90 – 100 million ha of rain forest. The average annual deforestation rate nationwide is now generally assumed to be about 1.87 million ha, which have been rising rapidly to the expansion of timber, oil palm, coffee, cacao, and plantations rubber. (FAO, Global Forest Resources Assessment 2005; World Bank, Indonesia Policy Briefs, 2005).

According to the World Fact book, the July 2006 population of Indonesia estimate was 245.452.739 people, with a growth rate of 1.41% (FAO, Reynolds et al, 2006).

The Human Development Index of 2004 puts Indonesia on place 111 of the world range, to give some examples: Norway is on place 1, Germany 19, Mexico 53, Malaysia 59,

Philippine 83, Iran 101, and on the last 177. range Sierra Leone (Human Development Index, 2004).

The country has a wide range of forest types. There are no less than 42 natural terrestrial ecosystems found in Indonesia. Many of these formations are undergoing changes in size and types. (FAO, Indonesia Country Report, 1996)

The Lore Lindu National Park (LLNP)

The present area covered by the LLNP resulted from the integration of two natural sanctuaries and a natural preservation area. Those two natural reserves include the Lore Kalamanta Wildlife Reserve (131.000 ha) located in Poso District and the Lore Lindu Wildlife Reserve (67.000 ha) located in the Donggala and Poso Districts. The nature preserve areas included The Danau Lindu Tourism/Protected Forest (31.000 ha) located in Donggala District.

Since government carried out the boundary measurements of the Lore Lindu National Park, various conflicts over the land and other resources have arisen between the government and local people. The land which belongs to the local people was determined as being part of the Park without their acknowledgement and agreement. The local people were very much depend on the forest and other natural resources were no longer allowed to hunt, collect wood, rattan, bamboo and medicinal herbs, or to cultivate coffee, which had long been their habit. (Burkard 2002b).

The official classification distinguishes between four types of forest according to formal protection status:

1. The National Park
2. The Protection Forest
3. The Limited Production Forest
4. The Community Forests

Only community forests are open for conversion of forest into agricultural land; whereas the protection forest is only open for the collection of rattan on the basis of official licenses. The National Park as well as the protection forest are formally declared as "prohibited areas" in regard to agricultural conversion (TNC).

Sintuwu is one of 21 villages situated in Palolo valley. Palolo is the upper area of Palu valley and is bordered by the Lore Lindu National Park in the south and by state forest in the north. Palolo is one of the most populous districts out of 18 districts in Donggala Regency, Central Sulawesi, stayed largely unsettled since the 1960s and has than gradually been occupied by both spontaneous and programmed immigration. After the first villages were founded, the government started to resettle people into the area. Immigration has made Palolo valley, including Sintuwu and other villages, a high density population area

which is a deviant situation, considering the domination of dry land cultivation in the ecology of Palolo. (Sitorus, 2002)

The village Sintuwu is situated on the edge of tropical rain forest, next to the Lore Lindu National Park, on the Gumbasa river banks. The legal status of forest in this village is the National Park status, which is not open for conversion of forest into agricultural land like I mentioned above. Sintuwu with 328 households is located about 60 km from the provincial capital Palu. Founded in 1961 by resettled Kaili groups (by practicing shifting cultivation in the protected forest area), Sintuwu became a migration target since the end of the 60ties, when a steady flow of migrants from the Kulawi valley (located on the western side of the Park) and from other parts of Sulawesi moved into Sintuwu of which the Bugis of Southern Sulawesi have become the most dominate group. Sintuwu is nowadays an ethnically mixed community with about 65% of its population consisting of indigenous groups, whereas about 35% are migrants. There is some difficulty in defining who is a migrant and who not. For reasons of lucidity, the Kaili who are the original group in Palolo, the Napu, Besoa as well as the Kulawi people from the Western side of the Park have been categorized as "indigenous" or "local" people, whereas all groups that have their homeland outside the research region have been referred to as "migrants". (Burkard 2002a, 2)

During the 1960s and the 1970s, Sintuwu was characterised by domination of the subsistence production rice and corn. Meanwhile the villagers cultivate the perennial cash crops, mainly coffee. These kinds of cash crops were cultivated extensively, with minimum care, so that there was only low productivity. Cacao was introduced about the mid-1980s and thereafter was cultivated extensively as a new profit crop. During the 1990 the enlargement of cacao plantations in Sintuwu drastically expanded in various ways, by the conservation of subsistence agriculture area. By introducing a multiple cropping system, and by the encroachment on forest area, which is labelled as illegal. (Sitorus, 2002)

1.3. Research Method

A case study has been carried out in March to April 2006 in the village Sintuwu, Donggala Regency, Central Sulawesi, Indonesia. Approximately 100 cacao farmers are located in Sintuwu. 50 farmers have been interviewed about their knowledge of cacao cultivation, processing practices and how information or data about the cash crop cacao are been communicated among cacao farmers.

Further the Agriculture Department, different NGOs, Cacao Traders in Palu/Central Sulawesi and the Coffee and Cocoa Research Institute Jember, East Java/Indonesia have been visited and interviewed with special regard on knowledge transfer among these different groups of the society which are all handle, some more or less, with cacao as a crop or commodity.

The research strategy is a case study, which includes the application of a qualitative approach together with a quantitative one. A quantitative approach is adopted specially to obtain quantitative data regarding the management of cacao cultivation from raising seedlings and maintenance of plantations to harvest and post harvest techniques, with special emphasis on the knowledge transfer of these rapid adapted cash crop.

The cacao farmer questionnaire was designed on the basis of "open-ended" questions, which means that the researcher could write down the farmers answer as he says it. In some cases it were chosen "multiple-choice" questions, which had a list of possible answers regarding cacao cultivation techniques for example sowing, shade, etc., with some space left for other answers so that still every answer could have been written down. The application of a qualitative approach together with a quantitative has been chosen to analyse and evaluate the collected data. The other questionnaires were designed on the basis of "open-ended" questions with a qualitative approach. The results of the survey have been edited first with the program SPSS for the evaluation. (Murphy and Sprey, 1982; Lamnek, 1988)

2. The Cacao World Market

In early 2003, when cacao prices were at an 18-year high, many exporters and traders entered the market. But when global cacao prices fell from \$2,375/MT to \$1,347/MT in 2003/2004 - a 43% drop over a ten month period, many short-term speculators and new entrants in the cacao trade suffered substantial losses. Global cacao bean prices are been traded in 2006 between \$1,380 and \$1,725/MT this season, which has led to further consolidation of exporters in Indonesia (Cocoa Report USAID, 2004).

The global trade in cacao is based primarily on the end use of the cacao bean. Some beans are used primarily for their flavour (to produce cacao powder), and others are used for their fat content (to produce cacao butter). Beans from Latin America tend to have the richest flavour, while cacao beans from Asia (particularly Malaysia and Indonesia) have little flavour and are used for their fat content (referred to sometimes as "fat beans"). Most large U.S. chocolate manufacturers (e.g. Hersheys, Masterfoods/Mars, etc.) sell in the high volume, mass production North American market where flavour is not as important. Other large manufacturers, in Europe and Asia, produce for more discriminating chocolate consumer markets. (World Cacao Foundation, 2006)

According to a major chocolate manufacturer, approximately 80% of international trade in cacao beans is based on fat content versus 20% based on flavour content of beans. West Africa produces cacao beans that have a generally high content of both fat and flavour, which accounts for the global premium paid for cacao from Ghana and Cote d'Ivoire.

Indonesian cacao beans, on the other hand, are traded at a discount to the standard New York terminal price. (Cocoa Report USAID, 2004)

World cacao production in 2005/06 is predicted to increase slightly over one percent from last season's crop decline. West African production will account for the majority of the increase while Asian production is forecasted to decrease. Latin America will remain relatively unchanged. West Africa will continue to be the leader in world cacao production in 2006, with roughly 70% of the supply. Asia and the Americas are expected to produce 16% and 14% (World Cacao Foundation, 2006).

2.1. The market-based governance structure of the Indonesian cacao market

Ruf (1995) cites the following factors that contributed to this boom phenomena: low cost of labour; abundance of suitable land; benefit of proximity to Malaysia; highly competitive marketing network in Sulawesi; aid policy for development in this sector, and extensive coconut plantations ready to receive cacao trees as intercrop. Apart from thus factors above, there is another important factor that contributed to the smallholders' large production expansion: the entrepreneurial and innovative skills of the smallholders, many of whom are Bugis, an ethnic group with its origin as seafarer from South Sulawesi. A large number of Bugis went to work in plantations in Sabah, Malaysia, in the late 1970s and 1980s, partly because of its proximity and the need for labour. While working in these plantations, they acquired the know-how to grow cacao very efficiently, but also acquired some capital. The number of those who returned to Sulawesi and started cacao farming is considered to be small. However, the dissemination of know-how and the remittance of capital from Sabah to Sulawesi are considered to have had a great impact on the expansion of cacao production in Sulawesi. (Ruf, 1995)

A World Bank report attributed this phenomenal growth largely to the 'hands-off' policy of the Indonesian government. Akiyama and Nishio (1996) argued that this policy encouraged smallholder dynamism and the development of a highly competitive marketing system in which farmers received a high proportion of the FOB price. (Akiyama and Nishio, 1996)

Indonesia's primary competitive advantage in global cacao trade lies in its ability to supply large quantities of fat beans. Cacao grown in Indonesia, originally bred in Malaysia, was developed for its high yield (fat) not its flavour. Current cacao yields in Indonesia range from 400 to 800 kg/ha, with the potential to increase yields as high as 1 to 1.5 MT/ha. Cacao yields in West Africa and other major producing countries, on the other hand, are much lower and only average 300 kg/ha or less.

Sulawesi cacao is traded on the global market as an unfermented, fat, bulk bean.

Processors and manufacturers will use Sulawesi bean as filler, due to its sufficient fat content and lower cost, and blend it with other fermented beans that add flavour. The Dominican Republic also produces unfermented bulk bean (so called Sanchez) but its export volume is less than one-tenth the size of Indonesia. (Cocoa Report USAID, 2004)

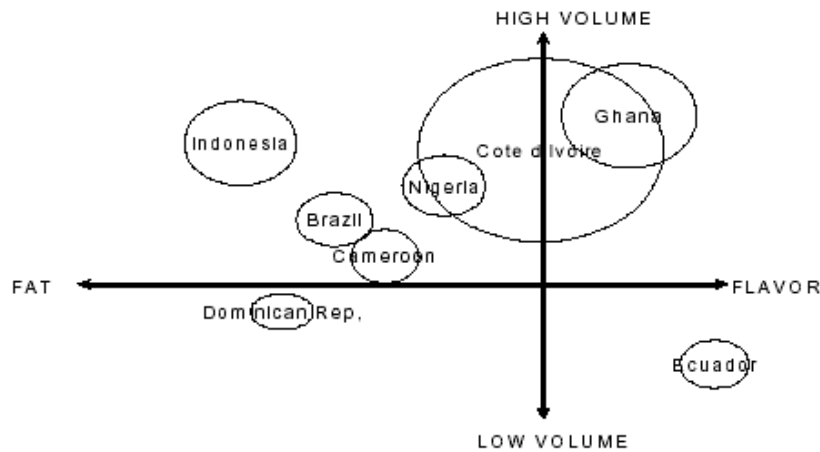


Fig. 1: Relative Positioning of Indonesia Cacao in Global Trade; Source: Cocoa Report USAID, 2004

Most global manufacturers and processors have learned to effectively blend unfermented Sulawesi beans with other beans to produce their products to specification. The global demand for these unfermented bulk beans has become relatively inelastic and not significantly affected by changes in price. As the largest producer of unfermented bulk beans, Indonesia currently occupies a strong position with few competitors in this segment of the global market. (Cocoa Report USAID, 2004)

Approximately 80% of total Indonesian cacao bean exports are now handled by the five largest exporters, all of whom are local affiliates or subsidiaries of multinational companies. The U.S. is the second largest buyer of cacao beans in the world, after the European Union, and imports 136,000 MT of Indonesian cacao and is by far the most important market for both cacao beans and cacao products from Indonesia. But demand and cacao processing capacity in Asia is growing rapidly, with a 13.2% annual increase in the 2003/2004 season alone. U.S. demand for Indonesian cacao has remained relatively static over the past few years but markets in Asia (most notably in Malaysia and Singapore) offer expanded export opportunities for Indonesia. (Cocoa Report USAID, 2004)

On the processing side, the industry produced 100,000 tonnes of processed cacao in 2003. Due to increasing demand from the importer countries, 5% growth is estimated for 2004. However, the 50% utilisation is still far from optimal as the capacity of processing industry is about 200,000 tonnes. The Indonesian government's Ministry of Trade and Industry includes cacao (processing) among the top ten prioritised commodities in the development plan for the years 2005 – 2009, and has set a target of 70% utilisation for the cacao

processing industry. Amongst Asian and Oceania grinders, Indonesia is considered to be the second largest after Malaysia. (Guyton, 2006; Cocoa Report USAID, 2004)

2.2. Investment of Cacao in Indonesia

There are a variety of on-going and pending investments to support Indonesian cacao—seven of them are public sector projects and three are private sector initiatives. Whether private or public-sector supported, most of these investments lack outreach to most of the 400,000 smallholder cacao farmers and/or are heavily dependent on external funds to continue.

SPONSOR	INVESTMENTS IN COCOA
Bi-lateral/Other Donors	USAID: Success Alliance
	German Business Association: ASKINDO Capacity Building
	ACIAR & Australian Government: improved genetics research
Government	District-level “Kimbun” projects [Dispun]
	National cocoa IPM & “condomization” [Dispun]
Multi-lateral Donors	IFC: Pensa Project (cocoa within agribusiness component)
	ADB: Tree Crop Productivity Enhancement (design phase)
Private Sector/Other	Masterfoods/WCA: Prima Project – Noling
	ASKINDO: Cocoa Village Model Project – Mamuju; with Bank Indonesia
	Bank Niaga: Warehouse Receipts Program – Makassar

Tab. 1: Current Investments (Public and Private) in Indonesian Cocoa; Source: Cocoa Report USAID, 2004

3. Sulawesi Cacao Cultivation

In 1973, F1 hybrids of a Trinitario- Forastero cross breeding were imported from Malaysia and were cultivated on plantations in North Sumatra. Especially the F2 generation of these hybrids provided good yields and was more resistant to pests and diseases. It was soon distributed in the eastern part of the Indonesian archipelago, notably in programs set up by the Ministry of Agriculture (Durand, 1995cf).

A growing problem for Indonesian cacao farmers is the significant damage to their crops by a small moth called the cacao pod borer, short CPB. More than 400.000 smallholders in Indonesia depend on cacao to provide cash income to support their families. CPB infestation is spreading at an alarming rate. Without the knowledge to control this pest, cacao farmers could be deprived of much-needed income from this valuable cash crop.

Conopomorpha cramerella is a flying insect that uses the surface of the cacao fruit as a storage place for its eggs. The larva bores through the floor of the egg directly into the cacao pod where it lives and feeds, and only emerges when it is ready to pupate. While developing it damages the mucilaginous coat that surrounds the cacao beans and thus they cripple due to the lack of nutrients. (World Cacao Foundation, 2006)

CPB can be controlled by using a species of ants, indigenous to some countries in Southeast-Asia. Research has proven that the presence of the black cacao ant Dolichoderus thoracicus can reduce the losses due to the CPB and also to mirids

significantly. Even if they are not abundant in cacao plantations, a population can easily be established.

Over 1.500 different insects are known to feed on cacao. The most important of these are the sap-sucking bugs like mirids or capsids which are pests in so many parts of the world, and the caterpillar of the cacao moth *Acrocercops cramerella*.

A third category of insects is important mainly as agents of spread of cacao diseases. The mealybugs which transmit cacao virus diseases are major examples of this. Other aid disease spread by making cacao more susceptible, usually because their feeding activities create sites suitable for the entry of pathogenic fungi, for instance shield bugs increase the incidence of *Monilia* pod rot. (Toxopeus and Lems, in Rehm, 1989; World Cacao Foundation, 2006)

Cacao processing in Sulawesi: Intensive field studies from South Sulawesi show different cacao processing among smallholders. The majority of the farmers use plastic sacks to carry the wet beans from the field to the farmhouse where they store the sacks in the back room for fermentation. Smallholders assume that proper fermentation will take place in the plastic sacks regardless the weight of fermenting beans, the duration of fermentation, the frequency of turning and the timing of the turning. There is no temperature rise of the fermenting mass in the sack as well as in the box container over the first 12 hours. Afterwards, the fermentation process begins slowly as indicated by the steady temperature rise of the fermenting mass to 28°C and 32°C in the sack and also in the box. After 48 hours fermentation, the maximum temperatures of the fermenting mass in the sack of 35 and 55 Kg reaches only 28°C and 30°C. Fermentation variation becomes more evident with smaller quantity of beans as their surface area is much greater in relation with their mass. 60% of the smallholders ferment the beans within the plastic sacks for only 12 to 36 hours. As Mulato (2001) points out, smallholders argued that the economic benefit in selling well-fermented beans does not balance with the weight loss because of too much sweating from cacao mass during five days fermentation. At the end, they will get less income from selling the beans due to the weight loss. Furthermore, besides additional cost for buying wooden boxes, they assume that the use of plastic sack for bean storing can reduce the weight loss due to less sweating compared to the wooden box. The investigations have shown that the common fermentation practice using plastic sack causes excessive weight loss. The woven surface of plastic sack gives more access to the sweating than the holes of the wooden box. There are 3 groups involved in the drying process of the cacao beans produced by smallholders. The first group consists of farmers who dry the beans by the sun from the initial moisture content of 55 to 20%. Afterwards these farmers sell the partially dried beans to the middle traders. The second group is the middle traders who continue the drying process until the moisture content of the beans reaches 12%. Drying is conducted by a

simple flat bed batch dryer and sometimes complemented with sun drying. The third group is exporters living in the city. They dry the beans by using artificial dryers to the final moisture of 7% to fulfil the standard export requirements.

The majority of farmers dry the beans in the sun for 2 days. The beans being dried in the sun are unprotected from the environment and therefore are susceptible to the attacks of insects, damaging by animals and contamination with foreign materials, which significantly influence the quality of the dried beans. In case of rain or during night time, the beans are piled up and covered with plastic sheet on the drying floor.

The determination of moisture content by middle traders influences the farmers' attitude on cacao drying. The moisture content of the beans is the main criterion used by middle traders to price the cacao beans. It is not objectively measured by a moisture meter as the quality standard request but it is only judged by how many days the beans have been dried in the sun, and by visual appearance of the cut-beans. Thus, farmers are not encouraged to extend the drying time because the price difference of US\$ 0.015 per kg offered by the traders is not quite significant. The traders then mix all the beans from different farmers in one place regardless the diversity in the dryness of cacao beans. Therefore, it is difficult to get uniform moisture content in subsequent drying. The drying procedure carried out by the traders is also influenced by the cacao price in the market. If the buying price of cacao beans raises, middle traders prefer delivering partially dried beans to exporters. They neglect re-drying process as they do during normal price level because they want to sell the beans at high price as soon as possible. (Mulato, 2001)

Cacao in Sulawesi is harvested all the year around with 2 peak seasons, the first one starts in March, reaches the peak in May, and accounts to nearly 21% of the total production; the second season begins in September, reaches the peak in October, and accounts to about 11% of the total production. The average annual yield is about 785 kg dry beans per hectare. Among the smallholders, the yield varies from 450 to 1.000 kg dry beans per hectare depending on the planting material and agronomic practices. (Mulato, 2001)



Fig. 2: Cacao fermentation in Sintuwu
 Fig. 3-6: Cacao drying in Sintuwu
 Photos: Maria Abbate 2006

3.1. Knowledge Transfer of Cacao Cultivation

The knowledge about cacao cultivation is not only transferred through educational programs of the Indonesian government or of NGOs. The outreach of the cacao trainee programs and technical assistance supported by the Indonesian Government and different NGOs, were currently stopped. The dissemination of new useful knowledge, has only been partially successful.

Ethnic origin	Sources of cacao cultivation knowledge					
	Father /family	Friends/ neighbours/ other cacao farmer	Farmer of other village/ island/ country	Seeing/ hearing/ working	By different parts like father, friends, GO, NGO, books, etc.	University
Kaili		8,0%		14,0%	16,0%	
Bugis	2,0%	2,0%	4,0%	2,0%	12,0%	
Balinese					2,0%	
Chinese				2,0%		
Napu Alitupo				2,0%		
Mix Kaili/Bugis	8,0%			2,0%	4,0%	
Mix other	2,0%	2,0%		8,0%	6,0%	2,0%

Tab. 2: Sources of cacao cultivation knowledge related to ethnic origin

The acquisition of cacao cultivation knowledge in Sintuwu is mostly supported by the family, or by friends as well as neighbours and other cacao farmers of the village. The exchange of information and the cooperativeness between the cacao farmers is very vivid and they work in different ways together. Occasionally cacao farmers help each other or they even pay employees and work for salary. The family, friends or other farmers have been a main source of knowledge for those who start new cacao plantations in Sintuwu. The adoption of

cacao cultivation knowledge by seeing and hearing and by working together, should also be recognised as an important way to receive knowledge about this fairly new adapted cash crop.

Trainee programs have been offered by:

- ACIDI/VOCA (Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance) cooperated with SUCCESS Alliance (Sustainable Cocoa Extension Services for Smallholders)
- The Dinas Pertanian & Perkebunan (Agriculture Department)
- BIPP – Balai Informasi dan Penyuluhan Pertanian, Kabupaten Donggala (Sub sector of Agriculture Department - District/Provincial Estate Crops Services) and ACIDI/VOCA
- The NGO CARE.

The Indonesian government and the NGOs were sometimes represented as a cooperation, which was not always known by the cacao farmers.

Regarding the dissemination of knowledge by cacao trainee programs, the contents have been:

1. General information about cacao cultivation, like how to propagate cacao trees, spacing of cacao trees and shadow trees, maintenance of cacao plantations.
2. PsPSP - Panen sering (Frequent harvesting), Pemangkasan (Pruning), Sanitasi (Sanitation) and Pemupukan (Fertilization). A special pest control program, following a strict sanitation plan. In order to keep the plantation free from massive CPB invasion, the cacao field is supposed to be cleaned from infected plant material, best farmers are advised to collect all infected plant material frequently, preferably in a hole outside the field and burn it.
3. Sarongisasi = Condomisasi: The “condomization” program to promote the use of plastic sheeting to reduce the pests and diseases by putting a special plastic cover on suitable fruits. The plastic bags are made for this technique and require also a special utilisation. The method is free from ecological side effects but it requires a lot of routine labour to “condomize” a bigger amount of cacao fruits. The name “condomisasi” is now replaced by the name “Sarongisasi” (from the word Sarong, traditional men clothing in South Indonesia), but the farmers still use both names.
4. Post harvest techniques like fermentation and drying.
5. The technique of grafting and cuttings was shown and practiced in the field. The farmers were given also a special hormone powder for the cuttings, and a special grafting knife.

6. Explaining the key issues of organic agriculture and a demonstration of alternative agricultural practices.

Health damaging side effects of pesticides, herbicides and artificial fertilizer, were not allowed to made a topic.

60% of the interviewed farmers did not take part in any trainee program. 32% attained 1 time, 4% twice, and 4% even three times.

Many of the interviewed cacao farmers, who have not been invited to any of the trainings so far, have been disappointed about this fact.

It was obvious, that cacao farmers who live in the centre of the village, have attained trainee programs more often than farmers who live outside of the centre at the margins of Sintuwu. The next table shows a village cluster of Sintuwu, clusters 1 – 4 represent the centre, clusters 5 – 7 represent the margins of Sintuwu.

In the village cluster represented as Cluster 1 – 4, more farmers have attained trainee programs than farmers who live more outside of the centre or at the margins of Sintuwu, in the village cluster represented as Cluster 5 – 7, see Tab. 3.

	Village cluster						
Trainee Program	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
0	16,0%	8,0%	2,0%	6,0%	14,0%	10,0%	4,0%
1	8,0%	4,0%	4,0%	12,0%	2,0%	2,0%	
2	2,0%					2,0%	
3	4,0%						

Tab. 3: Village cluster in relation to trainee program

In general it must be pointed out, that the dissemination of cacao cultivation knowledge by books and information brochures from the trainee programs appear to be of minor importance. A dissemination by radio, television, video or disk is also not very common. The government radio has reported about rural crops, cacao prizes and quality. Often the radio sent herbicide, pesticide and fertilizer commercials. A report on television about other cacao growing countries and one about cacao quality have been watched by some farmers. One farmer owns a video which shows the technique of grafting. He had watched the disk with many other farmers, doing his part in the dissemination of useful knowledge.

Advertising wallpapers from pesticide and fertilizer companies stuck on many trees and houses and are very present in Sintuwu and the surrounding area and do not really help the implementation of sustainable agronomic practises.



Fig. 7: Road side cacao trees as advertising space for agrochemical products. Photo: Maria Abbate, 2006

3.2. Utilization of Cacao Cultivation Knowledge

The extreme expansion of Indonesian cacao production in the last ten years was mainly caused by large production increases of Sulawesi smallholders.

Sintuwu's cacao farmers understandable wish to improve their economic status and the protection of the LLNP has led to a conflict between the aims of environmental and socio economic development. The size of the cacao plantations in Sintuwu still increases, 78% range from 0,25 to 2 ha, the remaining 22% is up to 13 ha big and can not be classified as smallholder farms anymore. The adoption of cacao cultivation in the last 10 years, can be shown in regard of the age of cacao plantations in Sintuwu, 32% are up to 5 years old and 48% are between 6 - 10 years old. Without incentives for the farmers to differentiate their beans and invest in quality improvements, smallholders will most probably continue to extend their farm size in order to maximize economic profits.

Farm size in % and ha		Ethnic origin						
		Kaili	Bugis	Balinese	Chinese	Napu Alitupo	Mix Bugis/ Kaili	Mix other
2%	0,25	2,0%						
22%	0,50	12,0%	2,0%				4,0%	4,0%
28%	1,00	10,0%	8,0%	2,0%			4,0%	4,0%
4%	1,50	2,0%						2,0%
2%	1,75	2,0%						
2%	1,80						2,0%	
18%	2,00	6,0%	2,0%		2,0%		4,0%	4,0%
4%	2,50		2,0%					2,0%
8%	3,00	4,0%	2,0%			2,0%		
2%	4,00		2,0%					
2%	4,50							2,0%
2%	5,00		2,0%					
2%	7,00							2,0%
2%	13,00		2,0%					
100%		38%	22%	2%	2%	2%	14%	20%
Age in % and years		Kaili	Bugis	Balinese	Chinese	Napu Alitupo	Mix Bugis/ Kaili	Mix other
2%	1,00	2,0%						
6%	3,00	2,0%	2,0%				2,0%	
8%	4,00	4,0%						4,0%
16%	5,00	6,0%		2,0%			6,0%	2,0%
4%	6,00						2,0%	2,0%
6%	7,00		4,0%					2,0%
6%	8,00	6,0%						
2%	9,00						2,0%	
30%	10,00	14,0%	4,0%		2,0%		2,0%	8,0%
4%	12,00		4,0%					
4%	13,00		2,0%					2,0%
2%	14,00	2,0%						
2%	15,00	2,0%						
2%	18,00		2,0%					
4%	20,00		2,0%			2,0%		
2%	24,00		2,0%					

Tab. 4: Ethnic origin related to the distribution of farm size and age of cacao trees

CPB problem: in Sintuwu the Cocoa Pod Borer is called Tanasi, although it was not always clear if the farmers mean one specific insect or the damages on fruits, see picture next page. One farmer has caught one CPB fitting to the description in one of his cacao brochures, to show which animal it is.

50% of the cacao farmers have a lot of CPB/Tanasi problems. Several other pests like caterpillars and virus diseases, like vascular dieback cause more or less serious losses in yield, too.

		Trainee Programs			
		0	1	2	3
Management of CPB/Tanasi	No	10,0%	2,0%		
	PSPSP				
	Sanitation=pots in hole, cut branches, burn leaves and pots, etc			2,0%	
	cut branches, burn leaves and pots sometimes	16,0%	6,0%	2,0%	4,0%
	Pots out of plantation	4,0%			
	Cut branches	4,0%	2,0%		
	Spray + cut branches and/or burn leaves + pots	16,0%	12,0%		
	Spray pesticide like Matador, Dusban, Decice, Bambu Hijau	10,0%	10,0%		
	No	14,0%	2,0%		
	Management of other pests and diseases				
Management of other pests and diseases	PSPSP				
	Sanitation=pots in hole, cut branches, burn leaves and pots, etc	2,0%	2,0%		
	Cut branches, burn leaves and pots sometimes		2,0%		
	Cut branches		2,0%		
	Spray pesticide like Matador, Dusban, Decice, Bambu Hijau	2,0%	10,0%		
	Try to find and cut branches and/or burn	38,0%	14,0%	4,0%	4,0%
Maintenance of plantation	Cleaning against mouse	4,0%			
	No	2,0%	2,0%		
	PSPSP				
	Sanitation=pots in hole, cut branches, burn leaves and pots, etc		2,0%	2,0%	
	Cut branches, burn leaves and pots sometimes	8,0%	2,0%		4,0%
Cut branches	50,0%	26,0%	2,0%		

Tab. 5: Cross table - Trainee Programs and management of cacao cultivation routines

Even though the farmers learned how to handle the CPB and other pest and disease problems by the PsPSP program, the majority did not utilise this knowledge in a successful way. The cacao farmers answered often, that they work according to this plan, but by asking on if they have a covered hole with collected pots and if damages plant material gets burned frequently, they often admitted that they do not really do so because the improvement of the situation comes only slow, while they have a lot more work. Some farmers argued that it is good to make small fires inside the plantations by burning pots and leaves to repel insects with the smoke.

The PsPSP program is only practiced by a minority of cacao farmers, so that CPB always finds some neighbouring plantation to complete its life cycle and return. It seems to many

farmers, that the plus of labour they invest into sanitation is not worth the effort. The losses due to CPB and other pests are still limiting the productivity enormously.

The “Sarongisasi” technique is not in use, because it is too labour intensive. It requires too much labour to protect a bigger amount of cacao fruits by condomization.

In general most of the cacao farmers maintain the farm and manage the pest and disease problems by spraying pesticides and cutting branches, here with 62%.

Approximately 60% of the interviewed cacao farmers know about side effects of pesticides and herbicides, although only the minority of farmers protect themselves while spraying pesticides or herbicides. Some farmers knew only a little about side effects, like that they should not spray in the near of water reservoirs. Some of the farmers (22%) had the opinion that there are no side effects and there is no possibility to grow cacao trees without spraying pesticides and herbicides. 40% think that it is better not to use pesticides, herbicides and artificial fertilizer.

Most of the cacao farmers sell their cacao beans to local buyer, who come every day to Sintuwu. In Palu the traders pay higher prices, but the farmer have to organise and pay the transport, which most farmers, who own no transport vehicles, do only in peak seasons, when they have bigger amounts of beans. Transport cooperatives would make it possible for farmers to sell their beans for a higher price in Palu, also outside peak harvest seasons. The self evaluation showed that 60% of the cacao farmers are convinced of producing a good quality, probably unaware of any world market quality standards.



Fig. 8: Cacao beans in different qualities; Photo: Maria Abbate, 2006

3.3. Portrait of a successful and creative farmer

Pak Baharudin was among the first cacao farmers in Sintuwu. He is a Bugis and established his first plantation in 1987 as promoted by the Indonesian government at this

time. He was thus able to profit from the cacao boom phase in the 90ties. Nowadays he owns one of the bigger, well built houses in the centre of Sintuwu, including an office, guest rooms, a small shop, and a brand new storeroom for the harvested and dried beans. He provided us with a pleasant accommodation during our stay.

He is the only farmer in Sintuwu who keeps detailed record of his whole production cycle, from the cost for purchased, seeds, fertilizer, pesticides, herbicides and the amount of yield per year to the profit after processing, transport and sale. He could calculate the turnover per year precisely, so that he had a realistic idea of the different factors influencing the productivity and profitability of his cacao plantation. He even had hand made statistics comparing the last ten years expenses, yields and profit, as shown on the following page.

He also tried to diversify his land use system by planting Vanilla and coffee but due to the jumping world market prizes of those crops, he concentrated his force on cacao cultivation, which provides a secure income source for him and his family.

After having visited trainee program, he soon adopted the technique of grafting, which shows success in his plantations. He tried also the condomization and the airlayering techniques, but he was not quite convinced by the results.

He formed a village group where several farmers meet to discuss their eventual problems and other farmers come to his home office to ask him for advise.

He was very aware that the mode of cacao bean fermentation practiced in Sintuwu does not meet the quality standards of the world cacao market, but he pointed out that the farmers would not agree to change their practises without directly benefiting from this fact. This view correspondents with the actual analyses that the world market or more precise the cacao traders have to give an economic perspective to those farmers who are willing to improve their quality of cacao bean.

Pak Baharudin was very open for new ideas and technologies. He would welcome any development initiative. He personally agrees to the aims of forest conservation and had no further future plans for a farm extension, but he admitted that other farmers, who do not have big plantations yet, still take the chance to established fields in the protected National Park area, which could also be witnessed by other farmers (one farmer even told that he felled 6 hectares of rain forest last year).

Pak Baharudin shared the view that an effective forest conservation has to take in regard the needs and goals of local people. He pointed out that cacao cultivation as the only sources of income could not be really sustainable and that a diversification of the sources of income would be as well of importance.

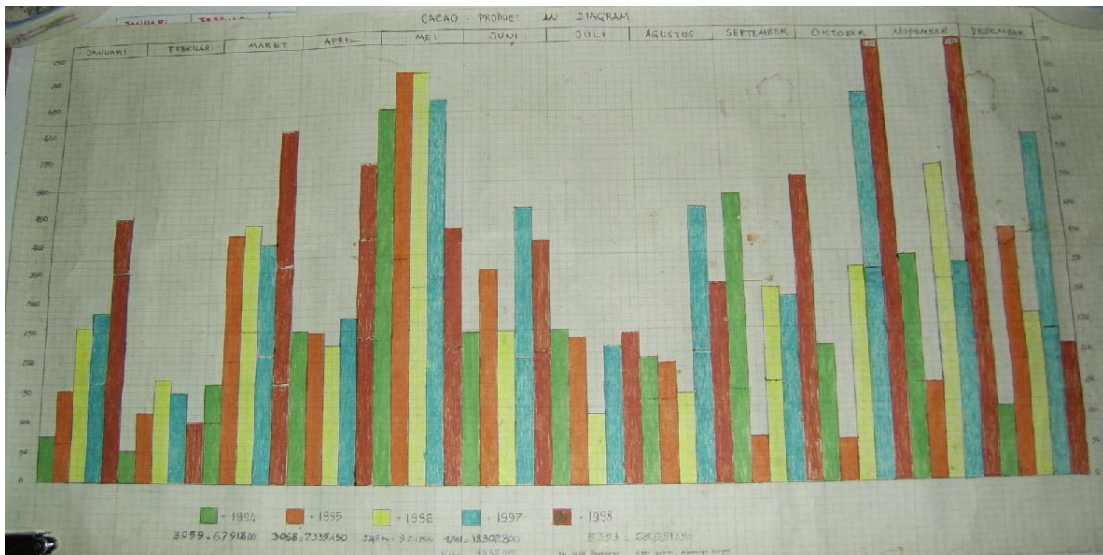


Fig. 9: Pak Baharudin's cacao production 1994 – 1998

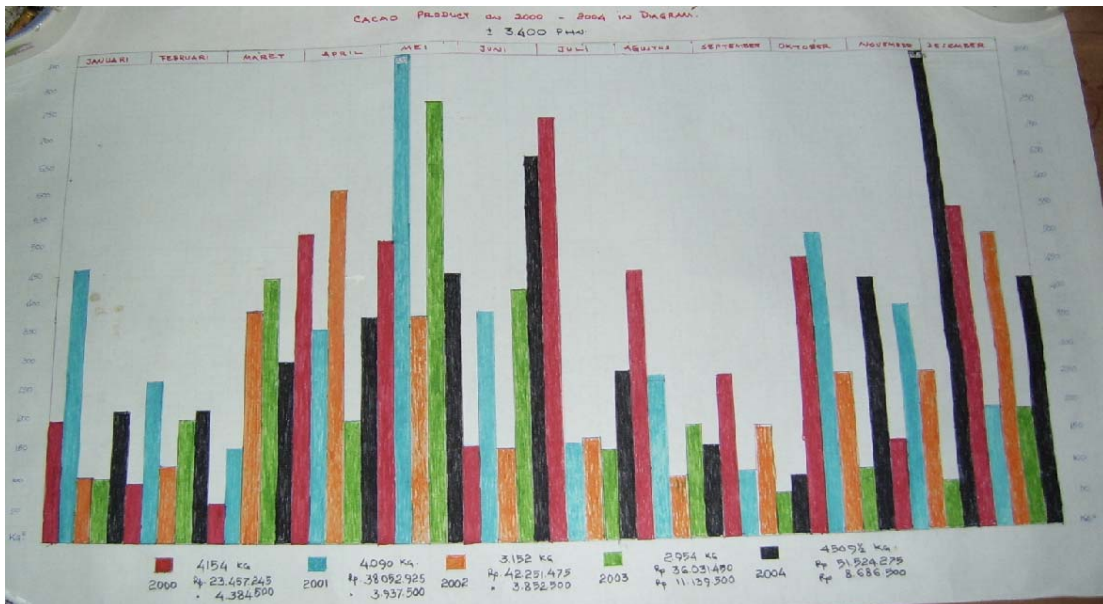


Fig. 10: Pak Baharudin's cacao production 2000 - 2004

4. Conclusion

The dynamical cycle of changes implied by forest conservation and agricultural expansion led to a fast transformation and dissemination of knowledge. According to the Sulawesi cacao boom, it must be taken into account that Sulawesi cacao farmers utilise cacao cultivation knowledge in a way, in which the cacao world market pushes these cacao growers. While the climate and soil in Sulawesi as well as the entrepreneurial attitude of the smallholders were vital for this development, a relative lack of support interventions in sustainable agriculture and marketing distribution arose. Since global trade in Sulawesi cacao bean is volume based, it is recommended that efforts to improve cacao productivity must form the basis for any cacao development initiative in Indonesia.

There are several issues which should be addressed by the Indonesian government in order to maintain the socio economic as well as the ecological stability.

The Cacao pod borer is an extremely serious problem and, if it spreads out of control, it continues to decimate the productivity of cacao plantations enormously. Apart from the Cacao pod borer problem, the major problem is a lack of additional land with suitable soil and climate, extension services in suitable areas, as well as frequent trainee programs.

Judging new plantations and maturing of recently planted trees, the expansionary trend of the last ten years is likely to continue for the next years. Due to the still increasing cacao world market, it can be expected that the forest exploitation around the Lore Lindu national Park will go ahead, however, tolerated by the Indonesian government or not. To face this challenge, it is of great importance to guide the cacao farmers on their way to sustainable agriculture systems.

Regarding the results of this case study, following critical issues can be pointed out:

1. Cacao farmers are able to develop themselves, if given access to necessary technical support in form of training courses, local consulting services and if economic perspectives are given to them. It is necessary for the future to increase the field productivity through improved plantation management to guaranty smallholders a higher income without the need for extended cultivation areas. Transfer of knowledge is the basis to improve cacao-farming profitability, thus technological progress resulting in higher yields would allow higher profits without taking more ecological precious land under cultivation.
2. The basic knowledge about cacao cultivation e.g. how to propagate cacao trees and maintenance of cacao plantations, etc., was mainly disseminated by family members, friends and neighbours.

The adoption of cacao cultivation knowledge by seeing and hearing and by working together, has as well a great impact on the transfer and the utilisation of ethno botanical knowledge, in this case the necessary skills and abilities for a successful cacao plantation.

Trainee programs play an important role in transferring new techniques through training courses, but the activities of the different organisations could be better organized and coordinated.

The Washington-based NGO, ACIDI/VOCA, was selected to act as field implementer for the PsPSP project and was quite successful in reaching a large number of farmers. It is not unimportant that these programs were designed, implemented and

funded largely by US-based organizations, as the US constitutes the single-largest export market for Sulawesi cacao.

3. The CPB problem seemingly decreased a bit, but farmers in Sintuwu start already to return to old patterns, frustrated by too little improvement due the fact that the PsPSP program is only practiced by a minority of cacao farmers, so that CPB always finds some neighbouring plantation to complete its life cycle and return. It seems to many farmers that the plus of labour they invest into sanitation is not worth the effort. The losses due to CPB and other pests are still limiting the productivity strongly. The Sarongisasi/Condomisasi or “condomization” program could not be successfully implemented, because the technique requires too much labour to “condomize” a bigger amount of cacao fruits, especially if the trees are big already. Further steps to cope with pest management should be taken by the Indonesian agriculture department and NGOs. Many of the current private and public sector initiatives to support cacao have limited outreach and are overly dependent on external funding.
4. The post harvest processes are handled in a very unsatisfying way. The cacao farmers have not sufficiently learned about the importance of cacao fermentation and drying. The fermentation for 1 or 2 nights in a plastic sack is in no sense appropriate. The better off farmers use concrete floors to dry the beans in the sun, unprotected from environmental influences, like insects, domestic animals and occasional rains. Farmers who could not afford this investment so far, dry the beans on various plastic sheets, unprotected to all sorts of pollution. The drying on tables or even better in solar tunnel dryers or similar drying facilities would probably bring an enormous quality improvement for relatively low investment costs. The tunnel dryer contributes the advantages of protection against environmental influences and a faster, quality improving drying process.
5. The very useful technique of grafting and cuttings was shown and practiced in the field. The farmers were given a special hormone powder for the cuttings, and a special grafting knife to learn how to utilise this technique. The technique has been adopted by just a few farmers, but those use it now quite successfully. Optimistically it can be expected that the use of grafted more productive cacao plants will help a growing number of farmers to meet future challenges.

6. To reach a maximum of farmers with trainee programs, different neighbourhood communities of the village have to be taken into account, to make the so called snowball effect, effective. The chance to attend trainee courses should be made accessible to members of all village communities equally. Especially young farmers with little experience can benefit from proper guidance by trainee programs.
7. The attempt of the NGO CARE to promote organic farming among cacao farmers could not be found successful, neither a single certified organic farm nor any fair trade concept could be established in the research area, so far.
To promote organic farming successfully, a quality certificate has to be designed and established and cacao traders have to agree to fair trading rules, more precisely to adequate high prices for organically produced cacao.
8. The SPC, developed in Jember in cooperation with the University of Hohenheim in Germany, could be a chance for smallholder cooperatives, to take a part of the cacao processing and so of the product value chain into their own hands. But a rather high financial input sponsored by external sources would be necessary to implement processing centres in the many Sulawesi villages involved in cacao farming.
9. Farmers lose profit to the middle traders who dry the beans to market ability. If cacao traders would agree to pay higher prices for better qualities of dried market able beans, the opportunity to improve their income would be a welcome incentive for cacao farmers to elaborate their mode of fermentation and drying. The necessary knowledge transfer for an appropriate utilisation of the technique could be promoted by the present development organisations.
10. The current marketing structure of the global demand for low quality as low price beans does not provide adequate incentives to improve quality. It is clear that rigid adherence to a non-interventionist approach to industry development is no longer an appropriate strategy in this content. Market forces alone have been unable to address the complex causalities of quality decline. The future of the Sulawesi cacao sector hinges heavily on its ability to address ongoing quality deterioration at the farm-level, preferably in a tightly coordinated way. Importantly, any quality improvements at the farm level must then be maintained throughout the supply chain.

Finally there are options to be suggested, which may show alternatives in this fundamental cycle of changes.

To overcome the existing problems, the Indonesian government should encourage cacao farmer cooperatives. The primary objective is to ensure the production of high quality cacao beans, which fulfil the international quality standards in terms of flavour and healthiness. Sufficient quantity of high quality cacao bean can be produced in a regular time basis that is accessible to set up a direct marketing system from cooperatives to reliable buyers. Simplifying the marketing chain will give a great influences, in improving the quality of the product and in obtaining higher benefit from higher selling price. In the long terms, it will give a positive impact to the improvement of cacao farmers income.

To improve the competitive strength, cacao cooperatives should be founded and backed up continuously with new technologies in the cacao plant production and the processing that can be delivered by the research and development institutions. Through this organisation, the farmers can be trained and convinced to increase the plant productivity and to produce better quality of cacao, instead of more expansive agronomic strategies.

The CPB is an extremely serious problem and the problem is difficult to solve, especially in the smallholder sector. At this stage, as a necessary first step, a comprehensive survey to determine the extent of infestation needs to be undertaken. This is an area where Government's involvement, both at the central and regional levels, could be beneficial.

There may be opportunities to explore additional methods to expand the dissemination of the PsPSP messages via media including radio and television, if appropriate. Print media could also be better exploited to disseminate the PsPSP methodology. The general distribution of technical brochures is of doubtful use, but some of the farmers found well made illustrated brochures, like the one from ACDI/VOCA, quite helpful.

Technical development, for example the implementation of fermentation or drying facilities requires investment of money. A fact that can limit the possibilities strongly, because investment capital is often too short and many farmers even have taken credits for other expenses already that still have to be paid back. The recently awarded concept of micro credit could possibly be successfully applied to empower cacao smallholders to make progressive decisions and purchase necessary materials. Post harvest processing could be an interesting opportunity for women, as the labour intensive plantation maintenance is mainly done by the men.

The Indonesian government plans to establish chocolate manufactures to produce chocolate in the country in the next years. This is an additional important step to leave more of the added value of the cacao value chain inside the country and thus to improve the socio economic output.

The Cacao Village Model from the national cacao association ASKINDO, could help to implement an integrated cacao development program for communities in Sulawesi. The “cacao village model” with the approach of training and technical support, focusing on the social, economic, and cultural dimensions could be a sustainable long term guidance in cacao cultivation.

Tourism could be an interesting possibility to let the protected Lore Lindu National Park become more widely accepted by the local people who live at its margins. If local people benefit from tourists, who come to see the intact rain forest and its flora and fauna, they are more likely going to agree with the conservation of nature. Tourism could probably help to solve the conflict between economic and ecologic aims, as the utilisation of nature as a source of monetary benefit, would mean a win-win situation for both, the National Park and the local people.

A growing demand for organically grown, high quality cacao beans can be an interesting option and a sustainable alternative for smallholders to improve their income, if a fair trade system, that lets farmers benefit economically in an adequate way, could be established. Due to the fact that until yet the Indonesian cacao growers have massive problems to produce world quality standard cacao, it seems that this sustainable option is too far away as that it could be realised in the near future. But finally, its an opportunity for this global sweet desire.

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