Study on Suitability, Feasibility, and Socioeconomic Benefits of Cocoa Production in Viet Nam

Final Report

prepared for

Ministry of Agriculture and Rural Development (MARD) – Government of Viet Nam

by

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PREFACE

A report prepared for Department of Crop Production of the Ministry of Agriculture and Rural Development, Government of Viet Nam by Agrifood Consulting.

This report[1] is the Final Report for the *Study on Suitability, Feasibility, and Socieconomic Benefits of Cocoa Production in Viet Nam*.

The Final Report has been prepared during October 2008 and is based on consultations and field work conducted by the Study Team during October 2008.

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The views expressed in this report are those of the consultants and do not necessarily reflect the views of the Department of Crop Production of MARD or other partners mentioned above.

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LIST OF ABBREVIATIONS AND NAMES

ACC	ASEAN Cocoa Club
ACIAR	Australian Centre for International Agricultural Research
ACDI/VOCA	American Non – Government Organization
CAFS	Cocoa Agroforestry System
CARD	The Collaboration for Agriculture and Rural Development program
Cargill	International provider of food, agricultural and risk management www.cargill.com
CDM	Clean Development Mechanism
CEMMA	Committee on Ethnic Minorities and Mountainous Affairs
CH	Central Highlands
CPB	Cocoa Pod Borer
DANIDA	Danish International Development Agency
DCP	Department of Crop Production
DOF	Department of Forestry
DOST	Department of Science & Technology
DPP	Department of Plant Protection
ED&F MAN	Provider of agricultural commodities: www.edfman.com
EIA	Environmental Impact Analysis
FAO	Food and Agriculture Organization of the United Nations
FPR	Frosty Pod Rot
FFS	Farmer Field School
FU	Farmer Union
FSSIV	Forest Science sub-Instituted South Viet Nam
GTZ	Gesellschaft fur Technische Zusammenarbeit
HFA	Household Forest Area
ICD	International Cooperation Department
IRR	Internal Rate of Return
LNV	Dutch Ministry of Agriculture, Nature, and Food Quality
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MARS	Mars Incorporated, a global company in the chocolate industry: www.mars.com/global/home.htm
masl	Meters above sea level
MOF	Ministry of Finance
MOET	Ministry of Education and Training
MOIT	Ministry of Industry and Trade
MOST	Ministry of Science and Technology
MRD	Mekong River Delta
NAFEC	National Agriculture and Fishery Extension Center
NLU	Nong Lam University in Ho Chi Minh City
NPV	Net Present Value
OLAM	Global commodity trading company: www.olamonline.com
PAH	Polycyclic aromatic hydrocarbons
PPC	Provincial People Committee
PSOM	Dutch Programme for Cooperation with Emerging Markets
SNV	Netherlands Development Organization
SE	Southeast region
SFE	State Forest Enterprise
Sub-NIAPP	National Instituted of Agricultural Planning and Projection – southern

	Branch in HCMC
SUCCESS	Sustainable CoCoa Enterprise Solutions for Smallholders
SA	Success Alliance Project
TF	Training Facilitator
TOT	Training of Trainers
TOUTON	French Trade Company in Coffee and Cocoa: www.touton.fr
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAC	Vuon Ao Chuong (Garden - Fish pond – Livestock system)
WASI	Western Highlands Agricultural Science Institute
WB	Weavil Borer
WCF	World Cocoa Foundation: www.worldcocoafoundation.org
WHO	World Health Organization of the United Nations
WU	Women Union
WWF	World Wildlife Fund

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1 EXECUTIVE SUMMARY

1. The cocoa sector in Viet Nam is in an ebullient stage of development, showing promise of rapid growth. From about 500 ha of cultivated land in 2003, total cocoa cultivated land is estimated at about 10,000 ha by the end of 2008. An increasing number of farmers have started to grow cocoa and about 20,000 of them are already involved in the sector. A number of initiatives by government and donors are focused on the sector and there is a general optimism that cocoa might be the next success story of agriculture in Viet Nam.

2. There are two views about the prospects of cocoa development in Viet Nam. On one side there is an optimistic view of the sector, expressing confidence that the cocoa sector will grow rapidly and achieve the ambitious growth targets expressed by the Government (60,000 ha by 205 and 80,000 ha by 2020). The optimistic view is based on various factors including the interest of international buyers and key actors in the world cocoa industry, the initiatives taken by the Government in recent years (establishing standards, approving clones, creating a Cocoa Coordination Committee), the dedication of the research organization, the interest of donors, the increase in world cocoa prices, and the suitability of cocoa cultivation in Viet Nam.

3. On the other side, there is a more cautionary view, inspired by a history of failures of previous attempt to develop the sector (during the colonial period, the American war, and the 1990s), a mismatch between government targets and actual policies, plans, and investments, and an assessment of various factors related to competitiveness of cocoa with other crops, the risks of outbreaks of pests and diseases, increasing labor costs, the trade-offs between biodiversity-benefits and agricultural intensification, and climate change

4. In both views the expansion of cocoa is considered possible and desirable provided that appropriate policies, plans, and investments are implemented so that cocoa fulfills its potential to improve rural livelihoods and the environment.

5. More fundamentally, both views agree on the fundamental need of a strategy for the sector and recognize the fact that at present there is no such strategy. In the absence of a sector strategy, the rapid growth achieved over the past few years will not continue and the cocoa sector will remain of marginal significance. The rapid growth in the past few years has been achieved mostly through investments funded by donors and foreign private sector. Unless the Government itself makes a commitment to investment in the sector, it will be difficult for Viet Nam to reach its growth targets.

6. In order to inform the Government decisions about the formulation of a strategy for the sector three key issues are addressed:

- **Suitability**: Under what agroecological conditions and farming systems is cocoa production suitable in Viet Nam?
- **Feasibility**: How competitive with other crops and economically attractive to farmers is cocoa cultivation?
- **Sustainability**: Under what conditions expansion of cocoa is sustainable from an environmental, economic, and social point of view?

Suitability

7. Cocoa has proved to be suitable to a variety of agroecological environments in Viet Nam. Almost 20,000 farmers have been engaged in cocoa production since 2004. Intercropping systems in the Mekong River Delta and some provinces of Southeast region have proved successful. Monoculture system in the Central Highlands is practiced, but, due to a combination of poor farming practices, limited technological transfer, and poor planting materials, the system has not yet reached its potential. Intercropping with cashews is already practiced in Binh Phuoc, Lam Dong, and Dong Nai; some technical issues have still to be resolved, and research work is ongoing to address these issues. Agroforesty models are currently pursued in four sites in Binh Phuoc, Lam Dong, and Dong Nai. It is too early to assess their impact but preliminary observations suggest good growth and positive impacts on communities, the environment, and biodiversity. Areas suitable for cocoa agroforestry exist in the Central Highlands and Southeast regions.

Feasibility

8. Economic analysis indicates that cocoa could be an attractive crop to smallholder farmers, both in intercropping and monoculture systems. Cocoa could be competitive relatively to alternative crops and has the advantage of lower labor (eg relative to coffee and rubber) and water requirements (eg relative to coffee). Moreover, Viet Nam has a comparative advantage in the production of cocoa, cocoa is linked to a large and growing world market, there is unfulfilled demand from the Asian processing industry, and international buyers are interested in seeing Viet Nam as a new stable supplier of fermented beans in the world market.

Sustainability

9. If good practices are followed cocoa could be environmentally sustainable and contribute to improvement in biodiversity. This is certainly the case for intercropping and agroforestry systems. Even in monoculture system, if models of permanent shade trees are adopted, both economic and environmental benefits could be derived. Water use is lower than in competing crops and there are additional benefits to smallholder farmers from the use of Clean Development Mechanisms (CDM) that could generate carbon credit to farmers engaging in agroforestry models.

10. From an economic point of view, fluctuations in world prices, availability of labor, and production risks associated with major outbreaks of pests and diseases are major challenges. Current world prices are high relatively to the last 10 years trends, but are also highly variable. Labor is becoming more expensive in Viet Nam and less available for farm work, driven by the economic transformation of the country into a middle income status, the movement of labor toward non-farm activities, and the exodus towards urban areas. Lower requirements of labor in cocoa relatively to other crops is an advantage; however, rising labor costs will have to be counterbalanced by improved productivity, bigger farm size, and outsourcing of some operations to specialized companies and business service providers (eg fermentation station companies, fertilizer and pesticide spraying companies). Even though the

current situation with pests and disease is not alarming, outbreaks of pests and diseases are a serious risk for which Viet Nam has to prepare now, at the period of still infancy of the sector. Research and technology transfer programmes have to be expanded considerably in order to ensure preparedness for the future.

11. From a social point of view, it was observed that child labor is not used in the sector, except for activities that could involve children outside of their school activities. Parents in Viet Nam give a very high value to education and push children to pursue higher education level. Women play an important role in cocoa. Focus group discussions indicate that cocoa is quite suitable for them, since it provides stable income and is not very demanding on their labor use. Farmer organizations are weak and yet essential for the sustainability of smallholder agriculture. Ethnic groups involvement in cocoa is still very limited in spite of a high potential of cocoa development in the areas (Central Highlands and Southeast) where large ethnic groups live, and the opportunity of involving these communities in agroforestry models that have both economic and environmental/biodiversity impact. However, the challenges of technology transfer to ethnic groups are considerable, as these groups are often at a disadvantage in terms of education, assets, and isolation from markets.

The core problem

12. In spite of rapid growth over the past 4 years, the cocoa sector in Viet Nam is at its infancy and volumes of production are still low in relation to the potential of the sector, implying an unfulfilled opportunity for cocoa to improve the living standards of the rural population and the environment. Addressing the core problem of low volume of production through a sustainable expansion of the sector will result in increased opportunity for income and employment generation in rural areas and environmental benefits.

Potential of the sector

13. The assessment of suitability, feasibility, and sustainability of cocoa production in Viet Nam indicates a considerable potential for expansion. The assessment of potential takes into account (i) the information provided by the provinces; (ii) the low suitability of the South Central Coast; (iii) no new agricultural land for cocoa will be used; instead cocoa will be either intercropped or cultivated in monoculture system in coffee and cashew land that have already reached their replacement point; (iv) introduction of cocoa agroforesty systems in degraded forest areas; (v) access to water during the dry season; and (vi) moderately sloping land.

14. Based on this assessment, close to 100,000 ha of land are found to be suitable for cocoa expansion. The translation of the potential into actual cultivated area will depend on three critical factors: (i) the strategy and policies pursued by the government; (ii) the funds available for investment; and (iii) the willingness of farmers to engage into cultivation of cocoa.

Potential for Expansion of Cocoa Cultivated Area (ha) in Viet Nam

	Intercropping	Monoculture	Agroforestry	Total	Percentage
Mekong River Delta	17,294	-	-	17,294	17.5%
Southeast	28,795	1,720	6,000	36,515	37.0%
Central Highlands	8,931.00	31,070	5,000	45,001	45.5%
Total	55,020	32,790	11,000	98,810	100.0%
Percentage	55.7%	33.2%	11.1%	100.0%	

15. The key elements of the strategy consist of (i) a vision for the sector; (ii) goals for 2020; (iii) a road map; and (iv) an action plan for the short, medium, and long-term. The strategy addresses the core problem of the sector (low volume of production) by establishing a set of policies, institutions, and plans that facilitate the fulfillment of the potential of cocoa to improve rural livelihoods while moving the sector towards a vision based on sustainable flows of benefits to smallholders and the environment.

Vision

16. The vision proposed here indicates what the cocoa sector in Viet Nam should aim to be. As such the vision is a guide for the elaboration of goals, road maps, and action plans. While the goals, road maps, and action plans might (and should) change over time as new information becomes available and conditions change, the vision should stay the same.

A cocoa sector that generates a sustainable flow of economic and financial benefits to stallholder farmers; adopts good practices in production, processing, and trading; is efficient and competitive in terms of stable and quality produce; promotes biodiversity and follows environmentally friendly practices; and is supported by a well organized research, extension system, and marketing system.

Goal

Viet Nam is a reliable supplier of quality cocoa beans in the world market with production of more than 100,000 tonnes by 2020.

Road Map

17. The road map consists of five elements including (i) a National Cocoa Technology Transfer Program; (ii) A Cocoa Research Program; (iii) A quality assurance system for Planting Material; (iv) the establishment of a Viet Nam Cocoa Denomination with high reputation in world markets; and (v) a cocoa monitoring and evaluation system

18. **National Cocoa Technology Transfer Program**. The programs will accelerate technical transfer to smallholder farmers, promote the adoption of good and sustainable practices, and contribute to improvement in productivity of the average farmer. Its main features will be a participatory approach to extension, based on Farmer Field Schools, effective training, demonstrations, and technical assistance. Differently from traditional

technology transfer programs pursued by DARD and Agricultural Extension which are based on input subsidies and often limited monitoring and training, the cocoa program should promote the sector on the basis of effective dissemination of viable technologies and sustainable practices, intensive training (see Annex K for a list of training topics carried out by the Success Alliance), and regular monitoring. Rather than being spread among farmers in isolated locations, the program will focus on areas with agroecological potentials within each district and create a critical mass for replication and spillover effects. Models of intercropping, monoculture, and cocoa agroforestry will be promoted in suitable agroecological areas. The Program will include a credit component to facilitate access to medium-term finance of poor farmers wishing to engage in cocoa cultivation.

19. **Cocoa Research Institute**. Rather than continuing the current situation of limited and irregular funding to research institutes, a cocoa research programme should be established over the medium-long term (5 to 10 years). To be effective the research programme should be institutionalized. It is proposed that the research programme to be institutionalized at the Southern Agricultural Science Institute which is located at the crossing of the main cocoa production areas (the Mekong River Delta, the Southeast, and the Central Highlands) and would therefore be in a better position to transfer technology. For a cocoa research programme to be effective, adequate capacity of researchers and technical staff will be required. A program of capacity building of a core group of researchers should be carried out in parallel with the establishment of the research programme. The envisaged Cocoa Research Institute will also have a Technology Transfer and Training Center to facilitate various initiatives by public and private sector in promoting cocoa sector in Viet Nam.

20. **Quality Assurance System for Planting Material**. The system will include a nursery certification system, internal and external auditing of certified nurseries, and inspection of nurseries and distribution of planting material. The certified nurseries will be periodically audited and inspected to ensure quality of their products. Certification of nurseries will be voluntary, but will provide farmers with a quality assurance of the seedlings they buy from certified nurseries. DCP and DARD will be the agencies responsible for certifying nurseries, monitoring the nursery system, audit certified nurseries, and inspect all nurseries operating in the country.

21. **Viet Nam Cocoa Denomination (VICOCOA**). A quality assurance system for cocoa beans exported will be established, with the aim of creating a reputation of Viet Nam as a stable producer of quality and safety cocoa beans. This will involve the establishment of standards for good practices in cocoa production, postproduction, and marketing (approval of a VIETGAP for cocoa), promotion of fermentation companies to ensure uniformity of quality of cocoa beans, the establishment of monitoring and quality control system mechanisms, regulation for export documentation and certification, and establishment of laboratories for testing quality, pesticides residues, and other contaminants in cocoa beans destined to export. Cocoa beans meeting quality and safety requirements will receive a certificate and logo that will help building a reputation for the Viet Nam Cocoa Denomination (VICOCOA).

22. **Monitoring and Evaluation System.** Currently, there is not yet a system for monitoring and evaluation of the cocoa sector. Data on the sector are few, unreliable, and dispersed across provinces. Monitoring of farming practices, nurseries, costs of production,

prices, and quality does not occur, or is irregular and lacks a systematic approach. Studies on cocoa in Viet Nam are few. If the sector has to expand, it will have to rely upon reliable statistical information and a good system of monitoring and evaluation studies to inform strategies and policies. A unit for monitoring and evaluation of the system should be established at the Department of Crop Production (DCP) and the General Statistical Office (GSO) should include cocoa in his surveys and annual publications.

Action Plan

23. In order to translate the road map into actions, an Action Plan is proposed with key activities, responsibilities, and partners. The Action Plan is presented for three periods: short term (2009); medium term (2010-2015), and long-term (2016-2020) and illustrated in Table 1-Table 3.

Policies

24. Several policies will have to be formulated and approved to promote the development of the cocoa sector. Most of these policies should be formulated and approved in the short (2009) to medium term (2010-2015) and include:

1. Approval of the Strategy for Cocoa Sector Development
2. Action Plans formulation and promulgation by Central and Provincial Governments
3. Establishment of Quality Assurance System for Planting Material and Nursery Certification
4. Approval of VIETGAP for Cocoa
5. Approval of Cocoa Research Institute, Research Program, and Capacity Building of Core Group of Researchers
6. Establishment of Quality Assurance for Export of Cocoa Beans (VICOCOA denomination)
7. Establishment of a Statistical System for Cocoa
8. Approval of a National Technology Transfer Program
9. Guidance and Instructions about Cocoa Agroforestry Systems Development
10. Review of Cocoa Products Export and Import Taxes
11. Guidance on Access to Medium-Term Credit for Cocoa Development
12. Approval of Research Programs on Introduction of New Planting Material from other countries and Clonal Trials
13. Approval of New Clones

Partnerships

25. Different actors will play a crucial role in the implementation of the cocoa development strategy for Viet Nam. These include the private sector, NGOs, donor agencies, research organizations, provincial and central government, farmer and community organizations, and international and regional associations. Each has played already an important role in the development of cocoa in Viet Nam. Further contributions are expected in the future.

Action Plan Agreement between MARD and LNV

26. An Action Plan agreement between MARD and the Ministry of Agriculture, Nature, and Food Quality was reached at the *International Cocoa Workshop on Public Private Partnership for Sustainable Cocoa Development in Viet Nam* held in HCMC on November 6-7, 2008. The workshop participants, including government agencies, private companies, NGOs, and research organizations assessed the report and expressed their appreciation for the analytical work, the main conclusions and recommendations.

27. As per Action Plan Agreement, the Department of Crop Production and the Embassy of the Netherlands in Ha Noi will establish focal points for sustainable development of the cocoa sector. A Partnership Management Office in liaison with the Viet Nam Cocoa Coordination Committee will be established at MARD to coordinate and monitor the progress of the agreed actions on partnerships and will report quarterly to all members of the Public Private Partnership between MARD and the Dutch Ministry of Agriculture, Nature, and Food Quality.

Table 1 Short-Term Activities (2009), Key Responsibilities, and Partners in the Action Plan

No.	Activities	Key Responsibility	Partners
1.	Approve Strategy for Cocoa Development	DCP/MARD	Private Sector, DARD, Research Organizations. Donors, NGO, Farmer Organizations
2.	Formulate National and Provincial Plans	DCP/MARD NAFEC/MARD DARD	Private Sector, Research Organizations. Donors, NGO, Farmer Organizations
3.	Identify Investment Funds (from Central and Provincial Government, donors and private sector)	DCP/MARD	Donors, Private Sector, PPC
4.	Prepare proposal for Cocoa Research Institute	DST/MARD	Research Organizations
5.	Establish statistical system for cocoa sector	GSO	DCP, DARD
6.	Formulate cocoa courses in the university	NLU	CTU, TNU, Research Organizations
7.	Translation of technical training manuals and literature on cocoa into Vietnamese	NLU	Private Sector, Donors, Research Organizations
8.	Establish cocoa monitoring unit providing quarterly reports on cocoa situation in Viet Nam	DCP	CCC, DARD
9.	Develop regulations for quality assurance systems of cocoa planting material and certification of nurseries	DCP	Private Sector
10.	Develop regulations for quality assurance systems of cocoa exports and Viet Nam Cocoa Denomination (VICOCOA)	DCP/ICD/NAFIQAD	Private Sector
11.	Development of VIETGAP for Cocoa	DCP	Private Sector
12.	Development of Regulations for Development of Cocoa Agroforestry Systems	DCP/DOF	Private Sector, Research Organizations, NGOs
13.	Proposal for New Research Program on Introduction of New Planting Material from Other Countries and Clonal Trials	DST	Research Organizations, DCP
14.	Training of core group of researchers	DST	Research organizations, Universities, Donors, Private Sector
15.	Training of extension workers and facilitators	NAFEC/SA	DCP, Research Organizations
16.	Mid-term Review of the performance of the sector	DCP	External Reviewers

Table 2 Medium-Term Activities (2010-2015), Key Responsibilities, and Partners in the Action Plan

No.	Activities	Key Responsibility	Partners
1.	National Technology Transfer Program is Implemented	DCP/NAFEC	DARD, Private Sector, NGO, Research Organizations, Farmer Organizations
2.	National and Provincial Plans are approved and implemented	MARD, PPC	DCP, DARD
3.	Agroforestry models are developed in new areas	DOF	DCP, PDOF, Private Sector, NGOs, Research Organizations, Farmer Organizations
4.	Cocoa research institute is established and long-term core funding is assured	DST	Research Organizations
5.	Quality assurance system for planting material and nursery certification is established	DCP/DST	Private Sector
6.	Quality assurance system of cocoa exports and Viet Nam Cocoa Denomination (VICOCOA) is established	DCP/ICD/NAFIQAD	Private Sector
7.	Laboratories for quality and safety control of planting material and cocoa beans are established	DCP	Private Sector, Research Organizations, Auditing Companies
8.	Statistics on cocoa sector are collected regularly and disseminated	GSO	
9.	Monitoring and evaluation of sector performance is carried out regularly	DCP	DARD
10.	Network of buying stations becomes dense	Private sector	DARD
11.	Fermentation companies established	Private sector	PPC
12.	New planting materials (from PNG, India, Ghana and Latin America) is tested and clonal trials are under way	Cocoa Research Institute	DST, DCP, International Associations
13.	VIETGAP for cocoa certification bodies are accredited and certified organizations are established	DCP	Private Sector
14.	Guidance on access of smallholder farmers to medium-term credit for cocoa development	MARD	VBARD, Financial Institutions, Private Sector, NGOs, Farmer Organizations
15.	Review of cocoa products export and import taxes	MOF	MARD, Private Sector
16.	Core group of cocoa researchers has been established	DST	Research Organizations
17.	Mid-term Review of the performance of the sector	DCP	External Reviewers

Table 3 Long-term Activities (2016-2020), Key Responsibilities, and Partners in the Action Plan

No.	Activities	Key Responsibility	Partners
1.	Processing industry develops	Private Sector	Farmer Organizations, PPC
2.	Based on sector performance and evaluation of the medium term National Technology Transfer Program, a new National Technology Transfer Program is formulated and implemented	DCP, PPC	DARD, Private Sector, Donors, NGOs, Research Organizations, Farmer Organizations
3.	New clones of non-Malaysian origins are approved	DST	DCP, Research Organization
4.	VICOCOA is recognized as an important denomination by international markets	DCP/ICD/NAFIQAD	Private Sector, Farmer Organizations
5.	Mid-term Review of the performance of the sector	DCP	External Reviewers

2 INTRODUCTION

28. The cocoa sector in Viet Nam is in an ebullient stage of development, showing promise of rapid growth. From about 500 ha of cultivated land in 2003, total cocoa cultivated land is estimated at about 10,000 ha by the end of 2008. An increasing number of farmers have started to grow cocoa and about 20,000 of them are estimated to be involved in the sector already. A number of initiatives by government and donors are focused on the sector and there is a general optimism that cocoa might be the next success story of agriculture in Viet Nam.

29. There are however also less optimistic and more cautionary views about cocoa development, recently expressed in a report by Sub-NIAPP[2]. Factors contributing to both the positive and cautionary views of cocoa development in Viet Nam are briefly described in the following two sections.

2.1 Factors Contributing to the Positive Outlook for Cocoa in Viet Nam

30. **The interest of key actors in international cocoa and chocolate industry** dates back to the initial visit of experts from Mars Incorporated[3] to Viet Nam in 1993. During this visit, the experts suggested to MARD that the cocoa sector had a considerable potential in Viet Nam. Since then, Mars Incorporated has made several contributions to cocoa development in Viet Nam: the company facilitated the introduction of new clones into Viet Nam from Costa Rica; provided support to research (particularly to the Nong Lam University in HCMC) and on-farm and research station demonstrations were established during the period 1997-2003. During 2004-06, Cargill and Mars Incorporated collaborated in the *Dutch Programme for Cooperation with Emerging Markets* (PSOM) to professionalize the commercialization of the cocoa value chain, introducing trading practices, quality parameters, and appropriate testing facilities and skills. In 2003-2004 ED&F MAN started distribution of seedling to farmers and became the first international buyer to provide a market for cocoa produced by farmers. Other companies followed suit. Cargill invested in buying stations in Ben Tre and Dak Lak since 2005 and is currently the largest buyer of cocoa beans in Viet Nam. Other international buyers including Olam, Armajaro, and Mitsubishi are already buying cocoa beans or planning to do soon. Cargill and Mars Incorporated have provided support to extension, research activities, and dissemination activities.

31. **The positive response of the Government**. In March 2005, MARD established the Viet Nam Cocoa Coordination Committee to facilitate formulation of policies related to cocoa sector. Participants in the VCCC include key agencies at MARD, the private sector,

[2] Sub-NIapp (2008) Rà Soát, điều chỉnh quy hoạch phát triển ca cao các tỉnh phía nam (Việt Nam) đến năm 2015 và định hướng đến năm 2020, Phân Viện Quy Hoạch-TKNN, 10/2008 (Review and Adjustment of the Cocoa Development Plan in southern provinces of Viet Nam up to 2015 and 2015, sub-Niapp)

[3] www.mars.com/global/home.htm

and research organizations. The Committee helped formulate the MARD Decision 2678/2007/QD-BNN-KH of 14 September 2007 that indicated the objective of 60,000 ha by 2015 and 80,000 ha by 2020. At the local level, the provinces in the cocoa producing areas are also establishing plans and provide support to farmers for the cultivation of cocoa. Standards for cocoa were established in 2006 and 8 clones (TD1, TD2, TD3, TD5, TD6, TD8, TD10 and TD14) were approved in 2005.

32. **The enthusiastic and dedicated effort of the research organizations**, most notably Nong Lam University which was engaged since 1997 in applied research in several dimensions including germplasm and clones experiments, cultivation methods, farming systems, pests and diseases, and fermentation. The university established demonstrations in several provinces, trained farmers, monitored their performance, and provided advisory services. Other organizations including the Forest Science sub-Institute of Viet Nam (FSSIV), the Western Highlands Agricultural Science Institute (WASI), and Can Tho University engaged in various research activities.

33. **The continued and increasing interest and support by donors**. Both DANIDA (during 1998-2000) and GTZ (during 2001-2003) provided support in the early stages of cocoa development. In 2004 the Success Alliance (funded by USDA-WCF-Mars Incorporated initially and subsequently by USAID) established a comprehensive technical assistance program that helped training 20,000 farmers, develop a nursery system, and disseminate information about cocoa in various provinces. WWF is involved in an agroforesty model (with funding by Dutch Government, USAID through the Success Alliance project, and Touton Company) in Lam Dong province. Winrock (funded by USAID) has started a cocoa agroforestry model within a biodiversity program that is currently implementing in South Viet Nam. Helvetas has just completed a feasibility study for organic and Fair Trade cocoa production and is planning to start a 5-year program in this area. The Dutch Government has committed to contribute the coming 3 years to the Public Private Partnership for Sustainable Cocoa Development in Viet Nam. Other donors might be interested in supporting the sector to promote biodiversity, poverty reduction, and private enterprise development.

34. **The high world market prices for cocoa**. Since its low levels of the late 1990s, when prices reached an historical low of USD 804/tonne in December 2000 average world prices were above USD 3,000/tonne in June 2008[4]. In London, benchmark second-month cocoa futures hit a 22-year peak of $3,277/tonne in July 2008. During the field mission in June-October 2008, the Study Team observed prices ranging between VND 35,000-50,000/kg paid at the buying stations. The prices and the presence of an increasingly network of buyers provide strong incentives to farmers, particularly given at a time when alternative crops such as pepper and cashews are less attractive.

35. **The suitability of agroecological conditions to cocoa cultivation in Viet Nam**. Since 1997, research and extension efforts have shown that a broad range of agroecological conditions exist in Viet Nam to grow cacao under different farming systems. The most successful methods of cocoa cultivation are intercropping with a variety of trees, most

[4] Since June 2008, world prices of cocoa have been declining. Current (October 2008) futures prices at NY is about $2,000/tonne.

notably coconut in the Mekong River Delta (MRD), and cashew nuts in the Southeast (SE) and Central Highlands (CH). Cocoa monoculture has also been introduced in the CH and other regions. Agroforestry demonstrations[5] (in Lam Dong, Dong Nai, and Binh Phuoc provinces) are under implementation. A study by Helvetas[6] has shown the feasibility of organic cocoa, but actual demonstrations have not yet been established. About 10000 ha of cocoa are currently cultivated and yields performance is increasing[7].

36. The combination of these factors suggest that the cocoa sector in Viet Nam might be on the verge of a major take-off growth stage, which, if appropriately planned and implemented, could take Viet Nam from the current insignificant position in world market to be among the first 7 exporters (those with more than 100,000) over the next 12 years (2020).

37. This positive outlook however needs to be balanced against a series of other factors that moderate the current optimism.

2.2 Factors Moderating the Current Optimism for Cocoa in Viet Nam

38. **A history of failures in the cocoa sector in Viet Nam**. Cocoa was first introduced into Vietnam by the French but never reached commercially viable production levels. In the 1960s, it was reintroduced by the Americans into the South of Vietnam. During that period, the ongoing war and insecurity in the countryside undermined the commercial viability of the infant cocoa industry. During 1980s, the Vietnamese government tried to reintroduce cocoa with support from several State-Owned Enterprises (SOEs). As part of this effort, thousands of farmers planted Theobroma cocoa throughout several dozen provinces ranging from Quang Ngai in central Vietnam to Can Tho in the Mekong Delta. In Quang Ngai alone, the cocoa penetration reached approximately 3,000 hectares (ha) during that period. A cocoa grinding factory equipped with high and modern technique was also built up in the mid 1990s. Farmers succeeded in growing cocoa and producing fruits, but the SOEs were unable to establish a market. Without an available local buyer for their beans and no access to the international markets, with the exception of a few farmers who used cocoa primarily for home consumption in such forms as cocoa wine, most farmers exited cocoa production. The cocoa grinding factory subsequently closed[8]. When in the early 2000, researchers from NLU tried to re-introduce cocoa, they met with extreme reluctance from farmers and provincial leader to engage in cocoa. Currently, the acceptability of cocoa by both farmers and provincial leaders is increasing, as a result of the factors discussed in the previous section. There should be however a note of caution related to the possibility that another failure of cocoa sector (originating from factors such as market, diseases and pests, etc) might block again the development of the sector for a considerable lag of time.

39. **World price trends and variability**. Commodity prices are notoriously highly variable and this is no exception for cocoa. Current price trends for cocoa put into an

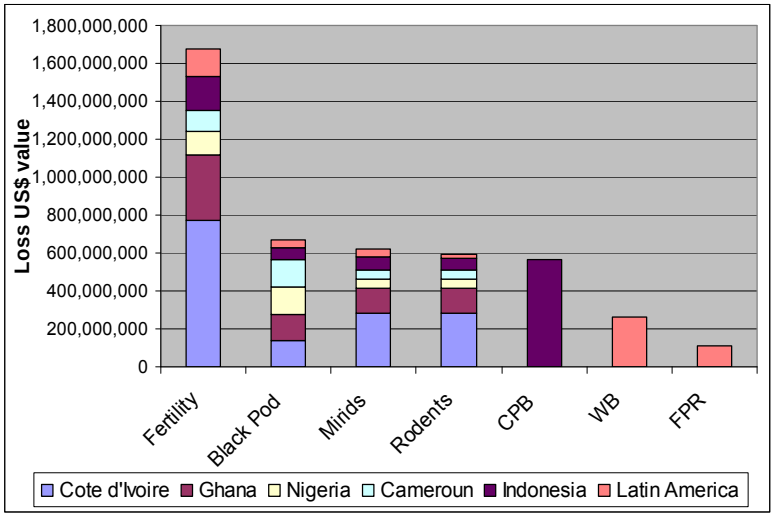
[5] See Annex I.
[6] Helvetas (2008) Feasibility Study Organic and Fairtrade Cocoa in Vietnam

[7] See section 5.3.
[8] See WWF (2007), Overview of the cocoa sector in Viet Nam.

historical perspective are not particularly high and the current outlook for continued increase in price might not be lasting over the long term. Spurred by the current high prices and increasing demand for dark chocolate in US and Europe which requires higher content of cocoa, the major producing countries (Ivory Coast, Ghana, and Indonesia) might expand their production capacity and over the medium period (5-10 years) generate a surplus situation as it has already occurred in the past. As a cocoa producer still in its infancy, Viet Nam needs to prepare strategies to deal with highly variable prices in world market and the possibility of reversing current increasing trends.

40. **Competing crops**. While the price of cocoa is currently high and increasing, the same occurs with coffee. Particularly in the major producing areas of the CH, the incentives for farmers to shift out of coffee or even intercrop cocoa with coffee are low. At current prices coffee brings about higher income; harvest time is concentrated whereas harvest time for cocoa lasts over a period of several months. In addition, most farmers are already familiar with coffee whereas cocoa is a relatively new crop. Rubber might be an alternative crop to cocoa. There are several aspects that might favor cocoa given the opportunity that cocoa offers for risk minimization, lower use of chemicals and water, lower and smother labor requirements, lower initial capital investment, biodiversity benefits, and a greater flexibility to adapt to a broader range of agroecological conditions than coffee or rubber. The government has a program to provide concessionary loans for rubber plantation whereas there is not such a program for cocoa. Apart from coffee and rubber, there are crops that may be alternatives to cocoa. The evidence for the advantages of cocoa relatively to competing crops has to be demonstrated and disseminated among farmers. Unless a sustained effort in this direction is undertaken, the development of the cocoa sector might be slowed down.

41. **Diseases and pests**. So far, diseases and pests affecting cocoa have been contained. Phytophtora and helopeltis are the two main dangers for cocoa in Viet Nam. However, intensification of cocoa and the expansion to larger areas might create the conditions for a proliferation of diseases and pest, as in other producing countries. The losses to the industry could be considerable and a brake to development unless investments in monitoring, research, and extension are expanded with the development of the sector. Estimates of losses to the world cocoa industry due to pests and diseases are huge and vary between 30 and 50% of total production (**Figure 1**). In the year 2000 the occurrence of moniliasis in Peru led to the abandonment of over 50% of all cocoa.



Source: Communication from Peter van Griesven

Figure 1 Losses due to Soil Fertility, Pests, and Diseases

42. **Labor costs**. Even though labor requirements of cocoa are less than coffee, rubber, pepper, and cashews labor costs in Viet Nam are increasing both in urban and rural areas. As the country moves toward mid-income country status (to be achieved by 2010) and further on will move toward industrialized country status, labor costs will increase as the result of labor migration from rural to urban areas and, within rural areas, from agriculture to non-farm activities. Cocoa is a crop that does not lend itself easily to mechanization (except in the fermentation and drying stages). Labor costs will remain a considerable part of the costs of production and are going to increase.

43. **Declining yields**. Whereas declining yields can often be attributed to the build-up of diseases and pests, in some areas (eg PNG) the early promise of sustained yields from improved varieties is not realized[9]. For no apparent reason trees become reluctant to flower and yield under the traditional management of the crop. Research into environmental physiology must be intensified to understand the reasons for yield decline, and thus to suggest the agronomic means to prevent it. Nevertheless, observations about declining yield, particularly in intensive monoculture systems is a sober reminder against the optimism of observations in Viet Nam where yields of 3 to 4 tonnes/ha have occurred. Even the assumptions of 1.5-1.8 tonnes/ha in the current action plan of MARD might be considered quite optimistic by world standards.

44. **Sustainability and biodiversity**. Models of cocoa in agroforestry systems are currently undertaken by three independent projects in Viet Nam (carried by WWF with Netherlands funding, Winrock International with USAID funding, and by FSSIV with Mars Incorporated). The development of the sector in Viet Nam could occur through intensification

[9] Scientists believe that PNG has this problem of "early senility" because of selection of VSD resistant varieties for its hybrid program in the past which may be further compounded by particular minerals lacking in the soil (communication from Mars Incorporated).

of monoculture or intercropping. Monoculture could lead to deforestation, loss of biodiversity, and environmental problems linked to use of chemicals and water. The trade-offs between biodiversity-benefits and agricultural productivity enhancement of intensive systems need to be carefully assessed.

45. **Climate change**. Climate change is expected to affect the cocoa sector through declining rainfalls, increasing temperature, and salinity intrusion in the Mekong River Delta. While a lengthening of the dry season might endanger the production of cocoa in the CH, the intrusion of salinity and flood might endanger the production of cocoa in the MRD.

46. **Mismatch between targets and implementation plans.** In spite of ambitious targets for the cocoa sector established by the Government, there are hardly any policies and investment plans to support the achievement of the targets[10].

47. **Lack of a strategy for cocoa development.** More fundamentally, there is no overall strategy, which clarifies the vision, goals, road map, and action plan for sector development.

2.3 Rationale of the Study

48. Given the infancy of the cocoa sector in Viet Nam, the *Study on Suitability, Feasibility, and Socioeconomic Benefits of Cocoa in Viet Nam* provides an opportunity to take stock of what the current situation is, identifies the constraints and opportunities to development, and suggests strategies, policies, and investment for the sector.

49. The Study is funded by the Dutch Government. The Ministry of Agriculture, Nature, and Food Quality of the Netherlands has initiated a number of Public-Private Partnerships (PPPs) with developing countries including Viet Nam as a result of the World Summit on Sustainable Development in Johannesburg in 2002. These initiative aims at enhancing the collaboration between public and private partners, civil society organizations and intergovernmental organizations in order to contribute to sustainable development and poverty alleviation taking into consideration the aspects of social, economic, and ecological sustainability.

2.4 Objectives of the Study

50. The objective of the study is to produce a socio-economic and environmental analysis for policy makers to understand the economic and financial benefit and costs of cocoa in Vietnam compared to alternative cash crops. The study will address the following issues:

1. Assess the current status of development of the cocoa sector in Vietnam;

[10] See chapter 6.

2. Determine the competitiveness of the Vietnamese cocoa farmer vis-à-vis other crops in Vietnam and versus other cocoa producers world-wide, now and in the future
3. Perform an agro-ecological analysis of typical existing and potential production areas. This would include a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) of the industry at this stage to identify constraints and opportunities for current and future growth.
4. Identify the key areas of further investment and policies based upon this analysis.

51. The outcome of the study will form the basis of a roadmap to direct investment from donors and the Vietnamese government. The roadmap will take into consideration stakeholders' interests, from farmer to processor, policy, and institutional aspects.

2.5 Organization of the Report

52. The Draft Final Report is organized into 10 chapters as follows:

Chapter 1: Executive Summary
Chapter 2: Introduction
Chapter 3: Methodology
Chapter 4: World Cocoa Market
Chapter 5: The Cocoa Value Chain in Viet Nam
Chapter 6: Policy and Institutions for Cocoa Development in Viet Nam
Chapter 7: Suitability of Cocoa in Viet Nam
Chapter 8: Feasibility of Cocoa in Viet Nam
Chapter 9: Sustainability of Cocoa in Viet Nam
Chapter 10: Strategy for Cocoa Development in Viet Nam

53. A list of 12 Annexes is also included as follows:

Annex A: Nurseries
Annex B: Farming Practices
Annex C: Fermentation
Annex D: Traders
Annex E: Provincial Plans
Annex F: Pests and Diseases
Annex G: Costs of Production and Revenues
Annex H: Alternative Crops
Annex I: Cocoa Agroforestry Systems in Viet Nam
Annex J: Environmental Impact of Cocoa Production in Viet Nam
Annex K: Training of Facilitators at Success Alliance Project
Annex L: Agreement on Action Plan for Cocoa Development MARD-LNV

3 APPROACH AND METHODOLOGY

3.1 The Key Issues

54. The overall purpose of the Study is to provide evidence-based analysis to assist the formulation of alternative strategies, policies, action and investment plans that could provide an informed and reliable basis for strategic and policy decisions.

55. In order to achieve this overall purpose, three set of issues are addressed, related to the suitability, feasibility, and sustainability of the cocoa sector in Viet Nam. Available data, field work, review of the literature, consultative meetings, and key respondents interviews have formed the basis for analysis of the key issues.

3.1.1 Issues related to Suitability

1. What are the agroecological environments in Viet Nam suitable for cocoa cultivation?
2. What cultivation methods are feasible and more appropriate to Viet Nam conditions?
3. What is the potential area for expansion of cocoa cultivated area and yield?
4. What are the agroecological constraints (water, soil, climate, pests and diseases) to the expansion of cocoa?

3.1.2 Issues related to Feasibility

1. What is the cost of production and income under different farming systems?
2. How competitive is cocoa relative to other crops?
3. Under what conditions is cocoa economically attractive?
4. What is the capacity of farmers, private sector, and institutions (research, extension, quality assurance, financial, farmer organizations, and trade associations) to support the expansion of the sector?
5. What are the main socioeconomic constraints (planting material, capital, technology, land, infrastructure, labor, market education) to the expansion of the sector?

3.1.3 Issues related to Sustainability

1. What are the environmental risks (deforestation, loss of biodiversity, climate change, soil fertility, watershed, pests and diseases) that might accompany the expansion of cocoa cultivation in Viet Nam?
2. What are the trade-offs between sustainable practices (eg agroforestry) that increase biodiversity benefits and productivity enhancement through shade removal and use of chemical inputs?
3. Who will benefit from the development of cocoa sector and what are the expected socioeconomic impacts on different groups?

4. What risk management strategy will be more appropriate to mitigate the environmental, agronomic, economic, and social risks that accompany the expansion of the cocoa sector?
5. What is the scope for partnerships between public and private sector (PPP) to facilitate the sustainable development of the sector and mitigate the risks?

3.2 Approach

56. The approach of the Study Team consists of three pillars: (i) a conceptual framework based on the understanding of value chains; (ii) the understanding of the logical framework process; and (iii) effective communication with stakeholders.

57. **Value Chain Analysis**. A value chain is defined as the full range of activities required to take a product or service from conception to final disposal after use, through the intermediary phases of production, processing and delivery to final consumers. A value chain approach focuses on the interaction of actors along each step of the production system (from raw producers to consumers) as well as the linkages within each set of actors. Such an approach thus considers trade relations as being part of a series of networks of producers, exporters, importers, processors and retailers, whereby knowledge and relationships are developed to gain access to markets and suppliers. The success of stakeholders in adding value to their production lies in their ability to access these networks. Several concepts are central to the understanding of value chains including the concepts of governance, innovation, distribution and network.

58. The concepts underlying the **Logical Framework Process** contribute to (i) systematically and logically analyzing sector performance, (ii) identifying and planning interventions that lead to the design of a strategy, programs, or project; and (iii) monitoring implementation. During the process, data gathering and conceptual analysis are needed to design appropriate interventions. The Logical Framework Process starts with the analysis of a sector and ends with the design of a project or program interventions.

59. **Effective Communication with Stakeholders**. A strong team and sound analytical tools are necessary but not sufficient conditions for the success of the Study. Unless the Consultant's Team is able to exchange views with stakeholders effectively, the recommendations and the strategy prepared by the team might lead to misunderstanding and fruitless conflict. The team has kept an open line of communication with a variety of stakeholders through well-structured periodic meetings, workshops, and briefings. The opinions, knowledge and ideas of stakeholders have been circulated and understood by all team members through a continuous effort to translate these ideas into clear statements. While this exchange of information might not guarantee a convergence of ideas, the exchange facilitates the understanding of alternative points of view and promotes a process of solution finding.

3.3 Methodology

60. Both quantitative and qualitative analytical methods have been used. Qualitative research methods) can provide important information about the preferences and perceptions of the participants in the agricultural sector. This information is important for the design of public investments that respond to the priorities of intended beneficiaries. However, perceptions cannot always be taken at face value because of problems of strategic responses, misinformation and limited recall. Without rigorous testing of hypotheses against quantitative data, one risks perpetuating fallacies by certifying perceptions as "facts."

61. The analysis is based on information collected from field work, review of the literature, and consultation with experts. Field work included surveys, focus group discussions, and key informant interviews.

62. The field work occurred primarily in the provinces where most of cocoa production is occurring, namely Ben Tre, Tien Giang, Ba Ria Vung Tau, Binh Phuoc, Dak Lak, Dak Nong, and Dong Nai. A visit to Lam Dong to learn about cocoa agroforestry models ongoing in the districts of Da Teh and Da Huoai was also conducted.

63. The province survey (PRO) aimed at assessing the constraints, potential, policies, capacities, and plans of provincial institutions responsible for the development of cocoa sector. The respondents were the provincial departments of agriculture and rural development. The survey questionnaires were sent to the DARDs in 15 cocoa producing provinces.

64. The nurseries survey (NUR) aimed at characterizing the activities of the nurseries. As nursery entrepreneurs are often engaged in multi-activities including multiplication and distribution of planting material, production of cocoa, fermentation, and collection of pods, this information provided a useful benchmark for the current status of the nursery industry. Six provinces were covered by the survey including Ben Tre, Tien Giang, Ba Ria Vung Tau, Binh Phuoc, Dak Lak, and Dong Nai.

65. The farming practices survey (FAR) aimed at assessing farming practices and farmers' constraints under different agroecological conditions and farming system. The targeted farmers were those who have recently engaged in cocoa cultivation either as monoculture or as intercropped. The respondents had at least 2 years experience in cocoa cultivation. Seven provinces were covered by the survey including Ben Tre, Tien Giang, Ba Ria Vung Tau, Binh Phuoc, Dak Lak, Dak Nong, and Dong Nai.

66. The cost of production survey (COP) aimed at determining the economic feasibility of cocoa production. The targeted farmers included those who have engaged in cocoa cultivation either as monoculture or as intercropping for at least 4 years. Four provinces were covered by the survey including Ben Tre, Ba Ria Vung Tau, Dak Nong, and Dak Lak.

67. The Cost of Production for Other Crops survey (OCR) aimed at obtaining information about cost of production of alternative crops to cocoa. The alternative crops included coffee, cashew nuts, rubber, pepper, and fruit trees (durian, coconut, mango, and pomelo).

4 THE WORLD COCOA MARKET

4.1 Key Features of World Cocoa Market

68. The key features in world cocoa production are listed below:

- Predominantly grown by smallholders
- Highly concentrated - 3 major producing countries
- Low average yields
- Significant expansion limited to 3 major producers and continued concentration therefore likely
- Increasing vulnerability of supply to a production shock in a major producing country
- Increasing losses and threats from pests and diseases
- Recent liberalization of marketing in major producing countries has led to lower quality and increased exposure of growers to price changes
- Political instability in some producing countries
- Ageing farmers and plant stock in West Africa
- Quality problems
- Labor supply issues in some countries
- Production can't be "wound-up" quickly
- Low prices in the past have led to reduced inputs and lower productivity on many farms.

69. The key features in world cocoa consumption are listed below:

- Sustained consumption growth throughout the 20th century
- Traditional major markets of Western Europe and North America remain important - industry advertising is high
- Significant emerging markets in Asia, Eastern Europe and Latin America
- Growth in China limited over the next decade
- Large potential in Russia but uncertain due to economic situation
- High prices/supply shortages may risk market potential due to establishment of consumption patterns that do not include chocolate or at best include chocolate with a low cocoa content (particularly in China)
- Perceptions about positive (of dark chocolate) and negative health aspects (mainly from fat and sugar content of chocolate) may influence consumption
- Growing use of alternatives to cocoa butter (since the year 2000, the European Union has decided to accept a 5% content of vegetable fats in chocolate products) a threat to demand growth.

4.2 Varieties

70. There are three main varieties of cacao: Forastero, Criollo, and Trinitario. The first comprises 95% of the world production of cacao, and is the most widely used. Overall, the

highest quality cocoa beans come from the Criollo variety, which is considered a delicacy. Criollo plantations have lower yields than those of Forastero, and also tend to be less resistant to several diseases that attack the cocoa plant, hence very few countries still produce it. One of the largest producers of Criollo beans is Venezuela (Chuao and Porcelana). Trinitario is a hybrid between Criollo and Forastero varieties. It is considered of much higher quality than the latter, but has higher yields and is more resistant to disease than the former.

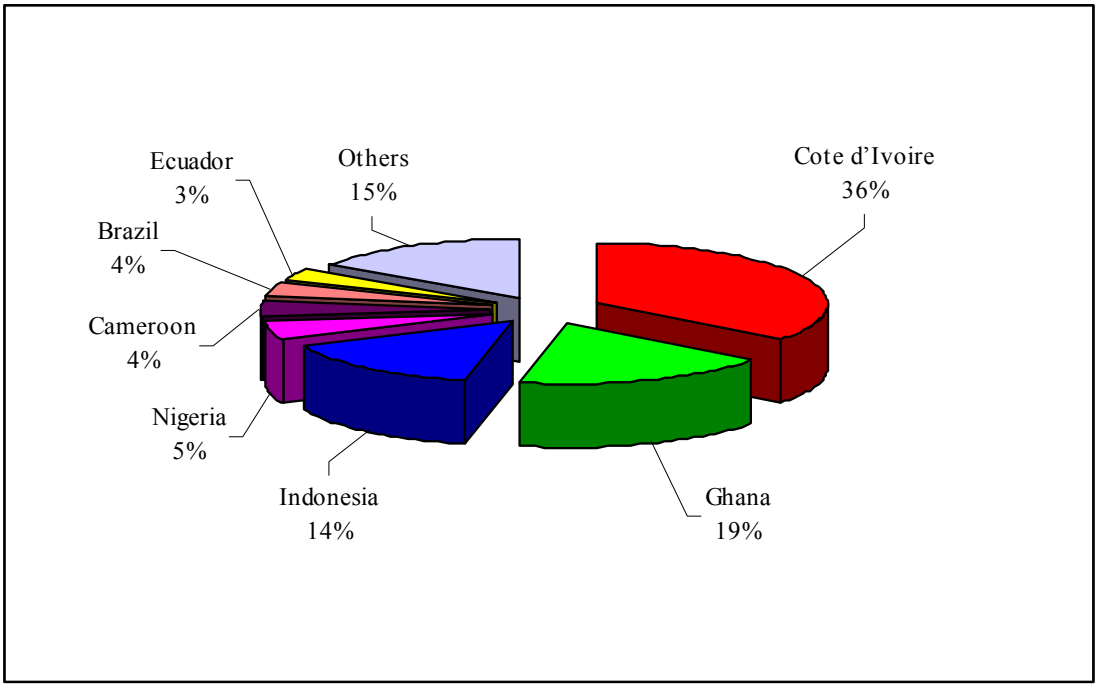
4.3 Production

71. West Africa supplies about 70% of the world's Cocoa production (see Table 4). This is led by four countries made up of Côte d`Ivoire, Ghana, Nigeria and Cameroon. The Americas produce about 12% of the annual global cocoa output. This is led by Brazil and Ecuador. Asia and Oceania produces about 18% of the annual global cocoa output. Indonesia is the major producer of cocoa in this region followed by Papua New Guinea and Malaysia respectively.

Table 4 World Production of Cocoa (thousand tonnes)

	2005/06		**2006/07**		**2007/08 (forecasts)**	
Africa	**2643**	**70.3%**	**2334**	**69.1%**	**2578**	**69.4%**
Cameroon	166		166		185	
Cote d'Ivoire	1408		1229		1370	
Ghana	740		615		675	
Nigeria	200		190		210	
Others	129		133		138	
America	**446**	**11.9%**	**415**	**12.3%**	**445**	**12%**
Brazil	162		126		160	
Ecuador	114		115		115	
Others	170		175		171	
Asia and Oceania	**670**	**17.8%**	**627**	**18.6%**	**690**	**18.6%**
Indonesia	560		520		580	
Others	110		107		110	
World Total	**3759**	**100%**	**3376**	**100%**	**3713**	**100%**

Source: ICCO Quarterly Bulletin of Cocoa Statistics, Vol. XXXIV, No. 1, Cocoa Year 2008/08.
Note: Total may differ from sum of constituents due to rounding



Source: Based on the data from International Cocoa Organization. Data are average of 2005/2006 and 2006/2007 crop years.

Figure 2 Share of major producers in total cocoa beans production

72. The major producers with more than 100,000 tonnes include 7 countries: Côte d'Ivoire, Ghana, Indonesia, Nigeria, Cameroon, Brazil, and Ecuador (see Table 5)

Table 5 The 7 Major Producers of Cocoa Bean

	Average Production 2005/2006 ('1000 tonnes)	Percentage of World Production	Average Yield in 2005/2006 (kg/ha)
Côte d'Ivoire	1319	37.0%	757
Ghana	678	19.0%	400
Indonesia	540	15.1%	1184
Nigeria	195	5.5%	439
Cameroon	166	4.7%	445
Brazil	144	4.0%	318
Ecuador	115	3.2%	262
Others	578	11.5%	417

Source: Based on average of production data from ICCO; yields are computed from FAOSTAT.
Note: Data on yields from FAO should be taken with caution. Production figures from ICCO and FAO are not consistent (eg Nigeria and Ecuador).

73. Average yields across all producers is 536 kg/ha and only a few countries reach average yields above 1000 kg/ha. Among major producer countries only Indonesia is in this position.

74. Production trends in all the seven major producers are on the rise, with exception of Brazil (see Figure 3 to Figure 9).

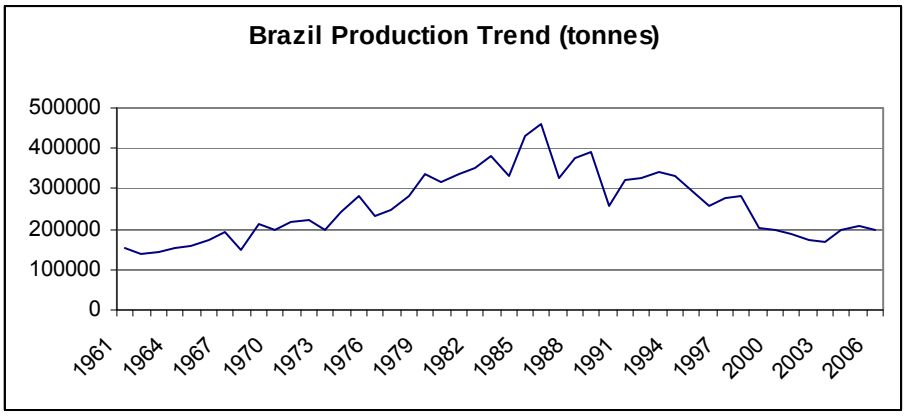


Figure 3 Production trend in Brazil

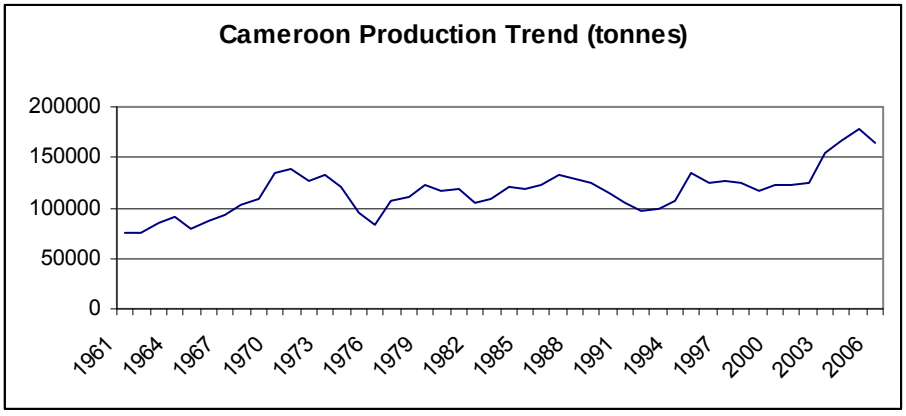


Figure 4 Production trend in Cameroon

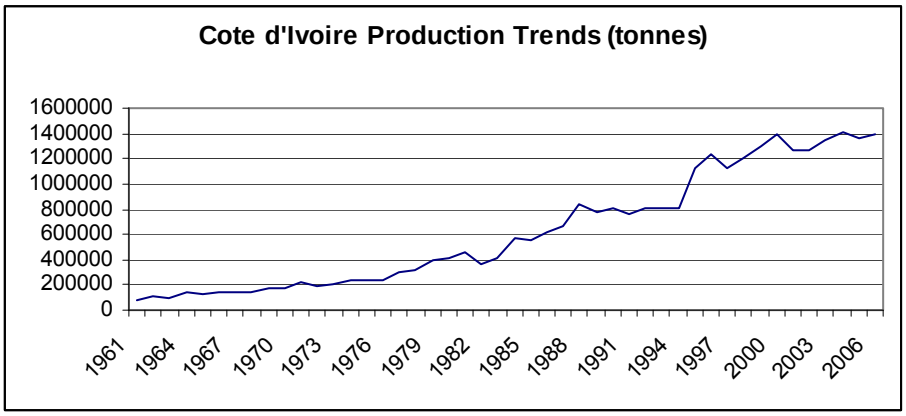


Figure 5 Production trend in Cote d'Ivoire

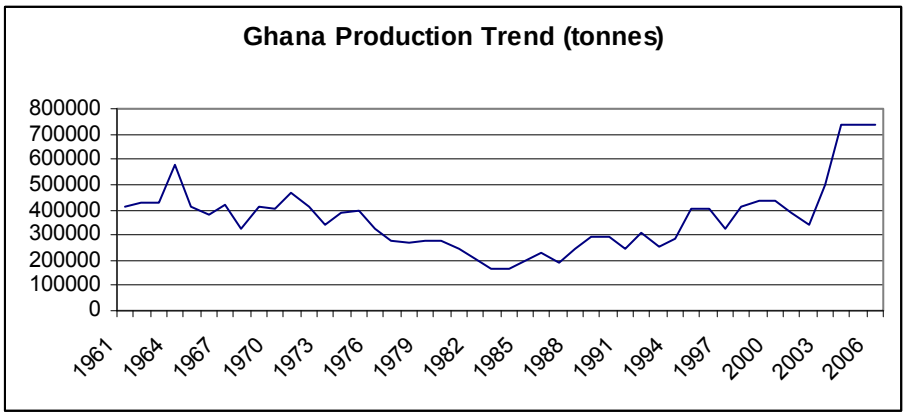
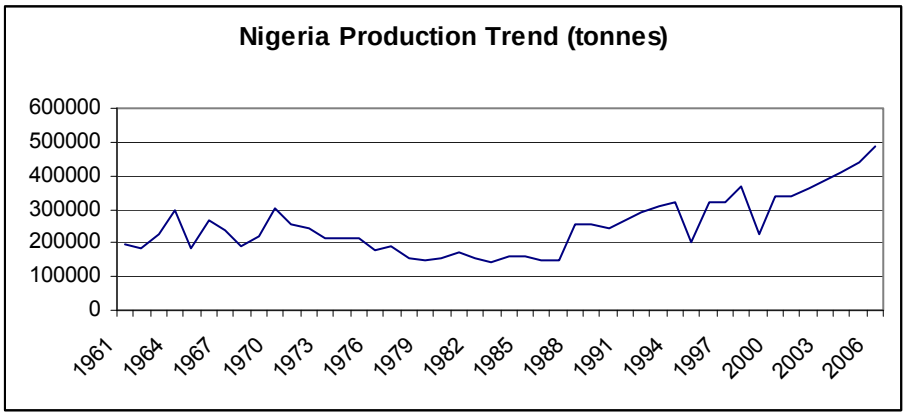


Figure 6 Production trend in Ghana

Figure 7 Production trend in Indonesia



Note: The FAO figures either come from Government sources that do not seem reliable. The current production is estimated to be 220,000 tonnes. The upward trend however seems to be occurring.

Figure 8 Production trend in Nigeria

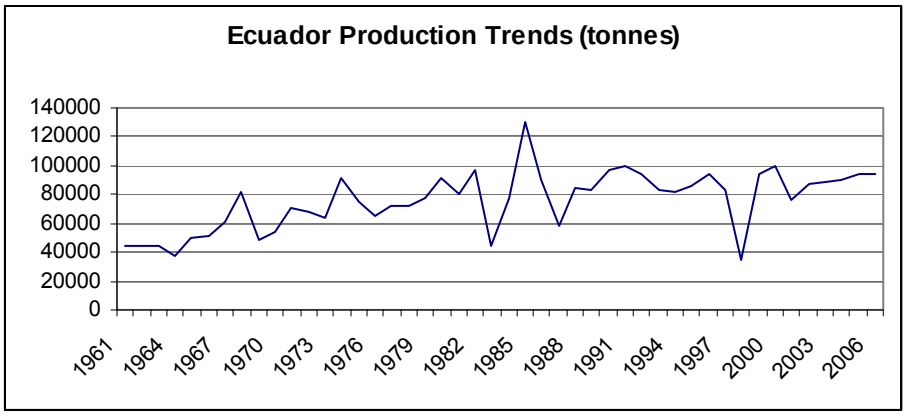
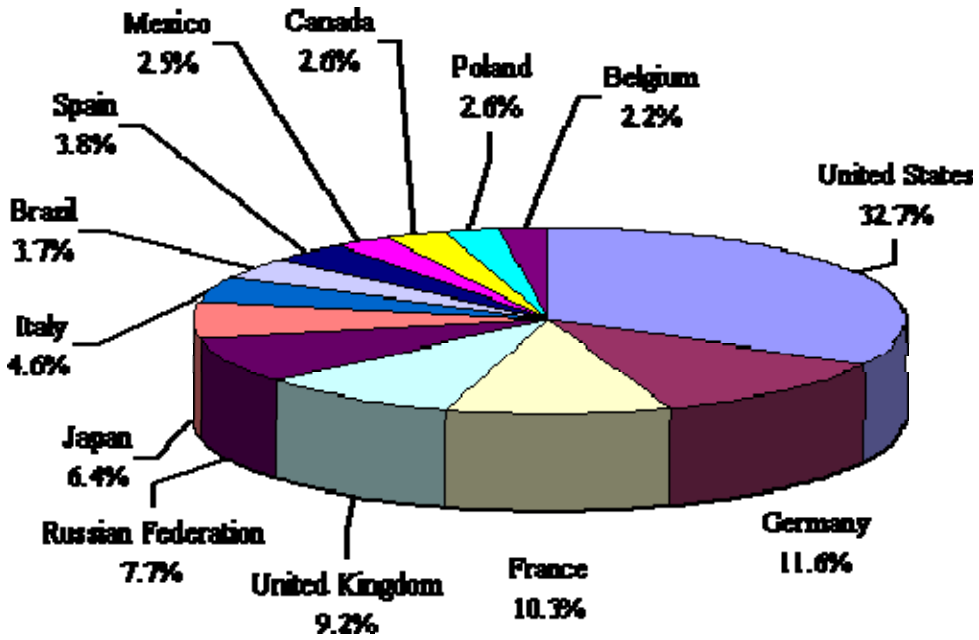


Figure 9 Production trend in Ecuador

Source: FAOSTAT.

4.4 Consumption

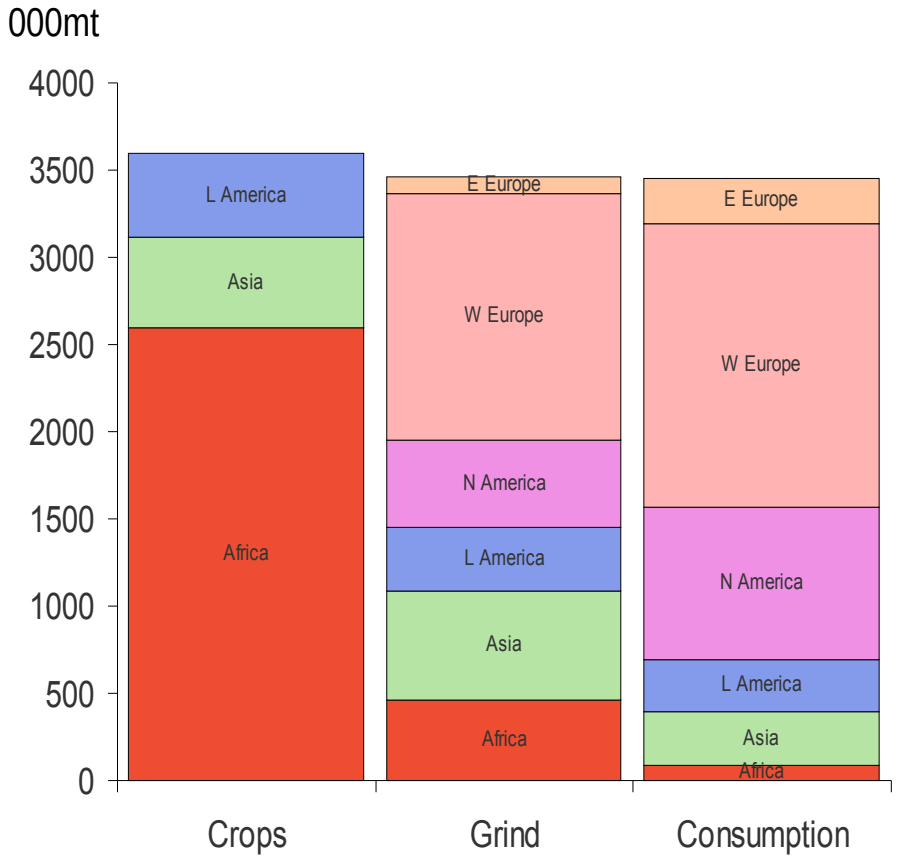
75. Although cocoa is largely produced in developing countries, it is mostly consumed in industrialized countries. For cocoa, the buyers in the consuming countries are the processors and the chocolate manufacturers. A few multinational companies dominate both processing and chocolate manufacturing. The following graph represents the main consumers of cocoa, based on the apparent domestic cocoa consumption, which is calculated as grindings plus net imports of cocoa products and of chocolate products in beans equivalent.



Source: UNCTAD based on the data from International Cocoa Organization, quarterly bulletin of cocoa statistics

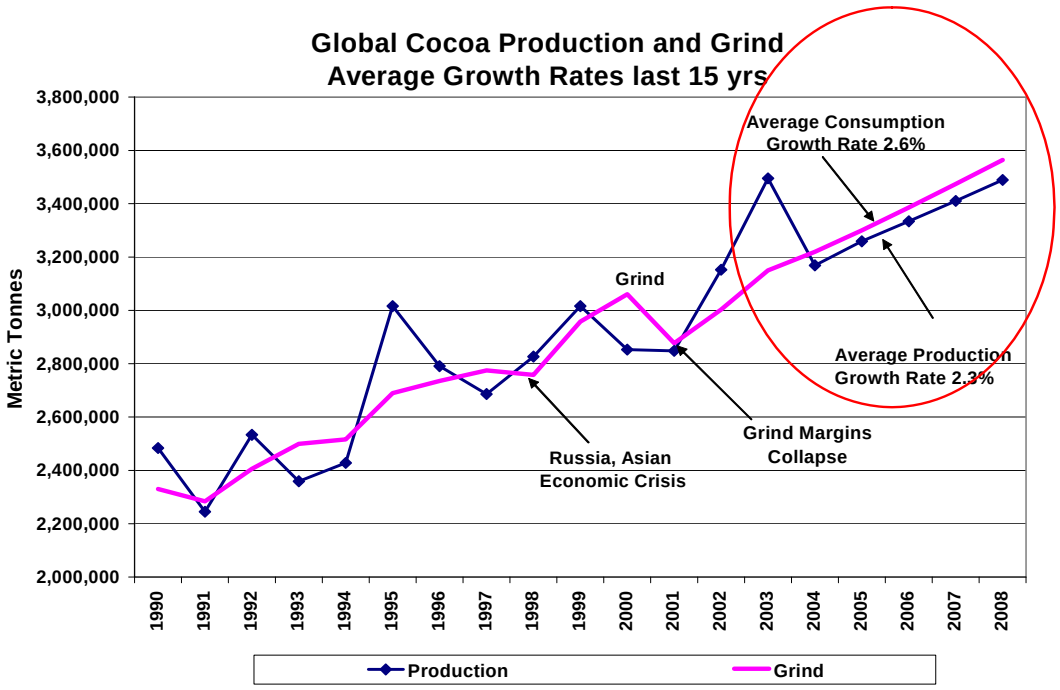
Figure 10 Share of main consuming countries in 2004/05

76. The pattern of grinding is similar to the pattern of consumption, even though some grinding is occurring in Africa and in Asia (Figure 11). About 200,000 tonnes of beans processed in Asia come from West Africa and Latin America and a lot of beans from Indonesia and PNG are processed in West Europe and USA.



Source: ICCO
Note: communication from Peter van Griesven

Figure 11 World cocoa bean production, grindings, and consumption 2007



Source: ICCO
Note: communication from Peter van Griesven

Figure 12 World cocoa bean production and grindings 1990-2007

77. Taking into account the data for the last 15 years average consumption growth rate of 2.6% is slightly above average production growth rate of 2.3%, suggesting a mature market with a relatively slow growth, but an upward trend (Figure 12).

4.5 Trade

78. Most of the main exporters are also the main producers of cocoa beans. Although countries like Brazil and Malaysia are main producers, they are not large exporters due to the size of their processing industry, which absorbs local production. In Latin America for example, the Dominican Republic exports more cocoa beans than Brazil.

79. The value of the world exports of cocoa beans was about USD 4.6 billion in 2006 (see Table 6). Total quantity of cocoa beans exported in 2006 amounted to 3.5 million tonnes with an average unit export value of USD 1311/tonne. Annual growth in export value between 2002 and 2006 was 8% while during the same period export quantities grew at an annual average of 17%.

Table 6 The First 10 Exporters of Cocoa Beans

Exporters	Value exported in 2006, in USD thousand	Quantity exported in 2006 (tonnes)	Unit value (USD/tonne)	Annual growth in value between 2002-2006, %	Annual growth in quantity between 2002-2006, %	Annual growth in value between 2005-2006, %	Share in world exports, %
'World	4,594,062	3,504,461	1,311	8	17	16	100
'Côte d'Ivoire	1,422,913	925,129	1,538			-3	30.97
'Ghana	1,096,322	685,482	1,599	13	21	38	23.86
'Indonesia	619,017	490,778	1,261	5	10	32	13.47
'Nigeria	299,536	184,571	1,623	-1	1	-27	6.52
'Cameroon	221,863	168,159	1,319	4	8	6	4.83
'Ecuador	143,288	89,342	1,604	10	12	26	3.12
'Togo	114,185	69,082	1,653	86	83	39	2.49
‘PNG	77,338	47,963	1,612	5	8	-20	1.68
'Dominican Republic	72,028	39,468	1,825	-2	-3	41	1.57
'Guinea	23,150	16,391	1,412	64	49	-9	0.5

Sources : ITC calculations based on COMTRADE statistics. Product: 1801 Cocoa beans, whole or broken, raw or roasted. Note: unit value for “world” is computed using all countries, including those not reported in the table.

80. The unit value of imports was USD 1,655/tonnes in 2006 (see Table 7). The largest importers of cocoa beans are the US, Netherlands, Malaysia, Germany, and Belgium, where the largest grinding plants are located. Together the five countries import more than 60% of world market.

Table 7 The First 10 Importers of Cocoa Beans

Importers	Value imported in 2006, in USD thousand	Quantity imported in 2006 (tonnes)	Unit value (USD/tonne)	Annual growth in value between 2002-2006, %	Annual growth in quantity between 2002-2006, %	Annual growth in value between 2005-2006, %	Share in world imports, %
'World	4,874,867	2,944,739	1,655	6	11	3	100
'USA	779,620	473,645	1,646	11	12	-18	15.99
'Netherlands	690,875	433,659	1,593	1	20	-17	14.17
'Malaysia	671,187	454,238	1,478	41	48	71	13.77
'Germany	490,661	290,957	1,686	9	10	6	10.07
'Belgium	351,934	198,886	1,770	14	15	11	7.22
'France	274,320	159,092	1,724	0	2	11	5.63
'United Kingdom	222,938	130,621	1,707	-5	-2	28	4.57
'Canada	132,007	78,115	1,690	9	8	48	2.71
'Spain	126,678	74,669	1,697	3	6	3	2.6
'Italy	125,828	66,123	1,903	2	0	-2	2.58

Sources : ITC calculations based on COMTRADE statistics.Product: 1801 Cocoa beans, whole or broken, raw or roasted. Note: unit value for “world” is computed using all countries, including those not reported in the table. Note: in 2006, US appear to be the largest importer of beans, given a significant stock build up in the US in that year. In general, the Netherlands is the world’s biggest grinder (communication from Job Leuning).

4.6 Prices

81. Historical prices of cocoa have been highly variable. After the cocoa booms of the late 1970s to mid 1980s, prices have been declining throughout the 1990s, to reach a historical minimum (in real terms) in December 2000, when the nominal price reached USD 801/tonne equivalent to a real price (US dollar deflated by the US CPI) of USD 462/tonne. Since 2001 prices have recovered and they are currently reaching a new peak level of USD 2,690/tonne (May 2008), equivalent to a real price of USD 1,223/tonne. The current price is 80% higher than the 20-year average of nominal prices and 34% above the 20 year average of real prices (June 1988 to May 2008). There is no any trend over the past 20 years (June 1988 to May 2008).

Source: ICCO

Figure 13 World Price of Cocoa Beans (US $/tonne), Nominal Prices

Source: Based on prices from ICCO and CPI index for US from Bureau of Labor Statistics with base 100=1982-84

Figure 14 World Price of Cocoa Beans (US $/tonne), Real Prices

4.7 Challenges at the Global level[11]

4.7.1 Meeting the New Demand of Consumers

82. In the mature markets of US and Europe recent trends see the increasing demand for dark chocolate (chocolate with a higher content of cocoa). Moreover, consumers are increasingly demanding chocolate which is produced in certain ways: organic, Fair Trade, single origin, and using environmentally good practices. A number of initiatives and partnerships among farmers, public sector, buyers, and processors is underway to meet the challenges of this emerging market trend. In Viet Nam Helvetas[12] is trying to meet this challenge with the launching of a new program to produce certified organic and Fair Trade cocoa. Ritter Sport, a major German chocolate producer is interested in establishing long-term relations with Viet Nam to assure supplies of organic chocolate[13]. Even though so far these efforts have not yet been translated into concrete actions, they are positive signals that Viet Nam should take into account. However, before Viet Nam goes into promotion of niche markets, long-term marketing and agronomic feasibility should be understood better.

4.7.2 Increasing Farmers' Income

83. Most of cocoa production in the world is carried out by smallholding farmers cultivating 2 to 5 ha. With low productivity of farms, typically around 500 kg/ha, the income from cocoa cultivation barely meet the requirements of a poverty line put at $2/day/person. Improved productivity and value added at the farm level could promise a higher income of the farmers through initiatives such as extension of good agricultural practices, involvement in fermentation at the farm level, certification for organic and Fair Trade, and production of superior quality cocoa.

4.7.3 Working toward a Sustainable World Economy

84. Sustainable development is defined by the Brundtland Commission as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The International Cocoa Agreement entered into force on 1 October 2003 gives the International Cocoa Organization (ICCO) an explicit mandate in the area of sustainability. The International Cocoa Agreement established a Consultative Board on the World Cocoa Economy and LNV planned a Roundtable on a Sustainable Cocoa Economy (RSCE). The concept of sustainability in cocoa has to take into account the economic, social, and environmental pillars of sustainable development. The challenge is how to translate the principles of sustainable development into policies, strategies, and practices that are acceptable by farmers and enterprises.

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[11] This section is based upon the Annual Report of ICCO, 2007 (see http://www.icco.org/pdf/An_report/anrep0607english.pdf)

[12] Helvetas Viet Nam, Feasibility Report Organic and Fair Trade Cocoa in Viet Nam, March 2008

[13] Communication by Helvetas Viet Nam.

4.7.4 Consumption of Premium Chocolate

85. Some recent research findings have shown that flavanoids in chocolate may decrease low-density-lipoprotein (LDL or "bad" cholesterol) oxidation, helping to prevent cardiovascular diseases[14]. In addition, cocoa's high content in antioxidants has been proven to reduce the risk of cancer. The demand for dark and high cocoa content chocolate has surged in response to these positive findings. Datamonitor reported that 33% of all chocolate candies launched in 2006 were dark chocolate products. ACNielsen highlighted an increase in sales of dark chocolate in the US by 9% on average between 2001 and 2005, with sales of high cocoa content dark chocolate increases of 25% during the same period. The global dark chocolate market is now estimated to represent between 5% and 10% of the total market for chocolate tablets (the others being plain milk, plain white, and filled chocolate tablets) with a higher share in continental Europe than in the US or UK. These changes have led to an increasing segmentation of the cocoa market according to the origin of the cocoa beans. 14 countries, mostly in Latin America have been recognized by the International Cocoa Council as exporters of fine or flavor cocoa[15]: Colombia, Costa Rica, Dominica, Ecuador, Grenada, Indonesia, Jamaica, Madagascar, PNG, Peru, Santa Lucia, São Tomé and Principe, Trinidad and Tobago, and Venezuela.

4.7.5 Supply Chain Management for Total Quality Cocoa

86. In 1998, the Association of the Chocolate, Biscuit and Confectionery Industries of the European Union (CAOBISCO) expressed its deep concerns over the physical quality of cocoa beans supplied to the industry. The Association had observed that farmers were not consistently harvesting, fermenting and drying their cocoa in line with recommended practices. This was due to farmers' lack of knowledge of best known agronomic practices and, in particular, to the inefficient supply chains in producing countries. Cocoa of widely different qualities and bean size were often blended to the limits which contracts allowed. In 2003 CAOBISCO established quality criteria that include both physical criteria and other criteria such as food safety, ethical considerations (including the absence of forced child labor cocoa production), and environmentally-friendly production methods. The concept of "total quality" was born. Key to the implementation of the concept is the establishment of a traceability system that ensures the integrity of the cocoa. This requires improvement in supply chain management directly linking buyers with farmers.

[14] The findings need further research in order to corroborate the health benefits of flavanols.
[15] It should be noted that "edelcacao" or "fine flavor cocoa" originating from the 14 countries is also used in milk chocolate (communication from Job Leuning).

4.7.6 Action Plan on Pesticide Residues

87. Up to 2005, procedures in the European Community (EC) allowed Member States to set and maintain national Maximum Residue Levels (MRLs) as applied to crops that were grown within the EU. However, in February 2005, the European Union introduced a new harmonized pesticide residue legislation on MRLs. For the first time, the legislation (EC No. 396/2005) applies to imported foods, including cocoa beans as well as to domestic produce. It had been adopted by the Council of the European Union and was expected to come into effect in early 2008. Under the legislation, tolerances would be established for pesticides which have not been approved for use in the EU or where GAP differs from that established in the EU. Similar legislation on MRLs was introduced in Japan in May 2006. Until the new legislation comes into force, temporary EU MRLs will be set, based on existing EU Member State national and/or CODEX MRLs. Hence imports into the EU will be judged against this provisional list. Where there are no national or CODEX MRLs in place, the EU MRL will be set at the Limit of Detection (LOD), i.e. 0.01mg/kg - effectively zero tolerance. This means that pesticides used on products destined for the EU must be approved by the EU. Otherwise, they could face rejection at the point of entry. The prospect of such a situation raised concerns in the cocoa sector, as it could disrupt cocoa trade.

5 THE COCOA VALUE CHAIN IN VIET NAM

5.1 Introduction

88. The market channels for cocoa sector in Viet Nam are illustrated in Figure 15. The main actors in the value chain include nurseries, farmers, fermenters, and traders (collectors, buying stations, exporters).

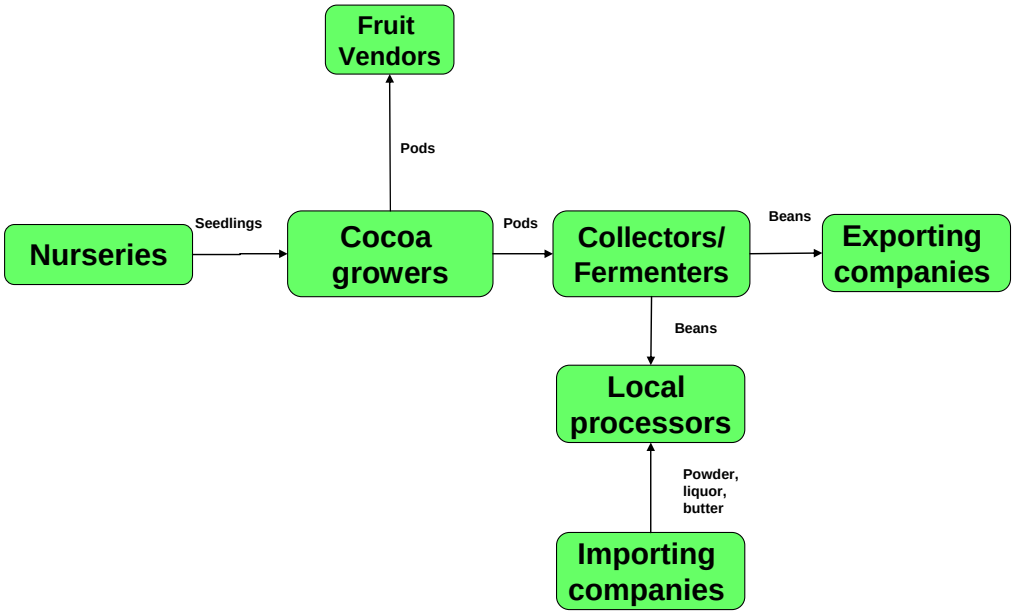


Figure 15 Market Channels for Cocoa in Viet Nam

5.2 Nurseries

89. This section summarizes the main findings about nurseries in the cocoa sector in Viet Nam. The findings are based on a survey undertaken by the Study Team during July 2008. Details about the findings reported in this section can be found in Annex A. Table 8 summarizes the SWOT analysis of nurseries.

Table 8 SWOT Analysis of Nurseries

Strengths	Weaknesses
1. Beginning of a nursery system including some mid-size companies and a distribution system in the main producing areas 2. Access to technical expertise 3. High margins	1. Absence of a quality assurance system 2. Lack of finance for further expansion 3. Access to quality planting material 4. Lack of policy support 5. Weak contract system 6. Lack of qualified skilled workers
Opportunities	**Threats**
1. Considerable income opportunities from growing demand of an expanding cocoa sector 2. Relatively quick payoffs 3. Integration of value chain from input to final products 4. Partnership with input suppliers	1. Entry by uncertified nurseries producing low quality seedlings 2. Outbreaks of Pests and Diseases

5.2.1 Strengths of the Nursery Industry

90. **Beginning of a nursery system**. Since 2004, the nursery industry has developed quite strongly as a combination of the critical role played by the Success Alliance project, the release of 14 promising commercial clones (out of those 14 clones, 8 clones were approved by MARD in 2006), and the expansion of cocoa cultivated area. A number of enterprising nurseries have in a short time span achieved some degree of technical expertise and have engaged in innovative practices including integration along the value chain and partnerships with other inputs suppliers (eg agrochemicals) and farmers.

91. The industry is still small (about 30 medium-large participants and perhaps another 20 very small nurseries). Total production of seedlings over the period 2006-2008 was 5.8 million with a growth of 23% per year over this period. Most sales are directly to farmers (57.4%), but they are made to projects (26.4%), traders (9.3%), and to government (6.9%). The expected sales of the industry in 2008 are estimated at almost 12 VND billion with a gross margin for the industry of 5.3 VND billion.

Table 9 Production of Seedlings over 2006-2008

Province	2006	2007	2008
Ben Tre	870,000	887,000	1,096,000
Tien Giang	300,000	40,000	
Binh Phuoc	137,000	145,000	260,000
Ba Ria VT	120,000	70,000	60,000
Dak Lak	37,000	128,000	53,000
Dak Nong	-	58,000	-
Dong Nai	230,000	330,000	1,000,000
Total	**1,694,000**	**1,658,000**	**2,479,000**

Source: ACI NUR Survey, July 2008

Table 10 Estimated Sales and Margins in the Nursery Industry

Province	Number Seedlings produced in the most recent crop year	Average Unit sale price of tree (VND/tree)	Expected Value of Sales of the Nursery Industry in 2008 (VND million)	Gross Margins in the Nursery Industry in 2008 (VND million)
Ben Tre	1,098,000	4,856	5,331	2,097
Binh Phuoc	225,000	6,240	1,404	784
Baria Vung Tau	68,000	4,000	272	82
Dak Lak	153,000	4,475	685	292
Dak Nong	58,000	4,458	259	92
Dong Nai	800,000	5,500	4,400	2,371
Grand Total	**2,402,000**	**4,986**	**11,976**	5,342

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

92. Most nursery managers have relatively good education, with 53% of them having completed tertiary education. Before starting their nursery business, in most cases they have undertaken training courses organized by NLU and Success Alliance. **Access to technical expertise** from NLU, WASI, and to a certain extent from DARD is also available to most managers.

93. **Margins** in the industry are quite high with an average value of 81%, with considerable variation among provinces, ranging from 42% in Ba Ria Vung Tau to 126% in Binh Phuoc.

Table 11 Margins in the Nursery Industry

Province	Average Unit Sale Price of Seedling (VND)	Average Cost of Production per Seedling (VND)	Average Gross Margin per Seedling	Gross Margin (%)	Average Gross Margin per Nursery (VND Million)
Ben Tre	4,856	2,946	1,909	65%	233
Binh Phuoc	6,240	2,756	3,484	126%	157
Baria Vung Tau	4,000	2,790	1,210	43%	82
Dak Lak	4,475	2,569	1,906	74%	36
Dak Nong	4,458	2,871	1,586	55%	46
Dong Nai	5,500	2,537	2,963	117%	1,185
Grand Total	4,986	2,762	2,224	81%	198

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

5.2.2 Weaknesses of the Nursery Industry

94. **Lack of a quality assurance system**. Many nurseries claim to have a quality assurance system, but only 64% have written documents explaining how the quality assurance is conducted in their nurseries. There is not a formal certification system for nurseries. The DARD provides licenses to nurseries and issues certificated, but this is not equivalent to a quality assurance system including auditing, records keeping, and procedures to deal with critical control points (eg HACCP) and risk analysis. Several small nurseries can set up operations without any control of the planting material they use and with dubious assurance about the clones they produce. If continued, this situation is a sure recipe for the dissemination of poor planting material, a situation that has already occurred in the past in the Central Highlands.

95. **Lack of finance for further expansion**. Most nurseries finance their investment and working capital with their own funds. Only 41% of total working capital is financed by financial institutions. A massive increase in finance will be required to keep up with the current expansion of 23% average annual seedling production growth. From the current 2.7 VND billion, finance will have to reach 11.5 VND billion by 2015 and 32.4 VND billion by 2025, just to maintain the current rate of bank finance of working capital.

96. **Access to quality planting material**. Reliable and assured sources of planting material are essential to the nursery business. In Viet Nam, the only source of planting material are NLU and WASI, but the capacity of these two institutions to meet demand is limited by scarcity of funding and human resources.

97. **Lack of policy support**. Most nurseries complain about the lack of clear policy about the cocoa industry and the absence of policy support for the nursery industry. In some cases, like in Dong Nai, provincial leaders are actually antagonistic toward to the cocoa industry as a whole.

98. **Weak contract system**. While some of the most innovative nurseries engage in contracts with farmers to sell seedlings in exchange of pods at production stage (thus engaging in multi-year interlinked contracts using input, credits, and outputs), generally there are not contracts between farmers and nurseries before the production of seedling occurs. That implies a high level of risk on the side of nurseries which are forced to estimate demand and can result in excess demand (like in 2008) or excess supply. A more ordered planning of seedling production could be organized through the establishment of forward contracts.

99. **Scarcity of quality skilled nursery workers**. Nursery business is highly technical and requires good skills of labor force. Training programs of labor force in the nursery are limited and usually limited to the managers. Most nursery managers conduct on-work training of their labor force but do not offer formal training.

5.2.3 Opportunities of the Nursery Industry

100. **Considerable income opportunities** from a growing demand of an expanding cocoa sector. If current growth rates of the sector continue or accelerated through the approval of a strategy and road map, the income opportunities for nurseries are considerable. Given high margins in the industry, several new entrants are expected and existing nurseries might expand even further. Recent visit to the Central Highlands confirmed this with a new nursery with capacity of 1 million seedling just recently been established.

101. Given the high margins in the industry, there is scope for **relatively quick payoffs** and breakeven points of less than 3 years on average. This explains the very optimistic expectations of nurseries managers about the future of the industry and their plans to expand rapidly over the next few years.

102. **Integration of the value chain** from input to final products. Several nurseries (see Box 4 in the annex, section A.11) have already starting integrating input supply with medium-term contracts with farmers in exchange of pods. This will effectively allow some nurseries to become fermentation and trading companies as well. Some nurseries are also experimenting with processing of cocoa beans into cocoa powder, cocoa butter, and cocoa wine.

103. **Alliance with agrochemical input suppliers**. In order to reach a broader clientele, nurseries are forming alliances with agrochemical input suppliers to provide a full set of material inputs to farmers wishing to engage in cocoa production (see Box 5 in the annex, section A.11).

5.2.4 Threats of the Nursery Industry

104. **The appearance of several nurseries** using planting material of unidentified origin could eventually result in a situation where poor or even disease-ridden planting material and

seedlings are distributed to farmers. This will create mistrust by farmers and slow down the growth of cultivated areas and thus result in a lower growth of the industry.

105. **Outbreak of pests and diseases** could result in considerable losses to farmers and thus reduce the incentive of farmers to cultivate cocoa and the demand for seedlings.

5.3 Farmers

106. This section summarizes the main findings about farming practices in the cocoa sector in Viet Nam. The findings are based on a survey undertaken by the Study Team during July 2008. Details about the findings reported in this section can be found in Annex A. Table 12 summarizes the SWOT analysis of nurseries.

Table 12 SWOT Analysis for Farmers

Strengths	**Weaknesses**
1. A variety of suitable agroecological environments for cocoa cultivation 2. A variety of farming systems including intercropping, monoculture and agroforestry 3. A choice of approved clones and an emerging nursery industry 4. A growing network of buying stations 5. Increasing knowledge about technology and markets reflected in improving yields	1. Little knowledge about quality 2. Limited land availability 3. Limited capacity to manage pests and diseases 4. Lack of farmer organizations 5. Low density of buying station network 6. Limited use of finance
Opportunities	**Threats**
1. Increase productivity through use of good agricultural practices 2. Adding value through fermentation and by-product utilization 3. Adding value through improving quality 4. Engage in sustainable models, with benefits to biodiversity, the environment, and paid environmental services	1. Pests and diseases intensification 2. Increasing cost of labor and inputs 3. Labor availability 4. Market fluctuations

5.3.1 Strengths of Farmers

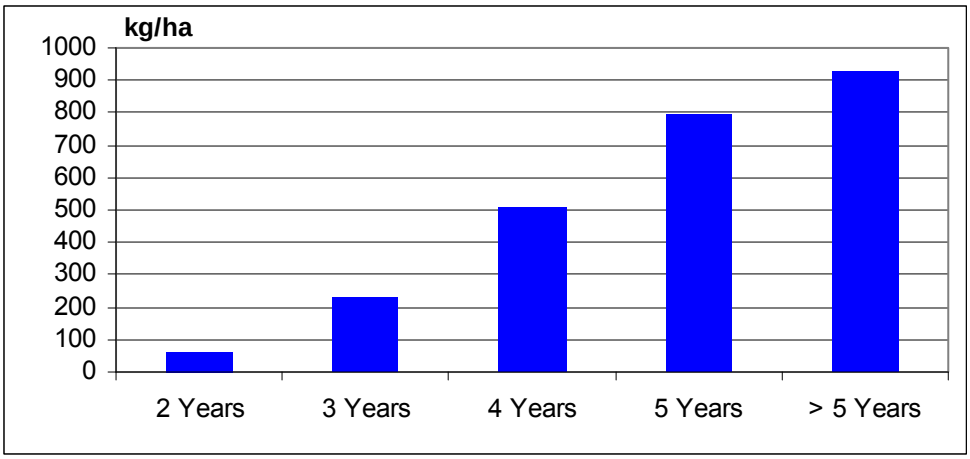
107. **A variety of agroecological environments** suitable to cocoa cultivations is available to farmers in Viet Nam. Cocoa in Viet Nam can be grown profitably at different altitudes, ranging from 0 meters above sea level (masl) in the Mekong River Delta to 800 masl in the Central Highlands and is resilient to a broad range of water availability and rainfall. Even though no environment in Viet Nam is similar to the original rain forest where cocoa originates, adaptation in technology and farming practices make cultivation of cocoa feasible in a number of provinces and regions of Viet Nam (see discussion on chapter 7 on suitability).

108. Farmers cultivate cocoa under a **variety of farming systems** including monoculture, intercropping, and agroforestry. Intercropping is the most common farming system, representing about 90% of total cultivated area. Monoculture is mostly undertaken in the Central Highlands whereas intercropping is undertaken in all regions. The most common intercropping is with coconut and fruit in the Mekong River Delta and with cashews in the Southeast and Central Highlands. Mix cropping with a variety of other crops (pepper, coffee, and fruit) is also practiced in some areas (eg Ba Ria Vung Tau). Recently, agroforestry models have been introduced both by donor-funder projects and the domestic private sector (see section 9.2 and Annex I).

109. A **number of approved clones** (8) are available to farmers with good performance across different agroecological environments. The most used clones are TD3 and TD5 and farmers use an average of 2 to 3 clones on the same farm.

110. Differently from the past, when cocoa promotion occurred without establishing linkages to markets, since 2004 there is a **growing network of buying stations and traders** interested in buying cocoa beans. Farmers have a choice of selling pods or beans, and a choice among buyers and even buying stations from different companies. The key international buyers are Cargill, EDF & MAN (now Dakman), and Armajaro. Access to market information is relatively good through a variety of sources including radio/TV, telephone, and price boards at buying stations, traders, and neighbors. Some farmers even get price information through the internet.

111. **Farmers knowledge about cocoa cultivation techniques and markets is** improving as the result of project work, access to market information, and basic education level (48% of farmers have lower secondary education and 32% have higher secondary level; only 1.9% have no education). In spite of considerable variation in yield performance among farmers, on average yields are growing at different stages of production. For the sample of farmers interviewed by the Study Team, the average yield performance is illustrated in the following graph:



Source: ACI FAR and COP Survey, July 2008

Figure 16 Yield Performance at different stage of production (kg beans/ha)

5.3.2 Weaknesses of Farmers

112. **Limited access to good planting material and seedlings**. In spite of a growing nursery industry, several farmers find it difficult to obtain certified budwoods or clones of good quality. In the absence of a quality assurance system of the nursery industry, planting material and seedling distributed to farmers can be of dubious origin and poor quality.

113. Most farmers have **limited knowledge about indicators of quality** of cocoa beans. Even for the most simple indicator (bean count), 64% of farmers do not have information about the value of bean count of their production. For some indicators such as fat content, pH level there is no knowledge.

114. Farmers are smallholders and have **limited land availability** for growing cocoa. Average cocoa cultivated land is about 1 ha and is higher in the Central Highlands and Southeast than in the Mekong River Delta. Small size of landholdings implies that higher income from cocoa requires intensification of production. A low productivity cocoa production system will not be viable in Viet Nam.

115. One of the main difficulties faced by farmers in cocoa cultivation is **management of pests and diseases**. Even though there have not yet been major outbreaks of pests and diseases as in other countries, phytophtora and helopeltis are common. Farmers have limited capacity in managing pests and diseases effectively.

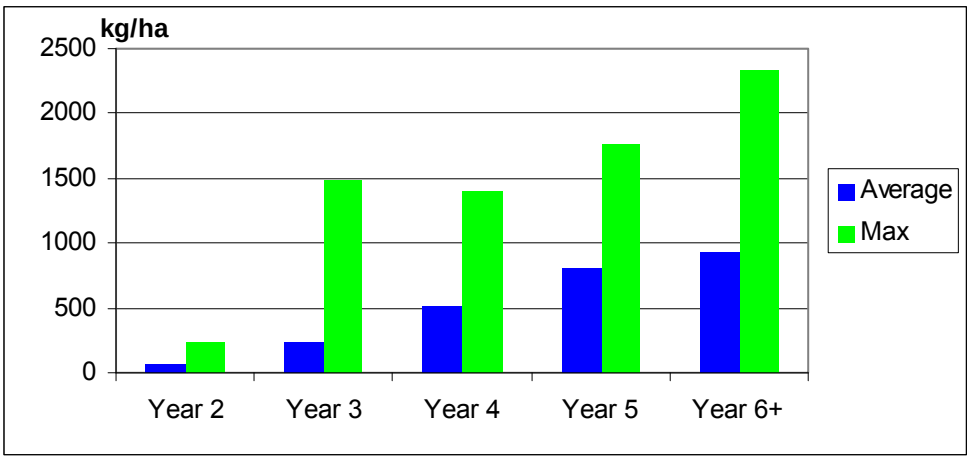
116. **Farmer organizations in cocoa are hardly present**. Cocoa clubs have been successfully established as a method to transfer technology within projects such as the Success Alliance. However, farmers clubs are temporary organizations that do not survive after project completion. There are basically no cooperatives to organize input procurement, output marketing, and fermentation, with the possible exception of one cooperative established in Tien Giang.

117. In spite of a growing network of traders and buying station, **the density of the marketing network is low**, partly as the result of a still low volume of production. Farmers in the Southeast and the Central Highlands have to sell beans at great distance from their farm (more than 50 km).

118. Cocoa production requires capital, particularly during the first years of establishment. Even though the capital requirements for intercropping are much lower than for monoculture (see chapter on feasibility section 8.2), there is a concern that particularly poor households wishing to engage in cocoa cultivation will be **constrained by lack of capital** and difficulty in accessing medium-term credit (2-4 years). Even for better off farmers, the finance constraint will be binding once a large number of them will start engaging in monoculture. Programs to facilitate access to medium-term credit (similar to what in the past has occurred with the development of smallholder rubber plantations) are not available in the case of cocoa.

5.3.3 Opportunities of Farmers

119. **Productivity increases**. Currently, productivity is growing as the result of trees entering production stage (year 3, year 4, …) and improved cultivation techniques. Some farmers have productivity considerably higher than regional or world averages. Yet, in order for cocoa to be an attractive crop to the average farmer yields have to further increase and reach level of between 2 to 3 kg of beans/tree (translating into 1.2 to 1.8 tonne/ha for intercropping and 2.2 to 3.3 tonnes/ha for monoculture). This is within the capacity of farmers to do and also within the current technological level achieved by research organizations in Viet Nam, but will require an effort in research, technology transfer to farmers, and supporting measures to address the weaknesses of the system.



Source: ACI FAR and COP Survey, July 2008

Figure 17 Yield Comparison between Average and Good Practices

120. **Adding value through fermentation and by-product utilization**. Even though fermentation is very attractive to farmers, still few farmers are engaged in this activity, as the

result of low volumes of production and limited knowledge of fermentation techniques. The analysis of margins in fermentation shows that fermentation is a source of value added, even for smallholder farmers with small volumes of production. More efficient fermentation will require larger volumes and fermentation stations that could be established by group of farmers or cooperatives. An additional source of income is the utilization of by-products of cocoa as feed and compost. Currently, only few farmers are engaged in this type of activities and by-products are basically wasted.

121. **Adding value through improving quality**. Improving quality of cocoa beans is the outcome of planting material, cultivation techniques, fermentation techniques, and postharvest operations such as packaging, storage, and transportation. Good practices in cultivation could ensure that food safety requirements are met, for example maximum residue levels in chemicals and heavy metals are not exceeded. Farmers are already aware that improvement in quality translates into a premium received by buying stations, so the scope for further value gained through improvement in quality is considerable.

122. **Engage in sustainable models of cocoa cultivation** with benefits to biodiversity and the environment, and the potential of paid environmental benefits of agroforestry models. The field work has shown an improvement in a number of environmental and biodiversity indicators (see Annex B.9 and Annex J) particularly for intercropped and agroforestry models. Preliminary analysis also suggests that agroforestry models could be amenable to benefits to stallholders in terms of CER certificates that could be traded under the CDM (see Annex J.3).

5.3.4 Threats of Farmers

123. **Outbreaks of pest and diseases**. The experience of major cocoa producers in the world has that as the volumes of production increase, outbreaks of pests and diseases are more frequent, particularly if good practices in cultivation (eg IPM), quarantine control, and quality assurance of planting material are not followed. Farmers are well aware that losses due to insects, diseases, and even mammals can represent a considerable loss and have a negative impact on their efforts and investment; however, besides applying pesticides and other chemical, they are not well aware on how to pursue integrated pest management for cocoa. A constant effort in research, technology transfer to farmers, and effective quality assurance will be needed to reduce the risks of this threat.

124. **Increasing costs of labor and inputs**. Labor costs are increasing as the result of overall rapid economic growth of Viet Nam, rapid urbanization, and the transformation of the rural economy from one based on agriculture to one based on non-farm activities. Input costs (particularly agrochemicals) are increasing as the result of trends in energy prices worldwide. The growth of labor and material input costs translates into higher costs of production unless compensating improvement in total factor productivity occurs at all stage of production.

125. **Labor constraints**. Even though cocoa is not a very labor-demanding crop (relative to other crops such as coffee and rubber), given the increasing costs of labor in rural areas labor constraints are going to become more serious in the future. Young people and sons and

daughters of farmers are more attracted to the non-farm sector and often also migrate to urban areas. This might lead to an aging of the farming population with potential negative impact on productivity.

126. **Market fluctuations**. Cocoa is a highly volatile commodity. Compared to coffee, short-term volatility is higher and long-term volatility is lower. Excessive market volatility might reduce the incentive of farmers to engage in monoculture cocoa production. Intercropping, storage, and hedging in the future markets might be responses to deal with market fluctuations.

5.4 Fermenters

127. This section summarizes the main findings about fermentations practices in the cocoa sector in Viet Nam. The findings are based on a field interviews and visits undertaken by the Study Team during July 2008. Details about the findings reported in this section can be found in Annex C. Table 13 summarizes the SWOT analysis of fermenters.

Table 13 SWOT Analysis for Fermenters

Strengths	**Weaknesses**
1. Albeit at a very early stage, there is already some research and extension work on fermentation techniques 2. Bean quality standards have been established 3. Fermented beans produced so far have proved to be of acceptable quality	1. Still artisanal industry with small size of fermentation batches 2. Limited knowledge of fermentation techniques by farmers 3. Lack of uniformity of fermented beans 4. Technical issues to be resolved
Opportunities	**Threats**
1. Emergence of specialized fermentation companies producing uniform quality of beans 2. Considerable value added in fermentation	1. Persistence of artisanal fermenters will make more difficult the emergence of uniform quality of beans

5.4.1 Strengths of Fermenters

128. **Albeit at a very early stage, there is already some research and extension work on fermentation and other postharvest techniques**. Research conducted at NLU on size of batches, type of containers, temperature control, and mechanization of some fermentation stages. In addition to fermentation research is also conducted on pod storage (prior to fermentation) and drying (after fermentation). Solar driers have been introduced by the CARD project, modeled after the ones developed in Papua New Guinea. Extension work funded by Success Alliance on fermentation has also established some demonstration fermentation stations.

129. **Bean quality standards** for Vietnam were established in February 2006 by the Vietnam Standards Center (STAMEQ). Three categories of beans (1A, 1B, and 1C) have been established with the following characteristics:

Table 14 Indicators of Grades 1A, 1B, and 1C for Cocoa Beans

Indicator	1A	1B	1C
Bean count	< 100	< 110	< 120
Moisture content	Max 7,5 %	Max 7,5 %	Max 7,5 %
Slaty bean	Max 3,0 %	Max 3,0 %	Max 3,0 %
Moldy bean	Max 3,0 %	Max 3,0 %	Max 3,0 %
Broken/Insect infected/ Germinated bean	Max 2,5 %	Max 2,5 %	Max 2,5 %
Foreign matters	Max 1,0 %	Max 1,0 %	Max 1,0 %

130. Preliminary results indicate **acceptable bean quality** and comparison with other countries reaches similar conclusion, which promises well for establishing Viet Nam as a recognized quality beans exporter (see Table 16).

Table 15 Analysis Results of Cocoa Beans Quality in 2006-2007

Moisture content	7.5 %
Bean count	97
Fat content	56.6 %
PH	5.13
Free fatty acid	1.67 %
Mouldy bean	1 %
Slaty bean	0 %
Cluster	0.9 %
Shell content	17.5 %
Insect damaged bean	0 %
Germinated bean	0 %
Flat bean	0.2 %
Broken bean	1.4 %
Foreign matters	0.4 %

Source: Cargill Viet Nam

Table 16 Quality of Vietnamese Cocoa and Other Countries

Indicators	Vietnam	TCVN (A1)	Indonesia	Cote d'Ivoire	Ghana
Bean counts/ 100gr	96,8	100	115.0	97.0	94.0
Moisture content (%)	7,3	7,5	7.5	7.4	7.6
Proportion of fully fermented beans (%)	76,6		n/a	n/a	n/a
Proportion of partly fermented beans (%)	19,7		n/a	n/a	n/a
Proportion of fully violet beans (%)	2,6		n/a	n/a	n/a
Proportion of slaty beans (%)	0,3	3	25.0	5.0	1.0
Proportion of mouldy beans (%)	0,2	3	5.0	5.0	2.0
Proportion of germinated/ infested beans (%)	0,5	2,5	1.5	0.0	0.0
Proportion of foreign matter (%)	0,4	1	3.5	5.1	1.3
Proportion of fat (%)	56,6		n/a	54.5	55.2
Proportion of shell (%)	17,5		13.0	11.1	12.5
Proportion of FFA (free fat acid) (%)	1,67		1.75	1.68	0.93
pH	5,13		5.50	5.90	5.60

Source: DCP 2008

5.4.2 Weaknesses of Fermenters

131. **The industry is still largely artisanal** with fermentation batches varying between 10 and 100 kg of beans. Specialized fermentation companies are still to emerge.

132. **Most farmers do not know much about fermentation techniques**, even though most of them are interested in learning and be involved in fermentation.

133. Given the small size of fermentation station and the great variation in fermentation techniques among them, **uniformity of fermented beans will be an issue** in the future.

134. **Technical issues** of how to improve fermentation techniques and particularly temperature control during the cold harvest period of the main season in the Central Highlands are still under investigation and need to be transferred to fermentation stations.

5.4.3 Opportunities of Fermenters

135. **Emergence of specialized units** for fermentation might result in new business development for small and medium enterprises and improve overall uniformity of fermented beans. "Fermentation factories" could be farmer owned and operated (eg by famer cooperatives) or as separate business units.

136. There are already **good margins to be made in fermentation**. Even though small in absolute terms for small batches, the margins provide additional income to farmers and provide a stable flow of cash during the course of the long harvesting period. Moreover, farmers consider the return to their labor in addition to the net margins as part of their income.

Table 17 Gross Margins in Fermentation

Batch size	kg	100	50	10
Pod Class	Class	I	II	III
Wage rate	VND/day	85,000	85,000	85,000
Labor cost	VND/batch	141,667	70,833	14,167
Gross Margin	VND/batch	748,000	359,400	48,000
Net Margin	VND/batch	606,333	288,567	33,833

Source: Study Team Field Work, July 2008

137. For larger operators, able to ferment between 1 and 10 tons per year, fermentation could be a good source of income (providing and additional 6 and 60 VND million). It is not surprising that some cocoa producers and small nurseries are now shifting to trading and fermentation as their main activity.

5.4.4 Threats of Fermenters

138. Persistence of artisanal fermentation is likely and this will make more difficult the emergence of uniform quality of beans.

5.5 Traders

139. This section summarizes the main findings about trader's practices in the cocoa sector in Viet Nam. The findings are based on a field interviews and visits undertaken by the Study Team during July and October 2008. Details about the findings reported in this section can be found in Annex D. Table 18 summarizes the SWOT analysis of fermenters.

Table 18 SWOT Analysis for Traders

Strengths	**Weaknesses**
1. Interest of major international buyers in cocoa from Viet Nam 2. Established a network of collectors, traders, buying stations, and exporters	1. Low density of marketing network particularly in the Central Highlands and Southeast 2. Unorganized marketing system with traders buying both fermented and unfermented beans
Opportunities	**Threats**
1. Creation of a Viet Nam Cocoa Denomination 2. Marketing to high quality markets in Europe and Japan	1. Lowering of quality as volumes of production increase

5.5.1 Strengths of Traders

140. Some of the main international buyers including Cargill, Armajaro, and EDF&MAN have established operations in Viet Nam and set up buying stations. **The traders are interested** in finding a new stable supplier of cocoa beans to partly counter the instability of the main suppliers in West Africa and Indonesia. The international buyers have provided an important role in the development of the industry not only in terms of their presence as buyers but also in terms of technical assistance, information, and promotion of the sector.

141. A **marketing network consisting** of collectors, traders, and international buyers already exists. The network is buying both pods and beans from farmers and fermentation stations. The network is relatively more dense in the areas where the Success Alliance has worked most in the past (particularly in the Mekong River Delta and in Ba Ria Vung Tau) and less dense in the Central Highlands and in Binh Phuoc and Lam Dong.

5.5.2 Weaknesses of Traders

142. The density of the marketing network, in terms of number of buyers and access to buyers and buying stations is relatively low in the Central Highlands and in some provinces

of the Southeast. Long distances to buying stations in these provinces have to be crossed to sell fermented beans.

143. **Some traders are currently buying both fermented and unfermented beans**; other (like Cargill) have strict rules about buying only fermented beans. If the situation persists in the future, a deterioration of beans quality is likely to occur, similarly to the situation in Indonesia.

5.5.3 Opportunities of Traders

144. **Creation of a Viet Nam Cocoa Denomination** that is recognized in world markets. This will require the partnership with public sector and the coordination along various actors in the value chains, including nurseries, farmers, and fermenters. The advantage of the denomination will be higher premium in world markets and more long-term relationships with buyers.

145. **Market opportunities exist for quality beans both in Europe and Japan**. Malaysian processing industry depends to a large extent on beans from Indonesia of lower quality. Beans from West Africa are also imported, for the distinctive and superior flavor, a factor largely related to planting material rather than only fermentation and cultivation techniques. The introduction of planting material from varieties other than the Malaysia varieties originating the clones produced in Viet Nam will require longer term research in plant breeding and clonal trials.

5.5.4 Threats of Traders

146. **Lowering of quality** could accompany the growth of volumes of production in Viet Nam, in the absence of a clear strategy for the industry. Lowering of quality would result in lower value added for all the actors along the chain.

6 POLICIES AND INSTITUTIONS

6.1 Introduction

147. Farmers, nurseries, traders, research and extension workers, and experts all agree about one conclusion: there is a lack of clear policies for the cocoa development in cocoa. Given the current growth of the sector and ambitious targets set by the government, this seems a little paradoxical. Cocoa is a sector still in its infancy; however, since 2004 has achieved a remarkable growth and some key decisions related to the approval of clones, promulgation of standards, and establishment of a Cocoa Coordination Committee headed by MARD would suggest that clear policies are in place and programs to achieve the targets set by the government are under way. In fact this is not the case.

148. The history of cocoa in Viet Nam has been characterized by a set of failures. These failures have been variously interpreted partly as lack of a link with world market, partly as the lack of peaceful conditions (as during the American war), and partly as the result of mismanagement (as during the brief but unsuccessful experience of the establishment of a processing plant in Quang Ngai in the 1990s). Plans for the development of the sector were also established in 1998 with a target for the year 2010 of 80,000 ha cultivated area in four regions (South Central Coast 13,000 ha, Central Highlands 28,500 ha, Southeast 20,500 ha, and Mekong River Delta 18,000). By the end of 2007 only about 10% of these cultivated area targets were achieved, and this was mainly the result of the contribution of a single donor-funded project, the Success Alliance, rather than the outcome of government investments and programs.

149. The lessons of the past indicate that establishing targets without preparation of detailed plans of investment, issuing of policies and provincial plans, human resource capacity building and allocation, solid information base (statistics, monitoring, studies), and understanding of the motivation of farmers and markets, is likely to result in underachievement and failure.

150. There is currently a general optimism that the new targets set up by the Government in 2006 and the rapid growth of the sector since 2004 might represent a turning point in this history of failures (see section 2.1). This might well be the case, but, as we will see in the last chapter of this report, it will require the formulation of strategies, policies, and plans and policy commitment to translate the targets into action.

6.2 Current Government Plans

151. The GOV issued Decision 2678/2007/QD-BNN-KH in 2007 indicating the following objectives:

1. By the year 2015, cultivation of cocoa reaching 60,000 ha, of which 35,000 ha harvested, with an average yield of 1.5 tonne/ha and a total production of 52,000 tonnes dry beans, corresponding to a value of export between USD 50-60 million.
2. By the year 2020, cultivation of cocoa reaching 80,000 ha, of which 60,000 ha harvested, with an average yield of 1.8 tonne/ha and a total production of 108,000 tonnes beans, corresponding to a value of export between USD 100-120 million[16].

152. In order to support this plan, an indication of VND 40 billion (about USD 2.5 million) public investment is provided in the Decision. It is widely perceived that the public investment indications to support the achievement of the objectives of the Government are largely underestimated.

153. Provincial targets indicated in the national plan for the year 2015 include the following:

1. South Central Coast: 6,000 ha concentrating in Binh Dinh, Quang Ngai, Phu Yen and Khanh Hoa;
2. Central highland: 17,000 ha concentrating in Dak Lak, Dak Nong, Lam Dong, Gia Lai and Kon Tum;
3. South East: 17,000 ha concentrating in Binh Phuoc, Ba Ria – Vung tau, Dong Nai, Binh Duong, Tay Ninh and Binh Thuan;
4. Mekong River Delta: 20,000 ha concentrating in Ben Tre, Tien Giang, Vinh Long, Tra Vinh, Can Tho, Hau Giang, Soc Trang, An Giang;
5. By 2020 it is projected to have 20,000 ha more in CH, SE and MRD to reach the target of 80,000 ha. Main approach to develop cocoa areas is small scale household production intercropped with other crops, especially cashew nut, coconut, longan, etc.

6.3 Provincial Plans

154. Information in this section is based on a questionnaire sent to 15 cocoa producing provinces. The details of the analysis are reported in Annex E.

155. **The provinces have been followers rather than leaders in the promotion and development of cocoa sector**. With the possible exception of Ben Tre and Tien Giang where the provincial leaders have embraced cocoa and worked actively in the sector, in most other cases, the support for the sector has been tenuous, indifferent, or in some cases even hostile (eg Dong Nai and Quang Ngai and Ba Ria – Vung Tau[17]). This is reflected in weak promotion policies for the sector, limited or no resources mobilized from provincial budgets, and a rather passive acceptance of projects such as the SA.

[16] At current prices of about $2,000/tonnes (November 2008), the export value would be considerably higher, namely over $200 million.

[17] In the case of BRVT, although Success Alliance project is being implemented in two districts Chau Duc and Tan Thanh, the local authorities often express their doubt about cocoa market and even prevent those who want to expand cocoa to other districts in the province.

156. **Provincial data on cocoa sector are incomplete and seem inaccurate.** No reliable information system on cocoa sector exists. The General Statistical Office (GSO) does not collect information on cocoa; as a consequence official statistics are missing. This is partly explained by the relative novelty of the sector and sometimes by the lukewarm or hostile attitude of some provincial authority towards the sector. Basic statistics on cultivated area, productive area, and production are at odds with data collected from traders. Production in 2007 was estimated by the provinces at over 1,100 tonnes; however trade data from exporters indicated only 240 tonnes. Estimates of production from sub-NIAPP were at 289 tonnes; estimates from DCP were at 360 tonnes.

Table 19 Areas under cocoa and production by end of 2007 estimated by Provinces

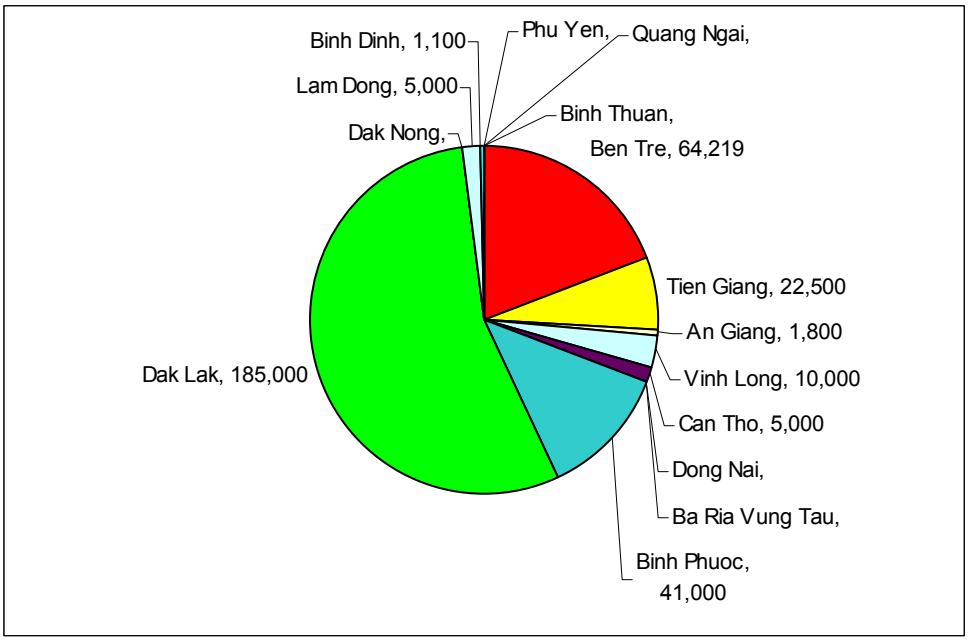
#	Province	Area (Ha)	Productive area (ha)	Production (tonnes dry beans)
1	Ben Tre	3,025	1,020	996
2	Tien Giang	1,231	498	7.2
3	An Giang	50	50	2.3
4	Vinh Long	300	na	na
5	Can Tho			
6	Dong Nai	170	na	na
7	Ba Ria Vung Tau	957	257	45
8	Binh Phuoc	1,200	na	na
9	Dak Lak	1,112	267	68.3
10	Dak Nong	342	na	na
11	Lam Dong	118	5	3
12	Binh Dinh	0	-	-
13	Binh Thuan	50	-	-
14	Phu Yen	4	-	-
15	Quang Ngai	25	25	17.5
	Total	8,583.6	2,122	1,139.3

Source: ACI PRO survey, July 2008; Data for Dong Nai is taken from Cocoa Need Assessment Survey, 2007. Data on production in Tien Giang is from Cho Gao coop, 2008.

157. **There is considerable mismatch between assessment of agroecological potential by the provinces and current plants.** The provinces indicate agroecological potential for cocoa development at about 335,000. This assessment is not based on broadly accepted scientific methods**.** The fact that cocoa is an adaptable crop to a variety of agroecological conditions in Viet Nam, does not imply that all the potential areas indicated by the provinces would be suitable to have plant growth that is meeting acceptable agronomic standards. Given the existing experience on cocoa already available in Viet Nam, a more in depth agroecological assessment should be conducted, using GIS methods and databases on soils,

climatic data (temperature, rainfall), topography, hydrological conditions, and land use maps. At this stage, only a preliminary assessment of potential could be made (see section 10.3).

158. More important is the fact that in spite of indications of a large agroecological potential, plans do not match the assessment. Several provinces do not have plans beyond 2010. All the provincial plans do not amount to more than 40,000 ha. Moreover, plans are not embodies in budgetary allocations and programs formulation to translate the plans into action.



Source: ACI PRO Survey, July 2008

Figure 18 Cocoa Agroecological Potential by the Provinces

159. **Several provinces do not seem yet convinced that cocoa could be a good alternative to existing crops.** The reasons of the skepticism are related to the lack of solid economic and feasibility studies of cocoa, lack of marketing (buying stations) and market information, a general reticence to embark on a new crop, and negative experience from the past.

6.4 Key Regulations

160. **Bean quality standards** for Vietnam were established in February 2006 by the Vietnam Standards Center (STAMEQ) and included:

1. TCVN 7518: 2005 - Cocoa bean – Term and definitions
2. TCVN 7519: 2005 - Cocoa bean
3. TCVN 7520: 2005 - Cocoa bean – Determination of moisture content

4. TCVN 7521: 2005 - Cocoa beans – sampling
5. TCVN 7522: 2005 - Cocoa beans – cut test

161. Three categories of beans (1A, 1B, and 1C) have been established with the following characteristics:

Table 20 Indicators of Grades 1A, 1B, and 1C for Cocoa Beans

Indicator	1A	1B	1C
Bean count	< 100	< 110	< 120
Moisture content	Max 7,5 %	Max 7,5 %	Max 7,5 %
Slaty bean	Max 3,0 %	Max 3,0 %	Max 3,0 %
Moldy bean	Max 3,0 %	Max 3,0 %	Max 3,0 %
Broken/Insect infected/ Germinated bean	Max 2,5 %	Max 2,5 %	Max 2,5 %
Foreign matters	Max 1,0 %	Max 1,0 %	Max 1,0 %

162. **Approved Clones**. Subsequent to clonal trial research conducted at NLU, 8 clones (TD1, TD2, TD3, TD5, TD6, TD8, TD10 and TD14) were approved in 2005.

163. **Cocoa Coordination Committee.** In March 2005, MARD established the Viet Nam Cocoa Coordination Committee to facilitate formulation of policies related to cocoa sector. Participants in the VCCC include key agencies at MARD, the private sector, and research organizations. The Committee helped formulate the MARD Decision 2678/2007/QD-BNN-KH of 14 September 2007 that indicated the objective of 60,000 ha by 2015 and 80,000 ha by 2020.

6.5 Research and Technological Transfer

164. For developing a new crop, applied research is the first step to be carried out. The fastest way is to adapt what has been done successfully in other areas having similar agroecological parameters.

165. With the support of organizations such as the World Cocoa Foundation, Mars Incorporated, GTZ, and DANIDA, basic technology to plant cocoa has been introduced and tested successfully in Vietnam since early 2000 and is ready to be applied in larger scale. In demonstration farms vegetative growth of cocoa is good, but it is still too early to confirm productivity.

166. Technological transfer is the next step for the development of cocoa.

167. During this stage, the lessons learned from the past should be taken into account. Some lessons include:

- Unidentified Seeds. Hundred thousands ha of coffee were planted with unidentified seeds.
- Propagation. Grafted seedlings of cashew is just introduced recently after hundred thousand ha were planted
- Harvesting methods. Farmers got the habit of harvesting coffee cherries when they are not ripe (eg only 50% ripe). Smallholder farmers got this habit because of lack of extension work. At the time most extension and research activities favored large plantations (state-owned).

168. So far cocoa can be considered as an exceptional case, thanks to the fact that its development was the outcome of a serious effort at smallholder extension activities carried out under a well focused and managed project, the Success Alliance (SA). The SA project started in 2004 when only 300 ha of cocoa were cultivated. The three main objectives of the project were (1) planting 7500 ha of cocoa; (2) training 17 000 farmers to plant cocoa and (3) establishing market channels. The project provided smallholders with information such as good planting materials, specific habitats of cocoa, pruning techniques, pests and diseases management, and fermentation. Training was the largest activity and component of the project budget. Training of Trainers and Farmer Field Schools (FFS) has been very effective tools in transferring technology to farmers. The SA showed that local staff can do a good job in cocoa extension as long as there is good managerial system, availability of resources, and an effort sustained over a medium-term period (at least 5 years).

169. In spite of the critical role of research and extension in the development of the cocoa sector, up to now very few researchers and extension staff are involved in the cocoa sector. In NLU, staff of different sections of the University participate in cocoa depending on ad hoc projects. Therefore, they just contribute little part of their time to cocoa. Those few researchers and technicians who are active in the Cocoa Development Project of NLU are involved in almost all aspects of cocoa system. They work on plant propagation, breeding, irrigation, demonstrations, cocoa germplasm, introduction and propagation of new clones, pests and diseases management, clonal trials, fermentation experiments, preparation of training curricula, etc. The project is granted from the University 6 ha at Trang Bom, in Dong Nai Province for clonal trials, and 2. 5 ha at Thu Duc for demonstrations, germplasm, and nursery. The staff of the Department of Farm Machinery are working on producing the mechanic system for processing cocoa bean at household/cooperative level. The Department of Food Technology works on sensory evaluation and processing cocoa bean into end products. Supported by Mars Incorporated, a sensory lab and sensory panel has been established to support research on cocoa bean quality. The Plant Protection Division works on Tricoderma to control Phytophthora. Lacking an official section on cocoa at the University is the constraint for those staffs to work fulltime.

170. In WASI, research activities have been focused traditionally on coffee, the main crop in the Central Highlands. In the institute there is a small group working on cocoa planting materials, fermentation and pest and disease management. All the researchers and technicians have considerable experience in coffee, and only recently they have started working on

cocoa; therefore there is still lack of knowledge on cocoa, a serious constraint given the high potential for cocoa development in the Central Highlands that has been indicated both by the provincial authorities and by the researchers themselves. As a result some larger farms and plantations still consult NLU for technical advice. The institute has 7 ha for clonal trials and germplasm.

171. Can Tho University recently has been involved in the project "Cocoa Fermentation and Drying and Quality Assessment in Vietnam" funded by Australia Government.

172. FSSIV, the forest research institution is managing a sustainable cocoa forestry model funded by Mars Incorporated (see section I.3).

173. There is an obvious mismatch between the current level of human resources and budget for conducting research on cocoa and the ambitious objective to develop 80 000 ha in 2020 (currently about 10,000 ha of cocoa have been cultivated. Moreover, with the SA project coming to end in 2008, there is no a solid prospect of another large project that will focus on cocoa. While the SA has been successful particularly in the Mekong River Delta where it was able to devote efforts and resources on sustained basis for a period of 5 years, it was only in 2007 that the project started activities in the Central Highlands.

174. The current technology available for cocoa development in Viet Nam has proved successful in various agroecological zones, particularly in the Mekong River Delta and in parts of the SE (eg Ba Ria Vung Tau). However, this technology is still at the beginning stage. There is not yet sufficiently developed and tested technology for the SE (eg Binh Phuoc) and the Central Highlands (Dak Lak, Dak Nong, Lam Dong, etc) where most of the potential areas are identified. Moreover, new problems are expected to emerge from expansion of cocoa areas and with the aging of trees, such as cultural management, pest and disease management, quality improvement, and management of nursery system.

175. Officially, WASI is assigned by DARD to lead cocoa research and every year WASI receives fund for this purpose (Table 22); the funds are however extremely limited. In addition, the National Cocoa Coordinating Committee has appointed WASI and NLU to be responsible for research and training on cocoa; this appointment, however, has not yet translated in support or funding for any concrete activities.

176. If cocoa has to develop on a sustainable basis in Vietnam, there is the urgent need to establish a cocoa research institute or center similarly to what has been the case for other crops such as coffee, rubber, fruit, and vegetables.

Table 21 Staff Involved in Cocoa Research

Organization	**Staff involved in cocoa research part time**				**Full time staff equivalent**			
	PhD	MSc	BSc	Technicians	PhD	MSc	BSc	Technicians
NLU	4	9	10		1.2	3.5	4	
WASI		3	6			1.5	1.5	
FSSIV	1		2		0.1		1	
CTU	1	1			0.1	0.2		

Source. Study Team
Note: If there are 6 Msc that work each 25% on cocoa, then the full-time equivalent is 1.5

Table 22 Public Funding from the Central or Local Government for Cocoa Research (VND million)

Organization	2004	2005	2006	2007	2008
NLU		100	100	250	150
WASI	700	500	650	500	500
FSSIV					

Source. Study Team

Table 23 Public Funding from the External Organizations for Cocoa Research (VND million)

Organization	2004	2005	2006	2007	2008
NLU	500	500	500	500	500
WASI					
FSSIV	na	na	na	na	
Can Tho University			2300	1050	

Source. Study Team

177. The extension and plant protection network has also limited capacity. Each province has an average of 40 to 50 extension workers (few of them are agronomists) and a similar number of plant protection workers; however these workers have to serve the needs of a large farm population involved in numerous crops. Given the relative novelty of cocoa in Viet Nam, the majority of extension workers have limited knowledge on cocoa production.

178. Even in agricultural universities cocoa is not a subject matter. Reading material on cocoa in Vietnamese language is also very limited. Except the book on technique of cocoa plantation in Vietnam recently prepared by Dr Phuoc there is hardly any other technical publication in Vietnamese. The situation is worse at commune level. Except for those places where there is a cocoa project farmers do not know where to ask for advice if they want to grow cocoa.

7 SUITABILITY

7.1 Agroecological Zones in Viet Nam Suitable to Cocoa Cultivation

179. Cocoa developed in the South and Central American rain forest, where rainfall is high and well distributed throughout the year, with a short dry season. In the rain forest, cocoa growth at lower storey receives less sunlight; temperature is high and varies over a small range during the year; humidity below the rain forest canopy is always high. Suitable rainfall for cocoa is 1500 – 2000 mm and without long dry season (1 month).

180. Cocoa in Vietnam has developed under very different conditions from rain forest cocoa, as the following Table 24 indicates.

Table 24 Some climatic parameters of selected cocoa production areas in Vietnam

	Buon Ma Thuot	**Binh Phuoc**	**Ben Tre**	**Binh Dinh**	**Rain Forest Cocoa**
Rainy season	6 months (Apr - Oct)	6 months (Apr - Oct)	5 months (May - Oct)	4 months (Aug – Dec)	> 10 months
Ave. temperature (ºC)	23.8	26	27	27	18 - 32
Min. temperature (ºC)	17.5	17.5	21.9	22.8	> 15
Annual rainfall (mm)	1840	2500	1560	1700	1500 - 2000
Wind velocity (m/s)	2.8 - 8.0	1.5 - 3	2.2 - 2.4	2.0 – 3.4	< 3 m/s
Altitude (meter above sea level masl))	450 - 800	150-300	2	2 - 300	< 800

Source: Khi Hau Viet Nam

7.2 Physical and Climatic Characteristics of Cocoa producing Regions in Viet Nam

181. Currently, cocoa is cultivated in 3 main regions, namely the Mekong River Delta (including Ben Tre, Tien Giang, Vinh Long), the South-East (including Binh Phuoc, Dong Nai, Ba Ria-Vung Tau), and the Central Highlands (including Dak Lak, Dak Nong, Lam Dong). The main physical and climatic characteristics of the three regions are summarized below.

182. **Elevation**. In the Mekong River Delta, the elevation is less than 1 masl (masl) and the region is affected by the tides. The Ba Ria – Vung Tau and Dong Nai areas consist mainly of undulating to rolling land and have an elevation of around 100 to 500 masl. The elevation in Binh Phuoc varies between 100 and 700 masl while in Dak Nong and Dak Lak the elevation varies between 200 and 800 masl.

183. **Geology**. The geology of the MRD (Ben Tre and Tien Giang areas) consists of estuarine deposits of the Mekong River. These deposits occur as a coastal plain and have a high water table or occur as swamps. These areas are good for paddy rice. For fruit trees, these areas practice the ditch-dike system to facilitate the quick drainage and moving far from the water table.

184. The geology of the South East consists of olivine basalts and older granites. The granites occur on the more rugged and dissected terrain. The basalts occur on level to undulating terrain and sometimes interbedded with alluvium.

185. The geology of the Highlands consists of mostly quaternary basalts that are very rich in mineral nutrition and good in soil structure.

186. **Temperature**. Data from **Table 24** show that the mean of temperature in cocoa planted area ranges from 23 – 28 ºC.

187. **Rainfall**. The total rainfall varies from place to place. The rainfall is low (1300 – 1500 mm) in the Mekong River Delta and high in the Central Highlands and South East. In Dak Nong and Bao Loc, Lam Dong, total rainfall can reach as high as 3000 – 3500 mm. It is estimated that 70 to 90% of the total rainfall in these areas are in the 5-6 months of the rainy season. Although rainfall is low, the soil moisture in Mekong Delta is rather high as compared with other areas (Highland and SE region) due to the high water table.

188. **Wind velocity**. It is high in the Highland during the dry season (8m/s).

189. On the basis of this information, the two main factors in Viet Nam differing from the original habitat of cocoa in the rainy forest are wind velocity and dry spell. Cocoa can only be planted successfully when these factors are overcome.

190. Regarding the dry spell, the shorter the more suitable for cocoa. Dry spell is one month longer in the Mekong River Delta as compared with the two other cocoa production areas, namely the Central Highlands and the South East. In some districts the duration of dry spell varies. For example, in Bu Dang district of Binh Phuoc province; in Bao Loc, Bao Lam and Di Linh districts of Lam Dong province; in Dak Lap district of Dak Nong; and in M'Drak district of Dak Lak province the duration of dry spell is 1-2 month shorter than in other districts. Rainfall in these areas is also higher and concentrated in few months, which creates a more favorable environment for the emergence of the disease phytophthora.

191. Regarding wind velocity, the strong wind in Dak Lak in the dry season is quite unsuitable for cocoa. Cocoa grows well when wind velocity is lower than 3 m/s. In Dak Lak wind can reach a velocity of up to 8 m/s. Cocoa planted in this area develops well during the

first two years after planting. During this period, high density temporary shading is effective in providing a wind break. The shade trees however either die or are removed in the second year. Once temporary shading is removed wind velocity is high in the cocoa farm. Cocoa leaves which have big leaf plate and long petiole, are easily damaged by continuous and strong wind. Wind increases in strength when some leaves fall down and the negative effect becomes worse. Once branches without leaves are exposed to sunlight they get sun scorches and this leads to the susceptibility of many deathly diseases.

192. Strong wind also blows flowers away and therefore reduces pollination. However, The Central Highlands is well known for perennial crops such as rubber, coffee, and black pepper due to its excellent soil type, basaltic red soil, and availability of land. Cocoa can only be planted successfully in this area if wind can be controlled effectively and with appropriate cultural practices matching with this specific climate. Where wind can be controlled, cocoa enjoys this type of soil and is very productive. So far, highest yield of cocoa is recorded in this area in cocoa garden surrounded by rubber plantation.

193. In the Mekong River Delta, although dry spells are longer, they do not seem to create too many problems. The ditch dike system in the region can effectively bring water from the river system to every corner of the farm and causes high relative humidity in the micro climate of the cocoa garden. Furthermore, the sea tide generates high soil moisture which has the advantage of a longer interval between two consecutive irrigation and thus results in lower cost of irrigation. This advantage has to be weighted by the risk of salinity.

194. Advantages and disadvantages of different regions for cocoa cultivation are summarized in Table 25.

Table 25 Advantages and Disadvantages of Different Regions for Cocoa Cultivation

Region	Advantages	Disadvantages
Central Highlands	• Good soil • Land availability	• Water sources are limited • Wind velocity especially in the Central Highlands. • Heavy and continuous rain in the rainy season (September). This leads to heavy soil erosion and black pod disease.
Southeast	• Good soil • Land availability	• Water sources are limited • Heavy and continuous rain in the rainy season (September). This leads to heavy soil erosion and black pod disease. • High density of mixcrop (Ba Ria Vung Tau)
Mekong River Delta	• Existing system favorable to cocoa (shade is available) • Soil moisture • Water sources • Low wind velocity	• Small planting area • Acid sulphate soil • Salinity affected by sea tide during dry season • High density of mixcrop: Lacking sufficient sunlight, high relative humidity this leads to high diseases
South Central Coast	• Long dry season: less pests and diseases	• Long dry season: less water for plant development • Water resource • Small planting area • Strong wind • Poor soil

Source: Study Team

7.3 Cocoa Farming Systems[18]

195. Compared to the original habitat of cocoa, nowhere in Vietnam would be suitable for this crop. For planting successfully this plant, manipulations should be done in each agroecosystem. The factors that should be managed in each region are as follows:

196. Mekong River Delta:

- Soil acidity: cultural practices (drainage, organic fertilizer, keeping high water table), applying chemical (lime, rock phosphate)
- Salinity: Building damp, resistant varieties

197. Central Highlands and Southeast:

- Wind: Establishing wind break
- Soil erosion: Planting in terrace/contour; hedge of soil erosion control
- Water: Improving technique of irrigation, building water reservoir, integrated practices in water management.
- Uneven rainfall distribution (too heavy in sometime): pruning, resistant varieties, drainage, management shade tree

198. South Central Coast

- Sandy soil: Apply compost, organic manure
- Frequent flood and typhoon: control soil erosion, establish thick wind break

199. Cocoa cultivation in Vietnam is generally on small size farms raging from about 0 .4 to 1.5 ha. Typically these areas consist of mixed farms consisting of fruit trees such as longan, cocoa nut, durians, cashew nut, black pepper, or other trees such as Hopea and cinnamon. Cocoa is introduced into these mixed farms.

200. Many combinations have been tested. So far, the system cocoa – coconut has good result. Coconut has tall stand therefore relative humidity in coconut farm is lower thus reduce the incidence of disease for cocoa. Cocoa can survive well with the heavy root system of coconut in the competition for soil nutrients. When coconuts is intercropped with cocoa, soil moisture increases due to irrigation and also due to the mulch caused by cocoa residues (leaves, branches pruned during the cultural management).

201. In the Central Highlands, the common system is monoculture. In terms of growth and development, so far this system is good for rubber, coffee, and black pepper but it not yet clear if it is good in the case of cocoa. Cocoa in mixed farms such as in Ba Ria Vung Tau or in the Mekong River Delta may lessen the effect of strong wind. However, similar systems in the Central Highlands are not yet available. In cocoa farms with good wind break, the growth is good but due to low input of fertilizers and limited water the productivity is also low.

[18] Agroforestry farming systems are just starting to be implemented through models (see Annex I)

Box 1 South Central Coast - An unsuccessful attempt to introduce cocoa in the wrong area

In 1997, a cocoa processing factory was built in Quang Ngai in the South Central Coast. The factory stimulated interest in cultivating cocoa, since it allowed a market for the product. The rationale at the time for building the factory was to help this poor province by introducing a crop that would raise the livelihood of smallholders. Demonstration plots, introduction of new clones, and extension activities all were carried out. Unfortunately, all these efforts did not give good impact during that time for various reasons. The unfertile sandy soil, strong wind, long dry season, frequent typhoon and flood during rainy season imply and environment in the South Central Coast not favorable to agriculture in general and especially for cocoa.

Table 26 Cocoa Farming Systems in Viet Nam

Farming System	Locations	Characteristics	Advantages	Disadvantages	Comments
Monoculture	Dak Lak, Dak Nong	1000 trees/ha	Easy to take care the farm. Farmers are more professional in planting cocoa. and to plan the activities	High water requirement. Risky with the fluctuation of prices High pressure of pest and diseases. High wind velocity	
Intercropped Cocoa-coconut	Ben Tre Tien Giang, Vinh Long	600 cocoa trees + 150 coconut trees	Easy to be established. Productivity of coconut may increase. Good interaction between two crops leading to better microenvironment (high water holding capacity, improvement soil fertility, reducing soil erosion)	Low productivity. Difficult to take care Damaged when coconut frond/nut fall down	This system is just confined in Mekong Delta where sea water has not intruded
Intercropped: Cocoa-cashews	Binh Phuoc, Lam Dong, Dong Nai, Binh Thuan	600 – 800 cocoa tree +100 cashew	Easy to be established. No competition with existing crop. Good interaction between two crops leading to better microenvironment (high water holding capacity, improvement soil fertility, reducing	Productivity of cashew may reduce due to lowering normal density. High incidence of Pink disease in both cocoa and cashew. Difficulty in taking care and harvesting cashew. Growth of	Further observation is needed

Farming System	Locations	Characteristics	Advantages	Disadvantages	Comments
			soil erosion	cashew may be affected by cocoa (can not be explained so far)	
Intercropped: Home garden	Baria-Vung Tau Ben Tre, Tien Giang	500-700 cocoa tree + other crops (pepper, cashew, coffee, durian, cinnamon)	Diversifying in crop, income, cash flow.	Difficulty in taking care High relative humidity leading to high incidence of diseases.	

7.4 Agronomic Constraints to Cocoa Expansion

202. Some of the main agronomic constraints to cocoa expansion are:

1. **Soil and fertilizer**: Cocoa adapts well in different types of soil in Vietnam. Soil types in cocoa areas include sandy, loamy, and basaltic soils. However, even when growing on good soil, cocoa needs extra mineral nutrition. The right formulas in each specific soil at different growing stages are not yet available. No research has been conducted on this issue. Research should take into consideration many factors such as soil types, history of the specific farm, method of application of fertilizers, different types of inorganic fertilizers, cultural management, expected production, etc.

   Serious research on these issues will take time and require human and financial resources.

   Currently, recommendations on fertilizer use are general and growers base their decision on these general recommendations and adjust by observing the performance of cocoa trees in their individual farms.

   The general recommendations are based on the two different stages of cocoa: establishment stage and production stage. For the first stage complex formula high in nitrogen such as 16-16-8 or 20-20-10 are recommended with the rate 200 gram/plant/year and 400 gram/plant/year in the first and second year, respectively, after planting. For the latter stage complex fertilizer high in potassium such as 12-12-17; 18-40-30 are recommended with and application rate ranging from 600 to 1000 gram/plant/year. Higher applications up to 1800 gram/plant/year have been observed in monoculture system in the central Highland (Dak Min District of Dak Nong province) with excellent outcomes in terms of productivity (over 3 kg/plant).

   The dose, the amount, and the application are all important factors in the yield response to fertilizer and research is only starting to understand the complexities of these different factors in the case of cocoa in Viet Nam.

2. **Wate**r: Due to long dry spell, water is always main constraint not only for cocoa but other crops in the country. Water effect heavily on yield and quality of the cocoa bean. Short of water leads to small bean thus low quality and yield. Currently, irrigation for cocoa is often based on practices developed for coffee or on the experience/feeling of farmers.

   Current practices include:

   i. Using underground water by digging shallow well. Water is pumped out via rubber hoses. This is the most common practice in most of crops. Normally farmers irrigate more water than necessary. It has been documented that water table in the highland goes down fast in the last few year[19].
   ii. Sprinkler system. It is practiced in state run companies; it is a good and efficient system but the high investment makes it more appropriate for plantations than for small farms. The investment cost can reach $ 70 000 to $100 000 per set. It can also be stolen easily when established in farms that are far from shelters.
   iii. Quantity. The habit for coffee is to use 200 – 800 cubic meter/ha/at a time, three or four times during the dry season in the Central Highlands and 10 to 15 times during the dry season in Dong Nai and BRVT. This volume is too big thus wasted. Simple but effective techniques to improve water use efficiency such as mulching are not currently used by farmers. Drip irrigation is practiced in some demonstrations with good results. However, with the cost of 25 – 30 VND million/ha the system is still costly for most smallholder farmers. Some modification of this technique has been done to reduce the cost but it has not been transferred in large scale to farmers.

   Cocoa is rather resistant to drought. In the same area during the dry season, coffee can be seen leaf wilting symptom by drought while cocoa can survive. Furthermore, the main crop of cocoa is from October to January. This means that the fruit setting and pod development happen during the rainy season in the Summer. Therefore, once cocoa is established, water is just for the survival during dry season, thus less water than for other crops such as coffee is needed.

   However, for maximizing yield potential and quality, water is essential. Data collected from buying stations showed that bean count of the batches in May, June and July is rather high as compared with previous months. Those beans (of smaller size) come from pods that develop during the dry months from November – May of. This is the driest spell of dry season and affects negatively the bean size and thus quality and yield.

Table 27 Bean count at Ba Ria – Vung Tau, Crop Season 2006 - 2007

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JULY
Bea count (number of beans per 100 grams)	102	98	97	100	102	106.8	115

Source: Cargill

[19] Documented by Support to Water resources Management Project, Danida, in Dak Lak. 2000)

3. **Planting material**: Vietnam has some advantages in the beginning by introducing elite planting materials from well cocoa developed countries. A good cocoa germplasm bank was established with 150 clones of different types of Forastero and Trinitarios carrying good traits. Among these clones, a dozen of commercial clones adapt well in Vietnam and give high yield. All these commercial clones come from Malaysia, where there is no dry season and low rainfall (2000 mm) distributed evenly all year round.

   Although the imported clones are good in terms of yield, they also have problems. These clones do not seem to adapt well under heavy rain conditions. This is maybe the main reason explaining the high incidence of black pod when trees become older. Furthermore, these clones are known to be high in acid after fermentation, as confirmed by feedback from Cargill, Mitsubishi, and Mars Incorporated. Recent research on fermentation carried out within a collaboration project between Meiji and NLU showed that fermented beans of commercial clones are very high in acetic acid as compared with the ones in Ghana. Many efforts have been done to reduce the acidity by modifying current fermentation protocol. However, quality of cocoa is the result of 4 main factors namely: fermentation, varieties, environment and pests and diseases. The main cocoa varieties in Ghana are of the Amelonado type of the Forastero group while cocoa clones in Vietnam belong to the Trinitario group.

   In the NLU cocoa germplasm, there are few Amelonado types and these are not the best ones. However, those Amelonado clones have been used as treatments in clonal trial conducted by NLU to find out their yield and adaptation. Breeding program is always long term research, and have to go through many steps, therefore it will take some time before concluding the performance of the new clones.

   To solve the problem of black pod, the case of Papua New Guinea should be studied. During 1960s the cocoa industry of this high rainfall (>3000mm) country was heavily attacked by Phytophthora. Effort in breeding research concentrated to find resistant varieties. As a consequence, nowadays Papua New Guinea has many clones that are resistant to black pod. Collaboration of Viet Nam with PNG to develop cocoa resistant clones should be considered.

   Apart from finding solutions to the problem of continuous and heavy rains during the rainy season, another problem that needs research is adaption to the long dry spell of the dry season. India has already conducted some research to find clones that adapt to this condition.

   For the sustainability of the cocoa industry, Viet Nam should continue to introduce more cocoa genetic materials, especially those from Africa and Latin America which are well known for quality, from Papua New Guinea for resistance to black pod, and from India for drought tolerance. At the same time, Vietnam should have its own specific varieties that adapt well in each specific local agroecosystem, as well as specific quality. This can only be done via a well planned and long term cocoa breeding project by using genetic material imported. Such project will need adequate

human resources with high scientific standards, appropriate facilities, and stable financial support.

4. **Pests and diseases**[20]: Given that cocoa has only been recently developed, there are still few pests and diseases in Viet Nam as compared with other countries. However these will come sooner or later when cocoa expand further and trees become older. Currently, Helopeltis and Phytophthora are two main pests and cause serious loss in some places. The dangerous VSD disease is already present and it will be difficult and very costly to control in the future. It has been predicted that sooner or later, cocoa pod borer will also appear in Vietnam. To control this pest, production cost has increased 30% in Malaysia and is currently the main cause of reduction in production and quality in the last 2 year in Indonesia. Although Vietnam has adopted successfully some results from well developed cocoa producing countries, more remains to be done. One major constraint is the lack of more qualified human resources having expertise on cocoa research and extension.

7.5 Risk factors associated to expansion of cocoa in Viet Nam

Table 28 Risks associated to Expansion of Cocoa in Viet Nam

Risk Description	Assessment of Risk (low, medium, high)	Options to mitigate the risk
Cocoa Pod Borer: The most destructive pest in Asia. It will come from nearby countries or possible from rambutan	High	Strictly quarantine regulation
Vascular Streak Die Back: It is costly to control this disease. It can become severe during rainy season.	Medium	Using resistant clones, cocoa best practice
Low yield. Cocoa best practices at production phrase are not followed. Yield can be low thus not cost effective as compared with other crops such as rubber and coffee.	Low	Applied research, technology transfer, extension programs, and demonstrations
Strong wind in the highland.	Medium	Build windbreak
Planting materials: Nurseries produce clones not recommended. Low quality of the seedlings. Inappropriate ratio of cocoa clones.	Medium	Control system, technolology transfer
Shortage of water during dry season. For high yield, cocoa must be irrigated during dry season.	Medium	Improved water use efficiency; irrigation systems; water conservation.

Source: Study Team

[20] For a more in depth review of pests and diseases affecting cocoa in Viet Nam see section F.

7.6 Conclusions

203. Referring to climatic and physical conditions, no place in Vietnam is perfectly suitable for cocoa. Cocoa can only be planted if some of the climatic and physical factors could be manipulated and appropriate cultural practices adopted in each specific area.

204. Currently, cocoa develops well in Mekong River Delta. Fertile soil, availability of water, low wind, and availability of shade trees are advantages to develop cocoa in this region. However, the invasion of salinity during dry season, availability of fresh water, and limited land availability are the main constraints for the development of cocoa in large scale in this region.

205. In the Southeast region, the absence of strong wind and land availability are favorable factors. However, an undulating topography and water shortage are the main constraints for developing cocoa in this region. The system cocoa – cashew is this area is still under observation. There are still unresolved questions regarding pink disease, helopeltis, and interaction between cocoa and cashew growth interaction. If water availability and management could be improved, and the cocoa-cashew intercropping system could be further developed, this may be the best place to develop cocoa effectively in large scale.

206. In the Central Highlands, fertile soils and large land areas are available, but wind must be managed before planting cocoa. Water use is also another important constraint. Observations so far show that more pests and diseases have higher incidence in this region compared with other regions. Helopeltis, black pod, and algal rust are three main pests and diseases in this region. Currently, over 1000 ha of cocoa were planted in this region and most of them are in monoculture system. This is a potential area to develop cocoa. However, to exploit this potential, considerable research is needed.

207. Cocoa agroforestry models are being established (see Annex I) in Lam Dong and Binh Phuoc provinces. If successful, they could be replicated in a number of degraded forest areas in the Central Highlands and Southeast (Dong Nai and Binh Phuoc).

8 FEASIBILITY

8.1 Introduction

208. The previous chapter has shown that cocoa production is suitable in a variety of agroecological conditions in Viet Nam and under different farming systems. Farmers have already engaged in cultivation of about 10,000 ha and productive area is increasing as trees enter their productive stage.

209. In order to address the issue of feasibility, we have to build upon the agroecological suitability of cocoa and examine the questions of (i) whether the cost of production of cocoa under different models of production is attractive economically to farmers; (ii) whether cocoa is competitive with other crops that farmers have to option of cultivating; (iii) whether cocoa production in Viet Nam can be competitive internationally; and (iv) what social and institutional factors constrain the feasibility of expansion of cocoa production in Viet Nam.

8.2 Models of Cost of Production for Cocoa

210. Based on good practices and agroecological environments of Viet Nam, two models of cocoa production costs have been proposed by the Study Team: (i) the cocoa-coconut farming system, mostly prevalent in the MRD (including Ben Tre and Tien Giang); and (ii) the monoculture farming system, mostly prevalent in the Central Highlands.

211. For the intercropping model cocoa-cashews, it is still too early to make a clear assessment. Cocoa-cashews is cultivated in a number of environments but trees have hardly reached any productive stage that would allow evidence-based analysis to build a cost of production model.

8.2.1 Cost of Production in the Cocoa-Coconut Farming System

212. The model is based on a farm size of 1 ha, with intercropped cocoa and coconut including 600 trees of cocoa trees in a coconut farm with a density of 100 coconut trees. The relatively low density of trees ensures that both cocoa and coconut trees grow well and, with the application of good farming practices, productivity can be high.

213. **Material costs**. For cocoa these include fertilizers (both chemical and organic) and soil treatments (eg. lime), fungicides and pesticides, electricity for irrigation water. For coconut, the only material costs are fertilizers.

214. **Fertilizer** good practices include 200, 400, and 600 grams/tree of NPK 16-16-8 during year 1, 2, and 3 respectively. Starting year 4, the fertilizer formula changes to NPK 16-16-26 at a rate of 0.9 and 1.5 kg/tree in years 5 and 6 onwards, respectively. Lime should

also be applied at a rate of 0.5kg/tree for the first year and 0.2kg/tree from year 2 onward. Manure should always be applied to maintain organic matter of the soil at a rate of 10kg/tree in the first year and 5kg/tree from year 2 onwards.

215. **Fungicide and pesticides**. So far, pest is not a problem in this system due to the existence of natural enemies especially the cocoa black ant and weaver ant. Microenvironment of coconut so far is still environmentally sound due to no application of pesticides. This good situation can be maintained in the system cocoa-coconut if farmers raise the black ant. On the other hand, diseases can be more and more severe when cocoa grows up with thicker canopy and branches resulting in high relative humidity that are favorable to the development of cocoa black pod. Furthermore, the accumulation of cocoa plant residues from pruning will increase soil moisture that is favorable to the infection and development of stem cancer and other crop. IPM should be practiced to control diseases. Fungicides such as Metalaxyl, cuprous oxide, phosphonate potassium and Fosetyl-Al can be used in case of high disease pressure.

216. **Labor costs**. For cocoa, these include hole-digging and planting (at establishment of farms), applying fertilizers and plant treatments, irrigation, pruning and weeding, harvesting, fermentation and drying. For coconut, these include applying fertilizers and harvesting.

217. **Infrastructure and equipment**. These include fermentation boxes, tools, sprayer, and pump. For a farm producing 1.8 tonnes of dry beans per ha, three fermentation boxes, each of capacity of 100 kg should be bought (from year 3 onwards), and is assumed that 18 fermentation batches, each of 100 kg will be processed by the farmer during the year.

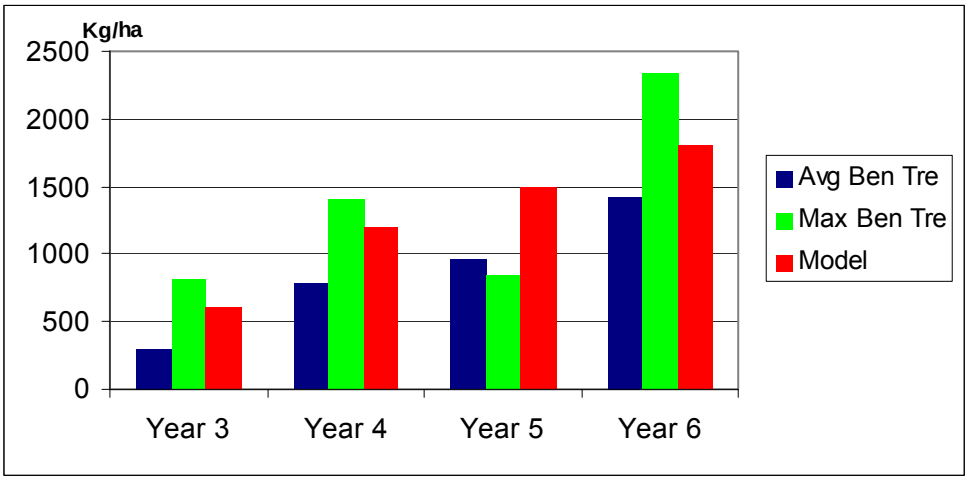
218. **Yields**. Yields of cocoa are assumed to increase from year 3 (1 kg/tree) gradually up to year 6 when they will reach a steady state of 3 kg beans/tree. Yields of coconut are assumed to be 80 nuts per tree.

219. The growth assumptions are consistent with the potential observed in the field data. Even though the growth assumptions are above what observed on average in the sample, they are below the potential observed in the field. For Ben Tre (Table 29) the model assumptions show that yields that are below the maximum yields observed in years 2-4 and year 6. The growth assumption for year 5 is above what observed among respondents, presumably because these farms have not followed good practices and show an anomalous behavior (lower yield than in year 4). The point of the comparison is to show that assumed yield growth is not only possible, but realistic, provided that good farming practices are followed.

Table 29 Comparison between model yield growth assumption and observed data

	Unit	Year 2	Year 3	Year 4	Year 5	Year 6
Average sample	Kg beans/ha	63	230	506	798	927
Average Ben Tre	Kg beans/ha		302	783	958	1423
Max sample	Kg beans/ha	248	1458	1240	1983	2066
Max Ben Tre	Kg beans/ha		810	1402	841	2336
Model Assumption	Kg beans/ha		600	1200	1500	1800

Source: ACI FAR and COP Survey, July 2008



Source: ACI FAR and COP Survey, July 2008

Figure 19 Observed Yields in Intercropping of Cocoa with Coconuts

220. Taking year 6 as a reference year, the revenues for cocoa and coconut are 72 and 43.7 VND million, respectively (Table 30), adding up to a total revenue of 96 VND million for the system. Taking into account of costs of production, the total income adds up to a total of 62.4 VND million, comprising of 45 VND million for cocoa and 17.4 VND million for coconut. If household labor is used, as it is likely to happen in most smallholder farming systems, the total income will be augmented by an additional 7 VND million to reach a value of almost 70 VND million (69.4 VND million). Given that the total labor use in the farm is 146 days (of which 84 days for cocoa and 62 for coconut), the total labor productivity of the system is 475,401 VND/person day, about 8 times the prevailing labor wage. At a price of beans of 40,000 VND/kg, the cost of production of cocoa beans is 14,983 VND/kg, which represents 37% of price.

Table 30 Cost of production indicators for cocoa at year 6 in Cocoa-Coconut System

Indicator	Unit	Value
Material cost cocoa	VND mil	23.1
Labor cost cocoa	VND mil	3.9
Total cost cocoa	VND mil	27.0
Labor use cocoa	Person days/ha	84
Labor use coconut	Person days/ha	62
Labor use total	Person days/ha	146
Material cost coconut	VND mil	3.6
Labor cost coconut	VND mil	3.1
Total cost coconut	VND mil	6.7
Material cost total	VND mil	26.6
Labor cost total	VND mil	7.0
Total cost	VND mil	33.6
Pods production	kg	
Bean production	kg	1800
Total beans equivalent	kg	1800
Total revenue cocoa	VND mil	72.0
Total revenue coconut	VND mil	24.0
Total revenue	VND mil	96.0
Total income cocoa	VND mil	45.0
Total income coconut	VND mil	17.4
Total income	VND mil	62.4
Cost per kg of beans	VND	14983
Unit price per kg of beans	VND	40000
Cost of beans as % of price	%	37%
Total income including labor	VND mil	69.4
Labor productivity	VND/person day	475,401

Source: Study Team based on ACI FAR and COP Survey, July 2008 and Field Visits.

221. Analysis of profitability of cocoa production implies the consideration of the flows of revenues and expenses over time, from initial investment in establishing the cocoa farm to infrastructure and equipment to production costs including both material costs and labor costs. The analysis is done taking constant prices and considering good practices. The analysis is reported for a period of 10 years. By year 6 it is assumed that production is at steady state and flows of expenses and revenues are also at a steady state.

222. Indicators of profitability reported in Table 31 include the internal rate of return (IRR), the Net Present Value (NPV) discounted at a rate of 12% (this is a discount rate in real terms), the total investment over the first 6 years of investment, the breakeven point (the first year when accumulated net cash flows are positive), and labor use/ha.

223. The emerging picture is of a farming system with considerable economic appeal. The IRR for cocoa is high at 62% and the net present value is about 112 VND million. The initial investment is repaid within the first 4 years, and labor use is moderate and allows the household (with a hypothetical 1 ha of land) to pursue other activities during the year. When including coconut in the picture, the total IRR increases to 133% with a net present value of

almost 192 VND million. More important, the breakeven point is reduced to 2 years for the system as a whole. The initial investment for cocoa up to its breakeven point is 62 VND million and for the cocoa-coconut system the initial investment up to its breakeven point is 24.2 VND million. Labor use also increases up to a total of 146 days/ha.

Table 31 Summary Profitability Analysis of Cocoa-Coconut System

Indicator	Unit	Value
IRR cocoa	%	62%
IRR coconut	%	
IRR total	%	133%
NPV (12%) Cocoa	VND mil	112.03
NPV (12%) coconut	VND mil	88.99
NPV (12%) total	VND mil	191.98
Breakeven point cocoa	Year	4
Breakeven point coconut	Year	1
Breakeven point total	Year	2
Total investment for cocoa up to breakeven point	VND mil	62.03
Total investment for coconut up to breakeven point	VND mil	41.71
Total investment for cocoa-coconut up to breakeven point	VND mil	24.17
Labor/ha at year 6 cocoa	Day/ha	83.90
Labor/ha at year 6 coconut	Day/ha	62.00
Labor/ha at year 6 total	Day/ha	145.90

Source: Study Team based on ACI FAR and COP Survey, July 2008 and Field Visits.

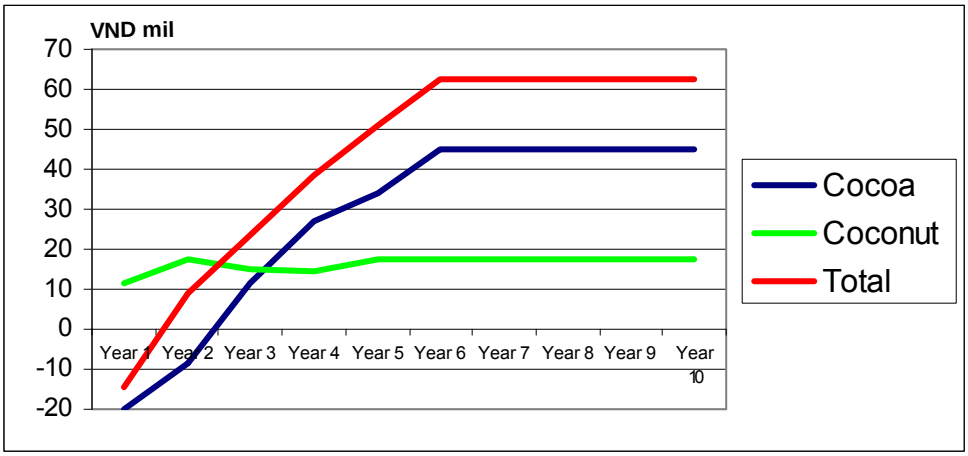


Figure 20 Gross Margins Intercropping Model

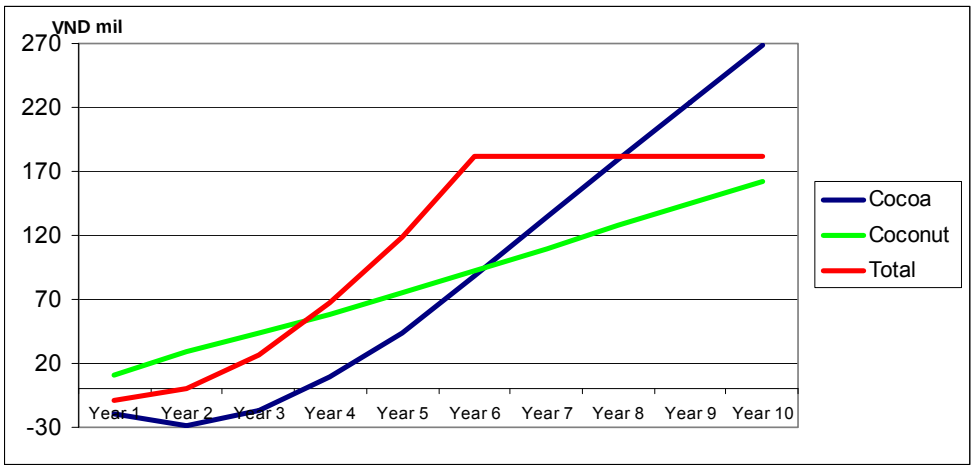


Figure 21 Accumulated Gross Margins Intercropping Model

224. Additional details for the flows over 10 years are provided in Table 32. For the cocoa investment, the analysis of cash flows shows a negative cash flows over the first 3 years, starting at -20 VND million in the first year of investment, picking in the second year at -28.4 VND million, declining in the third year as trees start to be productive, and moving towards positive cumulative cash flow in the fourth year with almost 10 VND million.

225. When considering the farming system as a whole, the flow of cash from coconut helps quite a lot to smooth the negative cash flow from cocoa during the first years of investment. In fact, the overall cash flow is negative at -8.6 VND million only the first year and becomes positive in the second year. This cash flow pattern is a distinct advantage relatively to a monoculture system since it provides less risk for cash-constrained smallholders.

226. Labor use has a maximum of 183 days during the first year and reaches a steady state value of 146 days at year 6. Regarding yields, there is no cocoa production over the first two years; in the third year yields pick up at 600 kg beans /ha and reach a steady state of 1,800 kg beans/ha by the sixth year.

Table 32 Flows over time of some indicators of profitability – Cocoa-coconut farming system

Indicator	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected revenue from cocoa			24.00	48.00	60.00	72.00	72.00	72.00	72.00	72.00
Expected revenue coconut	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Total Expected Revenue	24.00	24.00	48.00	72.00	84.00	96.00	96.00	96.00	96.00	96.00
Costs in cocoa	13.95	8.46	10.13	18.00	26.13	26.97	26.97	26.97	26.97	26.97
Costs in coconut	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65
Total costs (material + labor)	20.60	15.11	16.78	24.65	32.78	33.62	33.62	33.62	33.62	33.62
Infrastructure and equipment costs	6.00		2.50	3.00			3.00			3.00
Total costs cocoa + infrastructure and equipment	19.95	8.46	12.63	21.00	26.13	26.97	26.97	26.97	26.97	26.97
Total costs coconut + infrastructure and equipment	12.65	6.65	9.15	9.65	6.65	6.65	6.65	6.65	6.65	6.65
Total Costs + infrastructure and equipment	26.60	15.11	19.28	27.65	32.78	33.62	33.62	33.62	33.62	33.62
Gross margins from cocoa	-19.95	-8.46	11.37	27.01	33.87	45.03	45.03	45.03	45.03	45.03
Gross margins from coconut	11.35	17.35	14.85	14.35	17.35	17.35	17.35	17.35	17.35	17.35
Gross margins total	-14.60	8.89	23.72	38.36	51.22	62.38	62.38	62.38	62.38	62.38
Cumulative sum of gross margins cocoa	-19.95	-28.41	-17.03	9.97	43.85	88.88	133.91	178.94	223.97	269.00
Cumulative sum of gross margins coconut	11.35	28.70	43.55	57.90	75.25	92.60	109.95	127.30	144.65	162.00
Cumulative sum margins total	-8.60	0.30	26.52	67.87	119.10	181.48	181.48	181.48	181.48	181.48
Labor (person days/ha) in cocoa	121	73	59	70	77	84	84	84	84	84
Labor (person days/ha) coconut	62	62	62	62	62	62	62	62	62	62
Labor (person days/ha) total	183	135	121	132	139	146	146	146	146	146
Yield in terms of dry beans in kg			600	1200	1500	1800	1800	1800	1800	1800

Source: Study Team based on ACI FAR and COP Survey, July 2008 and Field Visits.

8.2.2 Cost of Production in the Cocoa Monoculture System

227. The model is based on a farm size of 1 ha, with a density of 1100 trees of cocoa trees, permanent shade and windbreaker provided by 140 trees of Leucina Laeuca and temporary shade provided by crotolaria.

228. **Material costs**. For cocoa these include fertilizers (both chemical and organic) and soil treatments (eg. lime), fungicides and pesticides, electricity for irrigation water, and investment in temporary and permanent shade and windbreaker.

229. **Fertilizer** good practices include 200, 400, and 600 grams/tree of NPK 16-16-8 during year 1, 2, and 3 respectively. Starting year 4, the fertilizer formula changes to NPK 16-16-26 at a rate of 0.9 and 1.5 kg/tree in years 5 and 6 onwards, respectively. Lime should also be applied at a rate of 0.5kg/tree for the first year and 0.3kg/tree from year 2 onward. Manure should always be applied to maintain organic matter of the soil at a rate of 10kg/tree in the first year and 5kg/tree from year 2 onwards.

230. **Fungicide and pesticides**. More pests have been found in the monoculture system in the highlands as compared with cocoa in the Mekong Delta. Termites in the first year after planting and Helopeltis during production stage are the main pest problem in the Central Highlands. Chlorpyrifos for termite and Cypermethrin, Dimethoate are recommended to control termite and Helopeltis, respectively. However, biological control should be practiced to reduce contamination. Cocoa black pod is also a main disease in this system, especially when it rains continuously during the rainy season. IPM should be practiced to control diseases. Fungicides such as Metalaxyl, Cuprous oxide, Phosphonate potassium and Fosetyl-Al can be used in case of high disease pressure. In addition, agal rust is also main disease when monoculture practiced in the highlands due to inappropriate shade and the effect of strong wind. Cuprous oxide and broad spectrum fungicide is recommended to control this kind of disease.

231. **Labor costs**. For cocoa, these include hole-digging and planting (at establishment of farms), applying fertilizers and plant treatments, irrigation, pruning and weeding, harvesting, fermentation and drying.

232. **Infrastructure and equipment**. These include fermentation boxes, tools, sprayer (mechanical), and pump. For a farm producing 3 tonnes of dry beans per ha, three fermentation boxes, each of capacity of 100 kg should be bought (from year 3 onwards), and is assumed that 30 fermentation batches, each of 100 kg will be processed by the farmer during the year.

233. **Yields**. Yields of cocoa are assumed to increase from year 3 (1 kg/tree) gradually up to year 6 when they will reach a steady state of 3 kg beans/tree.

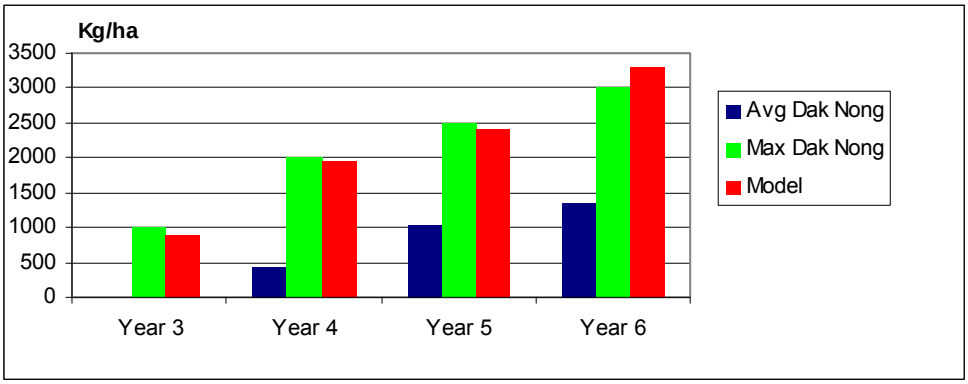
234. The growth assumptions are above with the averages from field observations. Even though the growth assumptions are above what observed on average in the sample, they are

below the potential observed in the field. For Dak Nong (**Table 33**) the model assumptions show that yields are very close to good farmer yields observed in the field (see Box 8 in Annex B.21). It should be remarked that on average farming systems in the Central Highlands (both in Dak Lak and Dak Nong) are usually poorly managed, partly as the result of little knowledge of good cultural practices (for example little use of fertilizer) and partly as the result of poor seedlings that were distributed before the commercially approved clones were released. This is partly the result of limited technological transfer occurred in the Central Highlands in the cocoa sector. The only major program of technological transfer was initiated by the Success Alliance in Dak Lak in 2007 (in Lak and Eakar districts) and activities are planned in 2009 to start in 2009.

Table 33 Comparison between model yield growth assumption and observed data

	Unit	Year 2	Year 3	Year 4	Year 5	Year 6
Average sample	Kg beans/ha	63	230	506	798	927
Average Dak Nong	Kg beans/ha		0	428	1039	1360
Max sample	Kg beans/ha	248	1458	1240	1983	2066
Max Dak Nong	Kg beans/ha		1000	2000	2500	3000*
Model Assumption	Kg beans/ha		880	1960	2420	3300

*Note *: Maximum yield in Dak Nong is based on observations conducted by the Study Team during October 2008 and estimated production for year 2008/09.*



Source: Study Team field survey

Figure 22 Yield Comparison between Monoculture Model and Field Observations in Dak Nong

235. Taking year 6 as a reference year, the revenues for cocoa adds up to a total of 132 VND million (Table 34). Taking into account of costs of production, the total income amounts to 84.4 VND million. If household labor is used, as it is likely to happen in most smallholder farming systems, the total income will be augmented by an additional 7.1 VND million to reach a value of 91.5 VND million. Given that the total labor use in the farm is 118 days, the total labor productivity of the system is 776,284 VND/day, about 13 times the prevailing

labor wage of 60,000 VND/day. At a price of beans of 40,000 VND/kg, the cost of production of cocoa beans is 14,447 VND/kg, which represents 36% of price.

Table 34 Cost of production indicators for cocoa at year 6 in Cocoa Monoculture System

Indicator	Unit	Value
Material cost cocoa	VND mil	40.5
Labor cost cocoa	VND mil	7.1
Total cost cocoa	VND mil	47.6
Labor use cocoa	days	118
Pods production	kg	
Bean production	kg	3300
Total beans equivalent	kg	3300
Total revenue cocoa	VND mil	132.0
Total income cocoa	VND mil	84.4
Total income including labor	VND mil	91.5
Labor productivity	VND/day	776,284
Cost per kg of beans	VND	14417
Unit price per kg of beans	VND	40000
Cost of beans as % of price	%	36%

Source: Study Team based on ACI FAR and COP Survey, July 2008 and Field Visits.

236. Analysis of profitability of cocoa production implies the consideration of the flows of revenues and expenses over time, from initial investment in establishing the cocoa farm to infrastructure and equipment to production costs including both material costs and labor costs. The analysis is done taking constant prices and considering good practices. The analysis is reported for a period of 10 years. By year 6 it is assumed that production is at steady state and flows of expenses and revenues are also at a steady state.

237. Indicators of profitability reported in Table 31 include the internal rate of return (IRR), the Net Present Value (NPV) discounted at a rate of 12% (this is a discount rate in real terms), the total investment over the first 6 years of investment, the breakeven point (the first year when accumulated net cash flows are positive), and labor use/ha.

238. The emerging picture is of a farming system with considerable economic appeal (Table 35). The IRR for cocoa is high at 57%, and the net present value is about 194.4 VND million. The initial investment is repaid within the first 4 years and amounts to 90.5 VND million; labor use is moderate and allows the household (with a hypothetical 1 ha of land) to pursue other activities during the year.

Table 35 Summary Profitability Analysis of Cocoa Monoculture System

Indicator	Unit	Value
IRR Cocoa		57%
NPV (12%) Cocoa	Million VND	194.38
Breakeven point cocoa	year	4
Total investment up to breakeven point	Million VND	90.51
Labor/ha at year 6 cocoa	person days/ha	117.86

Source: Study Team based on ACI FAR and COP Survey, July 2008 and Field Visits.

239. Additional details for the flows over 10 years are provided in Table 36. For the cocoa investment, the analysis of cash flows shows a negative cash flows over the first 3 years, starting at -38.6 VND million in the first year of investment, picking up in the second year at -52.4 VND million, declining in the third year as trees start to be productive, and moving towards positive cumulative cash flow in the fourth year with almost 6.4 VND million.

240. Labor use has a maximum of 136 days during the first year and reaches a steady state value of 1118 days at year 6. Regarding yields, there is no cocoa production over the first two years; in the third year yields pick up at 880 kg beans /ha and reach a steady state of 3,300 kg beans/ha by the sixth year.

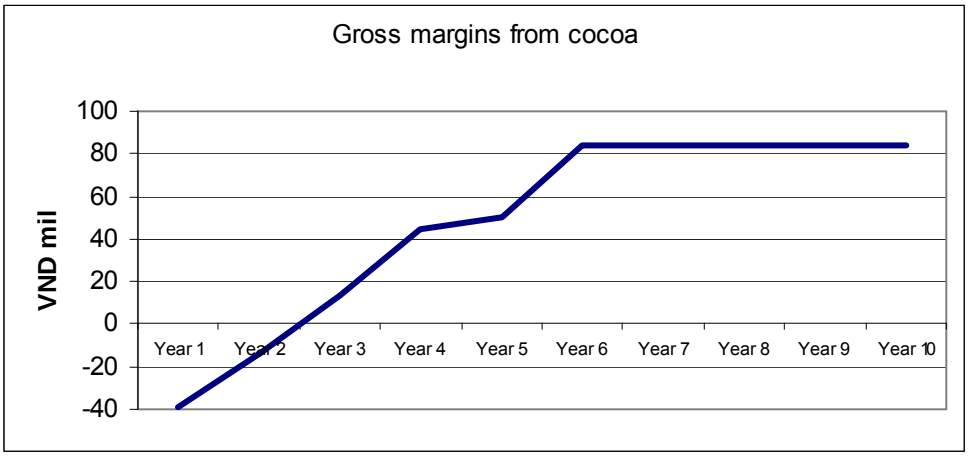


Figure 23 Gross Margins Monoculture Model

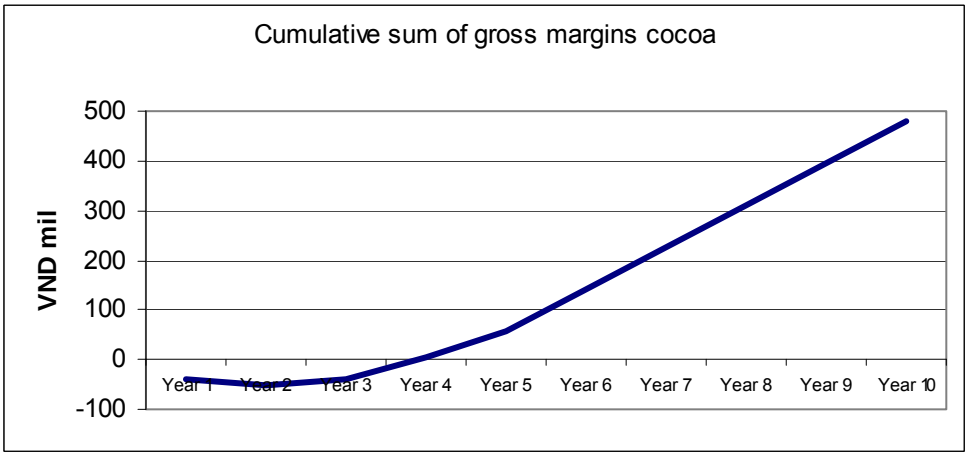


Figure 24 Accumulated Gross Margins Monoculture Model

Table 36 Flows over time of some indicators of profitability – Cocoa Monoculture farming system

Indicator	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue from Cocoa			35.2	79.2	96.8	132	132	132	132	132
Costs in Cocoa	28.13	13.73	18.70	31.46	46.17	47.58	47.58	47.58	47.58	47.58
Infrastructure and equipment costs	10.5		2.5	3						
Total Costs Cocoa + Infrastructure and Equipment	38.63	13.73	21.20	34.46	46.17	47.58	47.58	47.58	47.58	47.58
Gross margins from cocoa	-38.63	-13.73	14.00	44.74	50.63	84.42	84.42	84.42	84.42	84.42
Cumulative sum of gross margins cocoa	-38.63	-52.36	-38.36	6.38	57.01	141.44	225.86	310.28	394.71	479.13
Labor (person days/ha) in cocoa	136.00	30.00	49.02	84.29	99.87	117.86	117.86	117.86	117.86	117.86
Yield in terms of dry beans in kg			880	1980	2420	3300	3300	3300	3300	3300

Source: Study Team based on ACI FAR and COP Survey, July 2008 and Field Visits.

8.3 Sensitivity Analysis

8.3.1 Cocoa-Intercropping

241. For moderate changes (between -20% to 20%) in the prices of output, labor, and fertilizer, cocoa profitability indicators in the models are quite robust as indicated in the following table.

Table 37 Sensitivity of Intercropping Model to changes in price of output, fertilizer and labor

	Percentage change in the price of output				
	-20%	**-10%**	**0%**	**10%**	**20%**
IRR cocoa	46%	55%	62%	69%	75%
IRR total	117%	125%	133%	140%	147%
NPV (12%) Cocoa	66.25	89.14	112.03	134.92	157.81
NPV (12%) coconut	88.99	88.99	88.99	88.99	88.99
NPV (12%) total	146.20	169.09	191.98	214.87	237.76
	Percentage change in the price of fertilizer				
	-20%	**-10%**	**0%**	**10%**	**20%**
IRR cocoa	67%	65%	62%	60%	57%
IRR total	149%	141%	133%	125%	118%
NPV (12%) Cocoa	124.70	118.37	112.03	105.70	99.36
NPV (12%) coconut	93.00	90.99	88.99	86.98	84.98
NPV (12%) total	208.66	200.32	191.98	183.64	175.29
	Percentage change in the price of labor				
	-20%	**-10%**	**0%**	**10%**	**20%**
IRR cocoa	66%	64%	62%	60%	59%
IRR total	151%	141%	133%	125%	118%
NPV (12%) Cocoa	116.28	114.16	112.03	109.91	107.78
NPV (12%) coconut	92.49	90.74	88.99	87.24	85.49
NPV (12%) total	199.73	195.85	191.98	188.10	184.23

242. For changes in yield of greater magnitudes, the changes in profitability indicators are also greater. Comparing the model assumptions (under current good practices) with average practices (yield lower by 30%) and poor practices (yield lower by 50%), the outcome is reported in the following tables. Under poor practice (yield per tree at 0.9 kg/tree at year 6), cocoa is not profitable (negative present value of the cocoa investment). Under average practice, the profitability is still attractive for smallholders, but obviously less than in the case of good practices.

Table 38 Sensitivity of Intercropping Model to Yield Growth Assumption

Indicator	Unit	Good practice (3 kg/tree)	Average practice (yield lower by 30%)	Poor practice (yield lower by 50%)
Yield at year 6	Tonnes/ha	1.8	1.26	0.9
IRR Cocoa	%	62%	37%	10%
IRR Total (cocoa+coconut)	%	133%	107%	86%
NPV (12%) Cocoa	Million VND	112.0	43.4	(2.4)
NPV(12%) Total (cocoa+coconut)		192.0	123.3	77.5
Breakeven point cocoa	year	4	5	8
Breakeven point Total (cocoa+coconut)	year	2	2	2

Note: negative numbers in parenthesis

8.3.2 Cocoa-Monoculture

243. For moderate changes (between -20% to 20%) in the prices of output, labor, and fertilizer, cocoa profitability indicators in the models are quite robust as indicated in the following table.

Table 39 Sensitivity of Monoculture Model to changes in price of output, fertilizer and labor

	Percentage change in the price of output				
	-20%	**-10%**	**0%**	**10%**	**20%**
IRR cocoa	43%	50%	57%	63%	69%
NPV (12%) Cocoa	114.31	154.34	194.38	234.41	274.44
	Percentage change in the price of fertilizer				
	-20%	**-10%**	**0%**	**10%**	**20%**
IRR cocoa	62%	59%	57%	55%	52%
NPV (12%) Cocoa	217.42	205.90	194.38	182.86	171.33
	Percentage change in the price of labor				
	-20%	**-10%**	**0%**	**10%**	**20%**
IRR cocoa	59%	58%	57%	56%	55%
NPV (12%) Cocoa	200.67	197.53	194.38	191.23	188.08

244. For changes in yield of greater magnitudes, the changes in profitability indicators are also greater. Comparing the model assumptions (under current good practices) with average practices (yield lower by 30%) and poor practices (yield lower by 50%), the outcome is reported in the following tables. Under poor practice (yield per tree at 0.9 kg/tree at year 6), cocoa is not profitable (negative present value of the cocoa investment). Under average practice, the profitability is still attractive for smallholders, but obviously less than in the case of good practices.

Table 40 Sensitivity of Monoculture Model to Yield Growth Assumption

Indicator	Unit	Good practice	Average practice (yield lower by 30%)	Poor practice (yield lower by 50%)
Yield at year 6	Tonnes/ha	3.3	2.31	1.65
IRR Cocoa	%	57%	43%	10%
NPV (12%) Cocoa	Million VND	194.4	114.3	(5.8)
Breakeven point cocoa	year	4	5	8

Note: negative numbers in parenthesis

8.4 Competitiveness of Cocoa Relatively to Alternative Crops

245. A number of crops have bee indicated by farmers as being alternatives to cocoa. These crops include export crops such as coffee, rubber, cashews, and peeper; and fruit crops such as durian, longan, pomelo, mango, and coconut. Details about the profitability analysis of these alternative crops are provided in Annex H. The comparison of cocoa relative to the alternative crops is facilitated by the following Table 41.

Table 41 Profitability Analysis of Alternative Crops

	IRR (%)	10-year NPV @12% (VND million)	Breakeven point (year)	Total investment up to breakeven point (VND million)	Labor/ha at full production (person days/ha)
Alternative Crops					
Coffee	38%	100.2	5	188.1	258
Rubber	31%	140.8	6	244.5	391
Cashew	31%	17.9	7	41.9	64
Pepper	85%	219.9	4	109.7	129
Durian	58%	280.5	7	137.7	255
Pomelo	34%	79.8	6	134.0	170
Longan	31%	30.4	4	70.0	175
Mango (hoa loc)	127%	430.5	3	101.4	132
Coconut	41%	26.7	6	15.9	53
Cocoa Farming Systems					
Cocoa monoculture	57%	194.38	4	108.0	117.86
Cocoa – coconut intercropping	133%	192.0	2	41.7	146

Source: Analysis by the Study Team based on data from the ACI Field Survey, July 2008

246. Compared cocoa to other crops, the profitability indicators show the following:

1. The IRR and NPV for cocoa different farming systems fare quite well in comparison to alternative crops. This is particularly the case of the cocoa-coconut intercropping system.
2. In terms of breakeven point, cocoa can take between 2 and 4 years to pay off the initial investment; again, this is well within the range of alternative crops; the intercropping system outperforms other crops.
3. In terms of initial investment, cocoa monoculture is in the higher range, whereas cocoa intercropping is in the lower range.
4. In terms of labor requirements, cocoa is less demanding than coffee, rubber, durian, pomelo, longan, and mango, but more demanding than cashew and coconut.

247. The latter advantage of cocoa makes it suitable to be undertaken with other activities of the household (either farm or non-farm). Moreover, given that the labor requirements are smoothed over time (eg absence of a concentrated harvest season) they put less stress on hiring labor.

248. The labor requirement advantage of cocoa is a factor that might have an important bearing on the sustainability issue. As labor becomes more expensive in Viet Nam, and as an increasing number of rural workers move to non-farm activities and urban areas, the availability and cost of labor will become a major constraint for sustaining agriculture.

249. The presence of an increasingly dense market for cocoa beans makes it also convenient for the household who can receive almost daily payments for its beans during the long harvest season (2-3 months around the time of each major crop), therefore easing its short-term finance needs.

250. In addition to the previous observations, one could further comment that:
1. Cocoa is adaptable to a broader range of agroclimatic conditions than other alternative crops such as coffee and cashew;
2. Cocoa has a large world market with a relatively stable demand growth driven by the mature world chocolate industry;
3. Cocoa is a storable commodity, therefore less susceptible to the large price fluctuations of fresh fruit and perishable commodities; it does not require expensive cold chains to go through the supply chain; and
4. Cocoa has a good record of improving environmental indicators and biodiversity.

251. The main conclusion from an economic feasibility point of view is that cocoa is an attractive crop for several households in Viet Nam. The analysis shows that the crop could provide good financial returns under different farming systems, does not require the high labor investment as some alternative crops, and could be relatively stable source of income for smallholders.

252. Even though it might be too early to draw definite conclusions given the relative youth of the sector and the limited sample size of the surveys conducted, the previous observations indicate a positive assessment of the economic feasibility of cocoa for smallholders in Viet Nam.

8.5 Analysis of Domestic Resource Cost

253. The Domestic Resource Cost (DRC) is an indicator of comparative advantage, measuring the ratio of value added from domestic, non-traded activities to the foreign exchange earned or saved from domestic production (Sadoulet and de Janvry, 1995). The numerator of the measure is the sum of value added from domestic activities valued at market or shadow prices, while the denominator is the difference of the border price less value added from tradable inputs. A DRC with a value greater than 1 implies that production is inefficient and that foreign exchange would be better saved by importing the product rather than producing the product domestically, while a DRC less than 1 suggests comparative advantage and efficiency in production (Tsakok, 1990).

254. In the case of cocoa in Viet Nam, the DRC calculations are reported in Table 42. The calculations show a DRC value of 0.4 implying comparative advantage of production of cocoa in Viet Nam.

Table 42 Indicator of Comparative Advantage of Cocoa in Viet Nam (DRC)

Indicator	Unit	Value
Tradables		
Fertilizer	VND million/ha	33.2
Pesticides and Agrochemicals	VND million/ha	3.0
Electricity	VND million/ha	1.2
Internal Logistics (fuels and equipment)	VND million/ha	0.8
Transport to Amsterdam per ton ($70/tonne)	VND million/tonne	1.2
Total Production	Tonnes	3.3
Total Tradables	**VND million/tonne**	**12.7**
Non Tradables		
Labor	VND million/ha	7.1
Manure	VND million/ha	2.8
Lime	VND million/ha	0.3
Internal logistics (labor)	VND million/ha	0.8
Total non tradables	**VND million/tonne**	**3.3**
Price in Amsterdam ($2,200/tonne)	VND million/tonne	36.3
Tradables/(Price AMS-Non Tradables)	**DRC**	**0.4**

8.6 Institutional Feasibility

255. The feasibility of cocoa production in Viet Nam depends on several institutional factors including: (i) an effective research and extension system; (2) a quality assurance system for both planting material and output; (3) capacity of stakeholders in the value chain (nurseries, farmers, processors, and traders) and service providers; (4) access to finance for smallholder farmers, particularly the poor

ones; and (5) a consistent strategy and policy framework that is translated into plans, investments, programs, and actions.

256. Without adequate and sustained investment in research and extension, the transfer of technology to smallholder farmers that will allow them to achieve the yield improvements necessary for cocoa to be profitable and competitive will not occur. Public funding in research and extension system for cocoa in the past has been low and inconsistent with the ambitious targets for production.

257. Quality assurance of both inputs and outputs will assure that productivity increases could be achieved and additional value added is gained through the production of quality cocoa beans and access to high-value world markets for cocoa beans. Currently, quality assurance systems are not yet in place, even though there is awareness among stakeholders and policy makers that the systems need to be established.

258. Capacity of stakeholders is growing but is still limited. Training, capacity building, and learning through both formal and informal processes are necessary for accelerating the process of productivity improvement.

259. Even though cocoa intercropping is not demanding in terms of investment capital, it is still outside of the affordability of a large number of smallholders, particularly the poor ones. Cocoa monoculture is much more demanding in terms of initial investment and will require access to medium-term finance for expanding on a large scale.

260. Most important, there is a lack of a comprehensive, clear, and consistent strategy and policy framework that will enable to translate targets into plans, programs, regulations, and investment to promote the development of the sector.

9 SUSTAINABILITY

9.1 Introduction

261. The previous chapters have shown that cocoa is suitable to various agroecological and farming systems in Viet Nam and can be economically viable and attractive to smallholder farmers. The remaining set of questions relates to the sustainability of the sector. In order to address the sustainability issue, three dimensions – environmental, economic, and social – are considered in the following sections.

9.2 Cocoa Agroforestry Models in Viet Nam

262. In Vietnam, only a few cocoa agroforestry systems were recently established for demonstration purpose. For most farmers, cocoa agroforesty is still a very new concept. During the field work in the present Study conducted between 14-23 July 2008 the following sites were visited:

1. Sustainable Cocoa Agro-forestry System in Binh Phuoc province (SCAS);
2. Community – Sustainable Agro-forestry System in Lam Dong province (C-SCAS);
3. Household forest area managed by Community Conservation Unit in Lam Dong province (HFA); and
4. Private enterprise Cocoa Agro-forestry system in Dong Nai province (CAFS).

263. More detailed information about each model is reported in Annex I.

264. Although being different in approach, the main objective of these models is to use cocoa as a tool for improving quality of livelihoods of poor farmers as well as of degraded forest land (adjunct to protected areas). Besides, cocoa helps to maintain existing forest canopy and minimize impacts of cocoa production towards biodiversity conservation. All of the models are either newly established or have not yet reached the harvesting time. Therefore that makes it too soon to assess their sustainability, feasibility as well as their application in Vietnam.

265. Preliminary observations show that, except for Nghia Trung model, cocoa grows well under forest canopy and proper shading. Survival rates of cocoa are relatively high after one year. In comparison with intercropping models with fruit and long term industrial crops, cocoa requires at least the same amount of fertilizers. Termite is a common disease found in these models but the damage will not be considerable if pesticide is to be sprayed on time.

266. One marked difference between cocoa agro-forestry cultivation and other models is land clearance techniques and garden cleaning. Labor works spent for those activities, especially for secondary forests, are higher and garden maintenance

condition is also more difficult since nutrition competition between root systems of reproductive forest trees and cocoa is obviously unavoidable.

267. Except for HFA where humidity in the forest is relatively high thanks to the forest status, water for cocoa in dry season is a crucial factor. Cocoa seedlings and small trees are not strong enough to survive drought. It is suggested that agro-forest cocoa as well as other cocoa models should have good accessibility to water sources. Water demand of cocoa will be further discussed in another part of this report.

268. Furthermore, farmers should be trained well in fire prevention and protection methods especially for the dry season where a big volume of fallen leaves from cocoa and other trees become dry and flammable.

269. In Binh Phuoc and in central highland provinces such as Dak Lak, Dak Nong and Lam Dong, there are a number of private companies submitting proposal to local government to rent degraded production forests for reforestation and forest enrichment. One of the options is to introduce cocoa on these lands. However feasibility of these project proposals as well as suitability of cocoa should be thoroughly assessed in order to avoid deforestation before any decision is made. Sound policy for forest protection and management should be applied for cocoa production in agro-forests. The following table shows a preliminary assessment and comparison of investment and possible impacts of cocoa agro-forests in Vietnam.

Table 43 Investment and possible impacts of different cocoa agro-forests in Vietnam

Models	Investment								Possible impacts				
	Labor for Land clearance	Shading trees	Win-break trees	Water	Labor for garden cleaning	Fertilizer	Pesticides	Labor in garden maintenance	Forest protection	Biodiversity conservation	Improvement of degraded forests	Reforestation	Improvement of soil quality
SCAS	***	***	***	***	**	***	**	***	-	-	**	**	**
C-SCAS	***	-	-	**	***	**	**	**	***	**	***	*	**
HFA	**	-	-	-	**	**	**	***	***	**	***	*	**
CAFS	*	-	-	*	*	**	**	**	***	-	-	-	**

Note: * - low; ** - medium; *** - high

270. The first lessons learnt from those sites could be briefly summarized as follows:

1. The area and vertical structure of cocoa agro-forestry system need to be chosen in such a way that they help in achieving partial forest ecological services;
2. Shading and wind break trees should be established at least 1 year before cocoa planting for newly established plot; alternatively one could use fast growing legume *Crotalaria sp.* and artificial shade in the first 3 months;

3. Appropriate degree of shade should be applied to cocoa gardens at different stage;
4. Accessibility to water source during dry season is a must and cocoa needs to be watered during dry season;
5. Land clearance methodology should not give negative effects to the growth of cocoa root system;
6. Appropriate garden cleaning and planting methods should be applied to minimize the competition of forest trees' roots toward cocoa trees;
7. Application of soil erosion prevention methods such as contours or planting ground – level vegetations should be used, especially for hill-side gardens;
8. Garden visits should be regularly taken to early identify pest and diseases attacking cocoa trees especially in the basic construction period;
9. Sound policy on forest protection and management should be developed and applied for cocoa agro – forests, including planning and zoning area for such a system;
10. Ex-ante economic feasibility of the project should be assessed before the starting of the project in order to evaluate the economic sustainability;
11. Ex-ante evaluation of replicability should be assessed before the starting of the project in order to know the extent to which the model could be replicated, if successful; and
12. Farmers should be equipped with basic knowledge on cocoa production and technically supported by authorized bodies; moreover, their awareness of biodiversity conservation and forest protection should be raised.

9.3 Preliminary Analysis of Sustainability Issues Related to Cocoa in Viet Nam

271. The Vietnamese cocoa sector is still in its infancy with the total production area of about 10,000 hectares concentrating mostly in the Southern provinces. Cocoa is planted by small household farmers on different cultivation models dividing into two main categories: monoculture and intercropping (with short –term agricultural crops, fruit trees, cashew, coffee, and forest trees). When produced in a sustainable manner, cocoa could bring positive impacts toward biodiversity and environment. This is also in tune with the Vietnamese national strategy on sustainable cocoa development, which states efforts should be taken to ensure that sound policies and good management practices are applied to achieve the sustainability in three pillars: economic, environmental, and social.

272. Activities under the environmental pillar are important as cocoa grows in suitable natural areas (rainfall, climatic conditions, soil fertility and nutrients are maintained and improved upon). Cocoa growing areas can, under proper cultivation practices, maintain a high level of biodiversity. Cocoa growing should, as a minimum standard, not cause damage to the environment. The biodiversity in cocoa producing countries and soil nutrients in cocoa growing areas should be preserved and conservation efforts must be taken to ensure that the right balance between environment and cocoa cultivation is maintained.

273. There could be opportunities to explore the potential for carbon offsets in producing countries. Carbon is also absorbed by cocoa trees and by the cover of forest shade trees[21].

274. The environmental sustainability in cocoa production would involve efforts in terms of enhancing environmental sustainability in cocoa bean production. This would comprise activities to engage farmers in the use of "best known practices" in cocoa farming, including:

1. **Encouragement of shade cocoa.** In the world, shade cocoa proves to have more positive impacts to the environment than the full sun system. Although full sun cocoa yield as much as three times that of shaded cocoa, however the full sun cocoa gardens must be completely renovated much sooner (at 10-20 years versus 40-60 years) than a shaded ones (Beer 1987, Ruf and Zadi 1998). They also require agrochemical inputs and constant management to realize maximum yield potential. The productive lifespan is approximately 20 years under full sun; however cocoa may be able to live up to 60 years under mild shade and regime of fertilizers and pesticides[22]. Full-sun cocoa is more susceptible to pest and diseases outbreak.

   In most of cocoa producing provinces namely Ben Tre, Ba Ria Vung Tau, Tien Giang, etc. cocoa is mainly intercropped with short and long term fruit and industrial trees, creating multi-strata inter-planting systems on existing agriculture lands. This practice does not make cocoa compete with other crops in term of land fund and help to maximize utilization of existing lands and increase production of existing crops. Shade system, especially agroforesty, will also minimize the impacts of cocoa production on biodiversity.

   Even though monoculture is often associated with full-sun system, it is possible to practice monoculture under a partially shade system, as in the proposed model in chapter 8.2.2, where 1,100 cocoa trees are "intercropped" with 140 permanent shade trees of Leucina Laeuca. The system is already in place in the trial plots of WASI and in the monoculture systems at Krong Ana Company and Thang 10 company in Dak Lak.

2. **Encouragement of smallholder production.** In Vietnam, smallholder production offers more potential than large scale monoculture plantations for a sustainable, long-term cocoa industry. Small-scale producers can use family labor to support their production. Furthermore, with small-scale production, maintenance of cocoa garden is often better and more thorough compared to large scale production.

3. **Increase efficient use of inputs (fertilizers, pesticides, etc).** When cocoa price increases, a number of producers tend to increase quantity of agro-chemicals on their gardens with the aim to gain higher production. During

[21] Given estimates of NPV=$549/ha in Annex J.3, and using the plan of the Government to have 80,000 ha, this would yield almost $40 million in CER

[22] From a strictly economic point of view, it might be more efficient to replace a high productivity plantation every 20 years than keep a low-productivity plantation for a long time.

periods of low price, many producers tend to reduce their applications of fungicides and pesticides. These practices lead to large crop losses. But also low-level reduced spraying can lead to increased resistance over time. In short, increases efficiency of agrochemicals does not mean sporadically using them, but maximizing their yield response while minimizing their negative impact on the environment.

Vietnamese cocoa farmers find ways to reduce the use of agrochemical by using compost from husk and organic fertilizer (cow manure). This practice should be encouraged. Besides, there should be a way to manage spraying systems by using a list of approved chemicals (excluding ones that are banned in the consuming countries) and ranking the approved chemicals according to their overall toxicity, that also help to reduce the use of the most toxic substances.

There are also a number of biological controls in various stages of development that appear to reduce the need to use agrochemical inputs, i.e. non-pathogenic fungi can be applied to cocoa to reduce the levels of infective spores of disease-causing fungi. Finally the use of natural enemy species for biological control of insect pests should be encouraged, i.e. black ant (*Dolichoderus thoracicus*) can minimizes damages caused by *Helopeltis, Cheatanococcus hispidus and Phytophthora palmivora; yellow ant (Oecophylla Smaragdina*[23]*)* might be used to control some kinds of pests harmful to cocoa trees.

There is evidence that the black ant (dolichoderus thoracicus) can control at least some species of Helopeltis (experience in Lonsum plantations in Indonesia) and by the PRIMA project. Mealybugs (cheatanococcus hispidus) does not cause any harm in farms in Asia but on the other hand, are necessary to attract and maintain colonies of dolichoderus. Mealybugs are an issue for Cocoa Swoollen Shoot Virus which is present in West Africa only.

4. **Use of best possible planting materials.** Quality planting material is a key element to decide sustainability of cocoa production in Vietnam. Surveys taken in many cocoa gardens in Vietnam show that unproved clones and hybrid seedlings, especially the ones without knowing original, produce low yield and have low capacity of pest and disease resistance. Approved clones (TD 1, TD2, TD3, TD5, TD6, TD8, TD10 and TD14) provide higher production and can assure a longer production lifetime of cocoa trees. The cocoa farmers are always recommended to use approved clones distributed from certified nurseries. Studies on finding new cocoa varieties appropriate for Vietnamese natural conditions should be further carried out by relevant research organizations.

5. **Planting and application of land clearance and garden cleaning methods that minimize impacts of cocoa production towards environment and biodiversity conservation.** The application of appropriate land clearance and garden cleaning methods for different cultivation systems is another aspect of

[23] The performance of oecophylla smaragdina is not based on scientific data.

environment sustainability in cocoa production. Vegetation and layers of fallen leaves on ground have functions of preventing soil erosion, providing humus and nutrition as well as improving soil quality. They also help to prevent water evaporation and keep humidity for soil in cocoa garden during dry season.

Cocoa agro-forest generally requires only single, partial clearance of forest which is better for soil health and allows longer term of cropping cycles. Slash-and-burn, a traditional land clearance method applied by farmers in many rural areas, causes not only deforestation and soil erosion and degradation, but also prevents vegetation regeneration in cocoa plots while giving negative impact to environment and biodiversity conservation.

Inappropriate usage of weed cutting machine in agro-forest systems and herbicides in cocoa gardens could also lead to killing regenerated forest tree seedlings and might cause pollution to surface water.

For cocoa cultivated in central highland or south-eastern provinces with higher slope and rainfalls, in order to prevent soil erosion, cocoa is suggested to be planted on contour in combination with water drainage systems and Vetiver *(Vetiveria zizanioides and Vetiveria nemoralis)* fences.

6. **Action to prevent and manage the spread of cocoa pests and pathogens.** There are more than twenty diseases and pest commonly found in cocoa gardens in Vietnam, such as *Helopeltis spp., Zeuzera sp., Adoretus spp, Hypotactus, Endoclita hosei, Termite,* Phytophthora *palmivora, Corticium salmoncolor, Algal rust,* etc (see Annex F). Apart from spraying pesticide and fungicides and in order to early discover and prevent those diseases and pests, cocoa gardens should be regularly visited. Integrated pest management and action should be taken to prevent and manage the spread of cocoa pests and pathogens. Beside, programs should be developed to reduce the losses from pests and diseases at the national and regional level.

7. **Diversification of the (agricultural) activities of cocoa farmers.** Cocoa intercropping systems need to be further recommended as it is in line with the crop diversification orientation of Vietnam. Cocoa interplanted with short and long term fruits and industrial trees can diversify and increase income of the farmers in one cultivation land area, improve their livelihoods as well as buffer the impacts of low cocoa prices.

   Followings are the shade systems typical for provinces, where cocoa are intercropped with

   - coconut as temporary and permanent shade (Ben Tre)
   - cashew (Binh Phuoc and Lam Dong)
   - banana as temporary shade and *gliricidia sp.* as permanent shade (Long An and DakLak)
   - fruit crops such as longan, durian, rambutan, mango etc. (Can Tho, Ben Tre, Ba Ria Vung Tau, and Dong Nai)

- with *crotalaria* as temporary shade plants and *gliricidia sp.* as permanent shade trees (DakLak, Gia Lai and Lam Dong)
- with forestry trees in degraded forest land (Lam Dong and Dong Nai)
- with maize as temporary shade and fruit crops as permanent shade (DakLak and Dong Nai)

In addition to income from other crops, the use of shade systems could be profitable if paid environmental services under CDM programs are established (see Annex J.3).

8. **Application of sound policies in land use for cocoa production area to prevent deforestation.** Cocoa production could result in deforestation in the world. Some estimates indicate that cocoa production is probably responsible for loss of some 8 million hectares of tropical forest (Hardber et al. 1999), even though perhaps up to 50% of cocoa farms still have some level of forest trees on their farms. In Vietnam, as above mentioned, cocoa agro-forest models are at the experimental stage, but seem to bring positive impacts to the environment in terms of improving degraded forest and maintaining existing forest canopy. There should need a governmental policy that regulates requirements for cocoa agro-forest systems to be developed and expanded in order to prevent deforestation in a wide range especially on the degraded forest lands that were or are going to be allocated to poor farmers. Forest management policies on protection forest and special used ones should be strictly applied.

275. The environmental sustainability of cocoa processing and manufacturing would include activities to improve or introduce of methods of transport, processing and manufacturing systems that inflict minimum damage on the environment. Activities would include securing the application of best-known practices of fumigation in warehouses and on ships; the use of cleaner and more energy-efficient ways of transport; minimization of noise and emissions etc. All these activities have to take due account of the regulatory framework in Vietnam and locality of operation.

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9.4 Economic Sustainability

276. Economic sustainability of cocoa production in Viet Nam depends on the capacity of the sector of improving productivity, maintaining quality and safety of its produce, and coping with fluctuations in world prices.

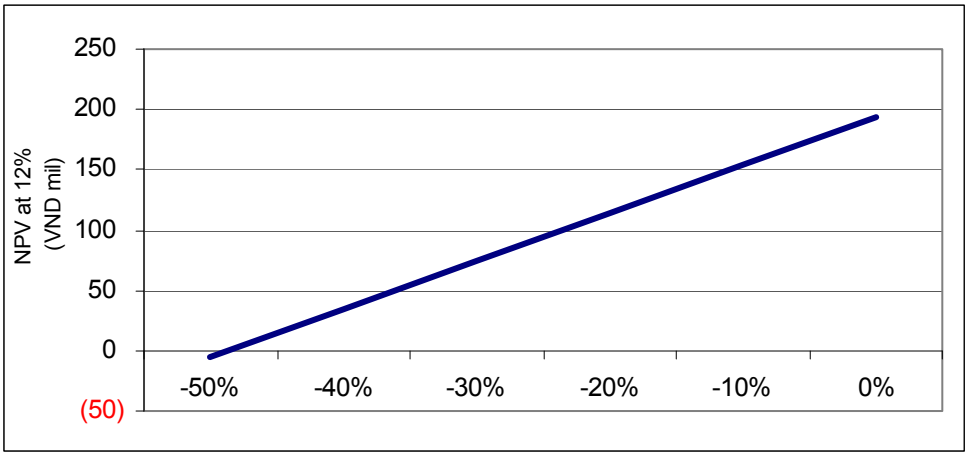
277. **Productivity increase**. Vietnamese farmers have demonstrated over time that with appropriate research, extension, and policy support they are able to increase productivity and adopt good practices. As living standards of the nation increase, the pressure on agriculture to provide higher income to farmers will also increase. Most farmers in Viet Nam will continue to cultivate small landholdings for the foreseeable future (at least up to 2020) and even though land consolidation will occur under the structural transformation of the economy, it will nevertheless proceed slowly over the period to 2020. The average cocoa farm size will be around 1 ha in the foreseeable

future and for it to be a source of adequate income, the productivity of labor, inputs, and total factor productivity will have to increase.

278. The feasibility analysis in chapter 8 has shown that with good practices there is already a good incentive for farmers to engage profitably in cocoa cultivation; however, the major issue will be to ensure that the majority of farmers (and not only the best farmers) adopt these good practices; this will require appropriate strategies, policies, and investments.

279. **Quality and safety**. Increase in total factor productivity depends not only on farming practices, but also on good postproduction practices, fermentation, and quality assurance systems. Even under the ambitious targets for the next 12 years set up by the Government (80,000 ha by 2020), and with high average productivity (1.8 tonnes/ha), Viet Nam will remain a small player in the world market, with a share of world trade of about 3%. That implies that, similarly to other small players (eg Venezuela, Ecuador) a sustainable strategy will be to position itself as a reliable supplier of quality and safe products.

280. **Coping with fluctuations in world prices**. The analysis of profitability shows that cocoa profitability is resilient to considerable variation in prices of output (see Figure 25). Under very extreme variations (more than 30%), however profitability is seriously affected and can reach negative values implying no economic incentive for the farmers to engage in cocoa cultivation. The response to fluctuations include: (i) increase productivity to ensure that margins are positive even under very low prices of cocoa; (ii) use of intercropping in order to diversify income sources from the same farm; (iii) establish long-term contract with buyers based on supply of quality cocoa beans; (iv) use of storage (and therefore access to finance) to face short-term fluctuations; and (v) use of hedging in the future markets (this being an options only for larger companies).



Note: Change in price of output are taken relatively the initial price of 40,000 VND/kg

Figure 25 Change of NPV (12%) with Change in Price of Cocoa

9.5 Social Sustainability

281. **Availability of labor**. As Viet Nam continues its rapid economic growth, it will soon (by 2010) reach the middle-income level status. Rapid economic growth implies a transformation of the economic with an increasing share of industry and services in total GDP, increasing urbanization, and a shift of the rural economy from one based mostly on agriculture to one based on non-farm activities. This will inevitably put a pressure on availability of labor for agriculture. Even though cocoa is less demanding than other crops such as coffee and rubber, the labor constraint will be increasingly binding.

282. The scope for mechanization in cocoa cultivation is rather limited and therefore will not provide a major solution to the labor constraint. More efficient use of labor and improved practices and technologies will have to compensate for the labor scarcity if cocoa cultivation has to remain viable in the long run.

283. **Effective farmer organizations** are few and largely absent both in the cocoa and other agricultural sectors in Viet Nam. Yet, the sustainable development of a smallholder cocoa sector will increasingly depend on the capacity of farmers to organize different stages of production, marketing, and postharvest activities to gain increased value added. In the absence of effective farmer organizations the capacity of increasing total factor productivity of smallholder farmers will be reduced.

284. Few farmers from **ethnic groups** are involved in cocoa. Yet there is a large potential for cocoa development in areas of the Central Highlands and Southeast (eg Binh Phuoc) where large groups of ethnic people live. Most of the ethnic people are amongst the poorest segments of society in Viet Nam and several of them rely on forestry products. Cocoa development offers the opportunity of increasing livelihood of these groups. Moreover, through agroforestry models it offers the opportunity of engaging them in activities that preserve forestry resources and increase biodiversity, and gaining paid environmental services through CDM. The challenge will be how to transfer sustainable practices to farmers who are at a disadvantage in terms of education, assets, and often isolated socially and physically. This will require additional resources and targeted programs.

10 STRATEGY

10.1 What have we learned?

285. **About suitability**. Cocoa has proved to be suitable to a variety of agroecological environments in Viet Nam[24]. Almost 20,000 farmers have been engaged in cocoa production since 2004. Intercropping systems in the Mekong River Delta and some provinces of Southeast region have proved successful. Monoculture system in the Central Highlands is practiced, but, due to a combination of poor farming practices, limited technological transfer, and poor planting materials, the system has not yet reached its potential. Intercropping with cashews is already practiced in Binh Phuoc, Lam Dong, and Dong Nai; some technical issues have still to be resolved, and research work is ongoing to address these issues. Agroforesty models are currently pursued in four sites in Binh Phuoc, Lam Dong, and Dong Nai. It is too early to assess their impact but preliminary observations suggest good growth and positive impacts on communities, the environment, and biodiversity. Areas suitable for cocoa agroforestry exist in the Central Highlands and Southeast regions.

286. **About feasibility**. Economic analysis indicates that cocoa could be an attractive crop to smallholder farmers, both in intercropping and monoculture systems[25]. Cocoa could be competitive relatively to alternative crops[26] and has the advantage of lower labor (eg relative to coffee and rubber) and water requirements (eg relative to coffee). Moreover, Viet Nam has a comparative advantage in the production of cocoa, cocoa is linked to a large and growing world market, there is unfulfilled demand from the Asian processing industry, and international buyers are interested in seeing Viet Nam as a new stable supplier of fermented beans in the world market.

287. **About sustainability**. If good practices are followed[27] cocoa could be environmentally sustainable and contribute to improvement in biodiversity. This is certainly the case for intercropping and agroforestry systems. Even in monoculture system, if models of permanent shade trees are adopted, both economic and environmental benefits could be derived[28]. Water use is lower than in competing crops and there are additional benefits to smallholder farmers from the use of Clean Development Mechanisms (CDM) that could generate carbon credit to farmers engaging in agroforestry models[29].

288. From an economic point of view, fluctuations in world prices, availability of labor, and production risks associated with major outbreaks of pests and diseases are major challenges. Current world prices are high relatively to the last 10 years trends, but are also highly variable. Labor is becoming more expensive in Viet Nam and less

[24] See section 7.2
[25] See section 8.2
[26] See section 8.4
[27] See section 9.3
[28] See section 8.2.2
[29] See Annex J.3

available for farm work, driven by the economic transformation of the country into a middle income status, the movement of labor toward non-farm activities, and the exodus towards urban areas. Lower requirements of labor in cocoa relatively to other crops is an advantage; however, rising labor costs will have to be counterbalanced by improved productivity, bigger farm size, and outsourcing of some operations to specialized companies and business service providers (eg fermentation station companies, fertilizer and pesticide spraying companies). Even though the current situation with pests and disease is not alarming, outbreaks of pests and diseases are a serious risk for which Viet Nam has to prepare now, at the period of still infancy of the sector. Research and technology transfer programmes have to be expanded considerably in order to ensure preparedness for the future.

289. From a social point of view, it was observed that child labor is not used in the sector, except for activities that could involve children outside of their school activities. Parents in Viet Nam give a very high value to education and push children to pursue higher education level. Women play an important role in cocoa. Focus group discussions indicate that cocoa is quite suitable for them, since it provides stable income and is not very demanding on their labor use. Farmer organizations are weak and yet essential for the sustainability of smallholder agriculture. Ethnic groups involvement in cocoa is still very limited in spite of a high potential of cocoa development in the areas (Central Highlands and Southeast) where large ethnic groups live, and the opportunity of involving these communities in agroforestry models that have both economic and environmental/biodiversity impact. However, the challenges of technology transfer to ethnic groups are considerable, as these groups are often at a disadvantage in terms of education, assets, and isolation from markets.

290. **About policy and institutions**. In spite of ambitious targets for the cocoa sector established by the Government for the year 2015 and 2020, there is a mismatch with actual policies, plans, and investment[30]. More fundamentally, there is not yet a clearly defined strategy for the development of the sector. This is reflected in institutional weaknesses, particularly in the pillar institutions that are indispensable for the development of the sector including a technically capable and adequately funded research system, an effective extension system, a quality assurance system for planting material and cocoa beans, a reliable statistical system, and a functioning monitoring and evaluation system.

10.2 Problem Tree Analysis

291. In order to formulate an appropriate strategy and road map for the sector, it is important to identify the core problem for the sector that needs to be addressed by the strategy. The problem tree analysis provides a tool to make this identification and provides insights into the causes and the impacts of the core problem.

292. The core problem for cocoa development in Viet Nam is the low volume of production (see Figure 27). In spite of rapid growth of the sector since 2004, the volumes are still low in relation to the potential of the sector, implying an unfulfilled

[30] See Chapter **6.**

opportunity for cocoa to improve the living standards of the rural population and the environment.

10.2.1 Causes of the core problem

293. The causes of the core problem can be understood in terms of three main factors: limited cultivated area (about 10,000 ha), low average yields (around 430 kg/ha), and the lack of a strategy for the sector.

294. **Limited cultivated area**. This factor is the outcome of three underlying reasons. First, most farmers have little knowledge or no prior experience about cocoa. Few demonstrations exist and only in those areas where either the SA has been active or the Agricultural Extension Center and research institutes have established on-farm demonstrations. Farmers are hesitant to engage in a new crop, particularly a perennial crop that involves considerable investment of their labor and financial resources. In the case of cocoa agroforestry, farmers have no prior knowledge that this system of cultivation is possible. Second, farmers often perceive that cocoa is less profitable relatively to other crops such as coffee, rubber, pepper, and some fruit trees. Lacking convincing evidence and information about profitability of cocoa, farmers will not start cultivating cocoa. Third, even when convinced that cocoa is a good investment, farmers might not have the sufficient capital or access to medium-term credit to finance the investment.

295. **Low average yield**. Low average yield in the case of cocoa is the outcome of three main reasons. First, the stock of trees is still young. Most areas currently cultivated to cocoa have been planted from 2004 onward. Trees aged 3-4 years and older are just coming to productive stage. Estimated productive area is about 10% of total cultivated area and mostly consists of trees aged 3 years or younger. It is not surprising then that average yield is still low. Indications of yield by age of trees show trees who are 6 years of age achieving average yields of 927 kg/ha. In regions that have benefitted from technology transfer projects such as the SA, average yields are reported to be much higher, reaching 1,423 kg/ha at year 6. Second, in some regions (eg Dak Lak) yields are low due to the adoption of inappropriate or poor farming practices in fertilization (eg too little fertilizer, inappropriate formulas, low frequency of application), pruning (inadequate to protect from excessive ventilation or humidity), shading (insufficient), windbreaks (to facilitate pollination), and management of pests and diseases (little knowledge about identification, protection and prevention of major pests and diseases). When yields are calculated in terms of cocoa beans/ha, poor fermentation techniques also play a role and might further contribute to reduce yields. Third, poor quality of seedlings and planting material of unidentified origin has sometimes resulted in low growth and poor pod production of cocoa trees. The absence of a nursery certification system and the lack of a quality assurance of planting materials have allowed the emergence of unqualified nurseries and the distribution of seedlings that are of poor quality.

296. **Lack of a cocoa strategy**. The lack of a cocoa strategy is the outcome of two main reasons. First, in spite of ambitious targets for the sector, the Government does not yet seem convinced about the feasibility of cocoa. As a consequence, little public investment has been allocated to research, extension, and capacity building of

institutions involved in the cocoa sector. Most of the funding to research, extension, and capacity building in the past 10 years has been made by donors and private sector through projects and partnerships agreements. For a sustained growth of the sector, public investment in public goods required for sector development is necessary and should be combined with a favorable environment to facilitate private investment. Over the recent past 10 years, little pubic investment in the cocoa sector has occurred. Second, the formulation and implementation of a strategy for the sector requires a clear vision, goals, plans, policies, and regulations that are yet largely left unformulated. The Government has made some progress in issuing regulations related to standards and has approved clones, but much more remains to be done.

10.2.2 Impacts of the core problem

297. The impact of low volume of cocoa production can be understood in terms of low aggregated employment of the sector (about 20,000 households are involved, but each household generates employment for about half a person year), low income (the total output value of the sector in 2007 was less than $ 1 million), little diversification of the rural economy, and little contribution to improving the environment and biodiversity, and no scope for the development of a significant commercial and processing industry.

10.2.3 Scenarios

298. The cocoa sector developed very rapidly from 2000 onward, moving from a negligible amount of cultivated land in 2000 to about 10,000 ha in 2008. If this explosive growth were to continue, the targets of the Government (60,000 ha in 2015 and 80,000 in 2020) could be reached well before the targeted years (Figure 26). A more conservative view, expressed in a recent study by sub-NIAPP would consider a moderate growth path, reaching about 35,000 ha in 2015 and 50,000 ha in 20,000. In the absence of strategies, policies, and investment, a decline of the sector is also conceivable. Both farmers and enterprises might become discouraged by the lack of institutional support for the sector and gradually withdraw altogether from the sector. Any of the scenarios is plausible. Government targets could be achieved and even surpassed only if a concerted action plan by government and private sector (including farmers and NGOs) partners is approved and implemented.

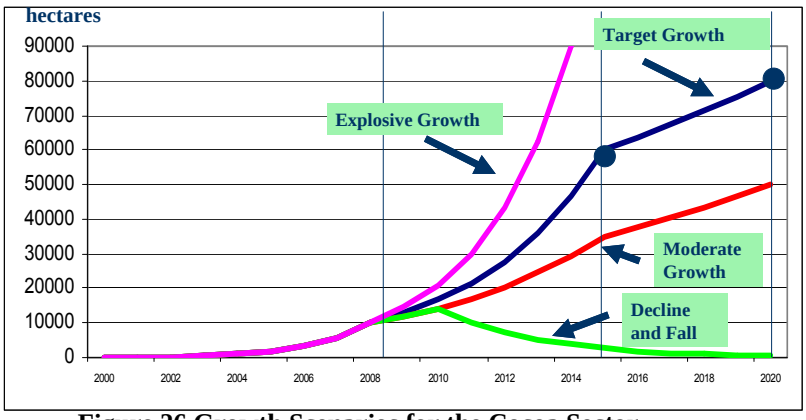


Figure 26 Growth Scenarios for the Cocoa Sector

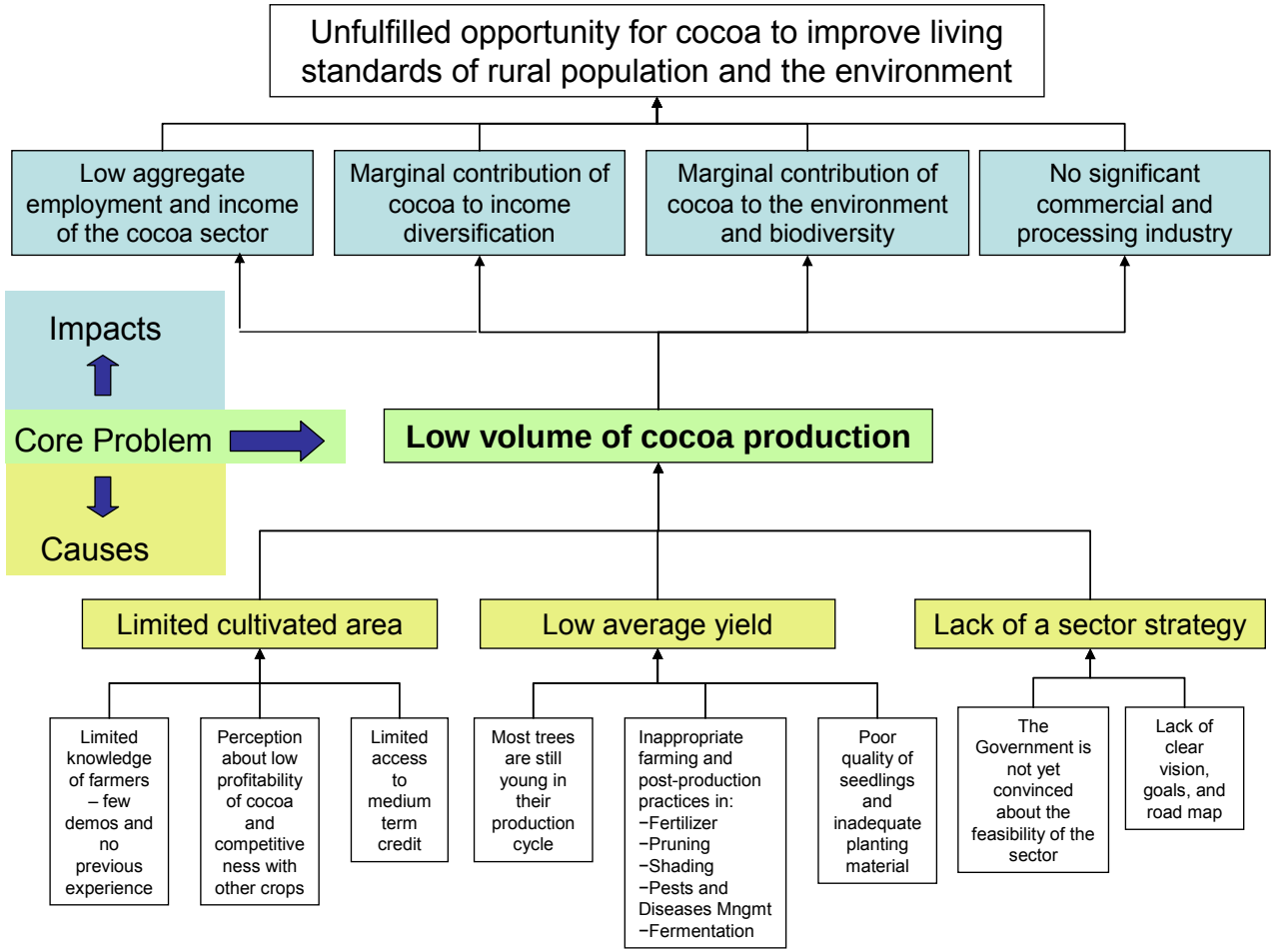


Figure 27 The Core Problem for the Development of the Cocoa Sector

10.3 Potential for Cocoa Development

299. The assessment of suitability, feasibility, and sustainability of cocoa production in Viet Nam suggests that cocoa has a considerable potential for expansion. This potential is assessed in Table 44. A preliminary assessment of potential takes into account the following:

1. The information provided by the provinces
2. The assessment of low suitability of the South Central Coast (therefore it is excluded by the assessment of potential)
3. No new agricultural land for cocoa cultivation will be used; instead cocoa will be undertaken under intercropping system (eg with coconut, cashews, etc) or in areas previously cultivated with coffee (or cashews) and have already reached the replacement point
4. Introduction of agroforestry system in degraded forest areas
5. Access to water during the dry season
6. Low sloping land
7. Suitability assessment of different agroecological areas
8. Feasibility of different farming systems
9. Environmental and biodiversity benefits

Table 44 Potential for Expansion of Cocoa Production

Region/Province	Intercropping					Mono-culture	Agro-forestry	Total
	Coconut	Cashew	Fruit	Pepper	Rubber	Coffee		
Mekong River Delta	**13,209**	**-**	**4,085**	**-**	**-**	**-**	**-**	**17,294**
Ben Tre	8,880	-	1,115	-	-	-		9,995
Tien Giang	1,989	-	1,190	-	-	-		3,179
Vinh Long	1,320	-	1,320	-	-	-		2,640
Can Tho	580	-	440	-	-	-		1,020
An Giang	440	-	20	-	-	-		460
Southeast	**-**	**22,510**	**1,515**	**1,210**	**3,560**	**1,720**	**6,000**	**36,515**
Binh Phuoc	-	17,110	275	495	2,348	520	3,000	23,748
Dong Nai	-	5,400	1,040	345	840	840	3,000	11,465
Ba Ria Vung Tau	-	-	200	370	372	360		1,302
Central Highlands	**-**	**7,695.00**	**-**	**540**	**696**	**31,070**	**5,000**	**45,001**
Dak Lak	-	4,560.00	-	225	464	17,820	1,000	24,069
Dak Nong	-	2,410.00	-	300	232	7,080	1,000	11,022
Lam Dong	-	725.00	-	15	-	6,170	3,000	9,910
Total	**13,209**	**30,205**	**5,600**	**1,750**	**4,256**	**32,790**	**11,000**	**98,810**

300. The assessment indicates a total area of 98,810 ha, distributed as follows: 17,294 ha (17.5%) in the Mekong River Delta, 36,515 ha (37%) in the North East South, and 45,001 ha (45.5%) in the Central Highlands. In terms of farming systems, the potential indicates 55,020 ha (55.7%) for intercropping, 32,290 ha (33.2%) for monoculture (under land to replaced old coffee gardens), and 11,000 ha (11.1%) for agroforestry.

301. The Mekong River Delta is highly populated, with small farms and an already mixed agriculture. Cocoa is a valuable addition in the region, but given the limited available farmland, the region will only be able to produce a moderate amount of cocoa in the future. The Central Highlands and the Southeast are the regions with highest potential for expansion of cocoa cultivated area in Viet Nam. Cocoa can grow in land with worse quality and needs less water in comparison with coffee. Suitable land for cocoa can be old and low yielding coffee land that needs to be replaced, assuming that this land has some degree of water accessibility. As currently there are about 50% of coffee gardens in Dak Lak reaching the end of production cycle and some of them cannot be replanted with new coffee due to low land quality or soil quality and crop disease, cocoa could be a feasible option for introduction in these areas. Binh Phuoc and Lam Dong have a big potential of intercropping cocoa on a large area of hill-side and near-water-source cashew gardens. Many of the cashew gardens in the provinces are on the hill-side and steadily become old and unproductive as they reach the end of their production stage. In Dong Nai, Binh Phuoc and Lam Dong current agroforestry models are pursued by both donor-funded projects and private sector (see Annex I). The agroforestry model currently pursued by a private company in Dong Nai has the potential to be replicated on thousands of ha of buffer zone of Cat Tien National Park, under land previously owned by State Forest Enterprises.

302. The potential assessment is consistent with government targets set for 2020 (80,000 ha) and is a conservative estimate when compared with the estimates by the provinces (in most cases except for Lam Dong and Dak Nong). Moreover, the assessment does not include other provinces in each region that could have potential for cocoa production (for example Gia Lai and Kom Tum are not included in the Central Highlands) due to lack of field work by the Study Team in these provinces.

303. The translation of the potential into actual cultivated area will depend on three critical factors: (i) the strategy and policies pursued by the government; (ii) the funds available for investment; and (iii) the willingness of farmers to engage into cultivation of cocoa.

10.4 Elements of a Strategy for Cocoa Development in Viet Nam

304. The analysis presented in the previous chapters suggests the key elements for the formulation of a strategy for the cocoa sector in Viet Nam. The key elements of the strategy consist of (i) a vision for the sector; (ii) goals for 2020; (iii) a road map; and (iv) an action plan for the short, medium, and long-term. In short, the strategy addresses the core problem of the sector (low volume of production) by establishing a set of policies, institutions, and plans that facilitate the fulfillment of the potential of cocoa to improve rural livelihoods while moving the sector towards a vision based on sustainable flows of benefits to smallholders and the environment.

305. The strategy proposed here will be discussed and validated by stakeholders during the National Workshop of November 6-7 and will be further elaborated during the month of November during the preparation of the Final Report.

10.5 Vision

A cocoa sector that generates a sustainable flow of economic and financial benefits to stallholder farmers; adopts good practices in production, processing, and trading; is efficient and competitive in terms of stable and quality produce; promotes biodiversity and follows environmentally friendly practices; and is supported by a well organized research, extension system, and marketing system.

306. The vision proposed here indicates what the cocoa sector in Viet Nam should aim to be. As such the vision is a guide for the elaboration of goals, road maps, and action plans. While the goals, road maps, and action plans might (and should) change over time as new information becomes available and conditions change, the vision should stay the same.

307. The vision emphasizes several key elements: economic benefits to smallholders, positive environmental and biodiversity benefits, competitiveness and efficiency, good and sustainable practices along the value chain; and effective institutions.

10.6 Goal

Viet Nam is a reliable supplier of quality cocoa beans in the world market with production of more than 100,000 tonnes by 2020.

308. The goal indicates some quantitative target for the sector as a whole. The emphasis is on reliability and quality of supply of cocoa beans from Viet Nam. The goal should be consistent with the vision for the sector and the analysis of the core problem for the sector indicated in section 10.2.

10.7 Road Map

309. In order to move toward the vision for the cocoa sector and attain the goal for 2020, a clear road map should be developed to inform government policies and investment decisions. The road map consists of five elements:

1. National Cocoa Technology Transfer Program
2. Cocoa Research Institute
3. Quality Assurance System for Planting Material
4. Viet Nam Cocoa Denomination (VICOCOA)
5. Monitoring and Evaluation System

10.7.1 National Cocoa Technology Transfer Program

310. Promotion of cocoa sector in the past 5 years has occurred mostly in the Mekong River Delta (Ben Tre and Tien Giang) and to a lesser extent in the Southeast (Ba Ria Vung Tau, Binh Phuoc, and Dong Nai) and the Central Highlands (Dak Lak, Dak Nong, and Lam Dong). Past efforts have shown that cocoa is suitable and attractive to smallholder farmers. Past efforts have to be sustained in those regions where they have proved successful and increased in those regions where they have been limited in the past. This calls for launching a new national technology transfer program that will cover the three major agroecological regions identified in the potential for the sector (Mekong River Delta, Southeast, and Central

Highlands) with a major emphasis on the Central Highlands and Southeast regions. The National Technology Transfer program will have a duration of at least 5 years and an approach to technology transfer similar to the one pursued by the Success Alliance project. The program will be implemented through the DARDs of the respective provinces, and will include training of farmers and training of trainers, demonstrations, and Farmer Field Schools. Rather than being spread among farmers in isolated locations, the program will focus on areas with agroecological potentials within each district and create a critical mass for replication and spillover effects.

311. The programs will accelerate technical transfer to smallholder farmers, promote the adoption of good and sustainable practices, and contribute to improvement in productivity of the average farmer. Its main features will be a participatory approach to extension, based on Farmer Field Schools, effective training, demonstrations, and technical assistance. Differently from traditional technology transfer programs pursued by DARD and Agricultural Extension which are based on input subsidies and often limited monitoring and training, the cocoa program should promote the sector on the basis of effective dissemination of viable technologies and sustainable practices, intensive training (see Annex K for a list of training topics carried out by the Success Alliance), and regular monitoring.

312. Even though the expansion of cocoa production is likely to occur mostly on intercropping systems, both monoculture and agroforestry systems have an important role to play in the sector development. Monoculture should be pursued under permanent shade system, rather than under full-sun, as shade system has proved to be economically viable and is likely to be more sustainable and with less negative impact on the environment and biodiversity. Cocoa agroforestry systems could be promoted on degraded forest land and be based on the lessons already learned in the implementation of ongoing models (see section 9.2)

313. The Program will include a credit component to facilitate access to medium-term finance of poor farmers wishing to engage in cocoa cultivation.

10.7.2 Cocoa Research Institute

314. Rather than continuing the current situation of limited and irregular funding to research institutes, a cocoa research programme should be established over the medium-long term (5 to 10 years) with focus on breeding, pests and diseases management, cultural practices, fermentation, and market research. The programme should be assured a continuity of funding over the medium to long term. Research in general and research on perennial crops is a time consuming effort. Breeding programs take years to be completed and demonstrations and experiments have long lags.

315. Similarly to other crops (coffee, rubber, fruit, vegetables), the research activities on cocoa should be centralized on a focal point which will host the facilities, the research activities, and technical staff. Options for the location where the Viet Nam Cocoa Research Institute could be established include WASI and NLU where cocoa research activities are already ongoing. Research centers under the institute could be established in the main cocoa producing regions, including the Central Highlands, the Southeast, and the Mekong River Delta. One alternative option is to consider the Southern Agriculture Science Institute as the host for the Viet Nam Cocoa Research Institute. In spite of not having been involved in cocoa

research so far, the institute is located at the crossing of the main cocoa production areas (the Mekong River Delta, the Southeast, and the Central Highlands) and would therefore be in a better position to transfer technology. The institute belongs to MARD, the ministry responsible for formulating and implementing policy and mobilizing investment funds in agricultural research. The institute is also adjacent to NLU which in the past and currently has taken the leadership in cocoa research in Viet Nam. The physical location in HCMC would favor research collaboration between the university and the institute, transfer of technology, and capacity building.

316. For a cocoa research programme to be effective, adequate capacity of researchers and technical staff will be required. A program of capacity strengthening of a core group of researchers should be carried out in parallel with the establishment of the research programme.

317. The envisaged Cocoa Research Institute will also have a Technology Transfer and Training Center to facilitate various initiatives by public and private sector in promoting cocoa sector in Viet Nam.

10.7.3 Quality Assurance System for Planting Material

318. Currently, the provincial authorities (DARDs) provide licenses to nurseries and issue certificates to them, but this is not equivalent to a quality assurance system that includes internal and external auditing, records keeping, and procedures to deal with critical control points (eg HACCP) and risk analysis. Several small nurseries set up operations without any control of the planting material they use and with dubious assurance about the clones they produce. If continued, this situation is a sure recipe for the dissemination of poor planting material.

319. As part of the quality assurance, a Nursery Certification system will ensure that certified nurseries[31] follow good agricultural practices and have internal control systems. The certified nurseries will be periodically audited and inspected to ensure quality of their products. A certified nursery will hold the certification status for a limited period of time and should be audited periodically and inspected occasionally. Certification of nurseries will be voluntary, but will provide farmers with a quality assurance of the seedlings they buy from certified nurseries.

320. DCP and DARD will be the agencies responsible for certifying nurseries, monitoring the nursery system, auditing certified nurseries, and inspecting all nurseries operating in the country.

[31] In addition to the requirement indicated in the Decision on Planting Material (No. 15/2004 PL-UBTVQH11) qualified nurseries should satisfy the following: (i) having budwood garden with approved clones; (ii) budwood garden must be free from main pests and difficult-to-control diseases (VSD, virus); (iii) every tree in budwood garden must be labeled; (iv) nursery should be far from cocoa production farm (>500m); (v) Clean water must be available; (vi) nursery should be covered by plastic film; (vii) potting medium should be free from pests and diseases; (viii) seedlings must be labeled; and (ix) there should be a documented quality assurance system.

10.7.4 Viet Nam Cocoa Denomination (VICOCOA)

321. Current work (in partnership with international private companies and donor-supported projects) is already ongoing to improve fermentation techniques and ensure delivery of a uniform product from all over Viet Nam. The ongoing work deals with improved techniques to ensure consistent pod storage, methods to kick start fermentation in the cooler climates of the Central Highlands during the main harvest season, and mechanization of some steps in the fermentation process. Given the relatively small quantities that individual farmers will produce, it will be a challenge to obtain good and uniform fermentation in those small quantities. Therefore, the concept of "fermentation factory system" should be promoted, as already is the practice in countries such as Brazil, Malaysia, and Papua New Guinea. Unfermented or poorly fermented beans imply a significant price discount and it will have little impact on the Viet Nam market position vis à vis an unfermented market dominated by Indonesia. Production of consistently good fermented beans will provide Viet Nam with a significant bonus in the region and globally. The Asian processing industry (eg Malaysia, Japan, and even Indonesia) are currently importing fermented beans from Africa and Latin America.

322. Monitoring and quality control system mechanisms have to be established, export documentation and certification must be truthful and legally binding, and checks must be robust to avoid mixing. This could be achieved through independent auditors, including international surveying companies as in Côte d'Ivoire, Nigeria, Malaysia, and Brazil. Good quality beans such as those from Malaysia get a premium of USD 200/tonnes over Indonesia.

323. Food safety of beans can be assured through good agronomic practices and good postharvest practices in fermentation and drying to eliminate use of agrochemical that are not compliant with importing countries, reduce level of pesticides and heavy metals, and control for ochratoxins and PAH[32]. A new set of standards for good practices in cocoa production, postproduction, and marketing of cocoa will be established through a VIEGAP for cocoa consistent with best practices worldwide. Opportunities for exports of quality beans are already available in Europe and Japan, where significant premiums on quality and safety could be obtained. However, to target the strict quality and contamination requirements Viet Nam must ensure it has analytical capacity in specialized laboratories to test for quality, pesticide residues, and other contamination.

324. Cocoa beans meeting quality and safety requirements will receive a certificate and logo that will help building a reputation for the Viet Nam Cocoa Denomination (VICOCOA). Producers meeting the standards of good practices will be certified as per VIETGAP.

10.7.5 Monitoring and Evaluation System

325. Currently, there is not yet a system for monitoring and evaluation of the cocoa sector. Data on the sector are few, unreliable, and dispersed across provinces. Monitoring of farming practices, nurseries, costs of production, prices, and quality does not occur, or is irregular and lacks a systematic approach. Studies on cocoa in Viet Nam are few. If the sector has to expand, it will have to rely upon reliable statistical information and a good system of

[32] Polycyclic aromatic hydrocarbons are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat.

monitoring and evaluation studies to inform strategies and policies. A unit for monitoring and evaluation of the system should be established at the Department of Crop Production (DCP) and the General Statistical Office (GSO) should include cocoa in his surveys and annual publications.

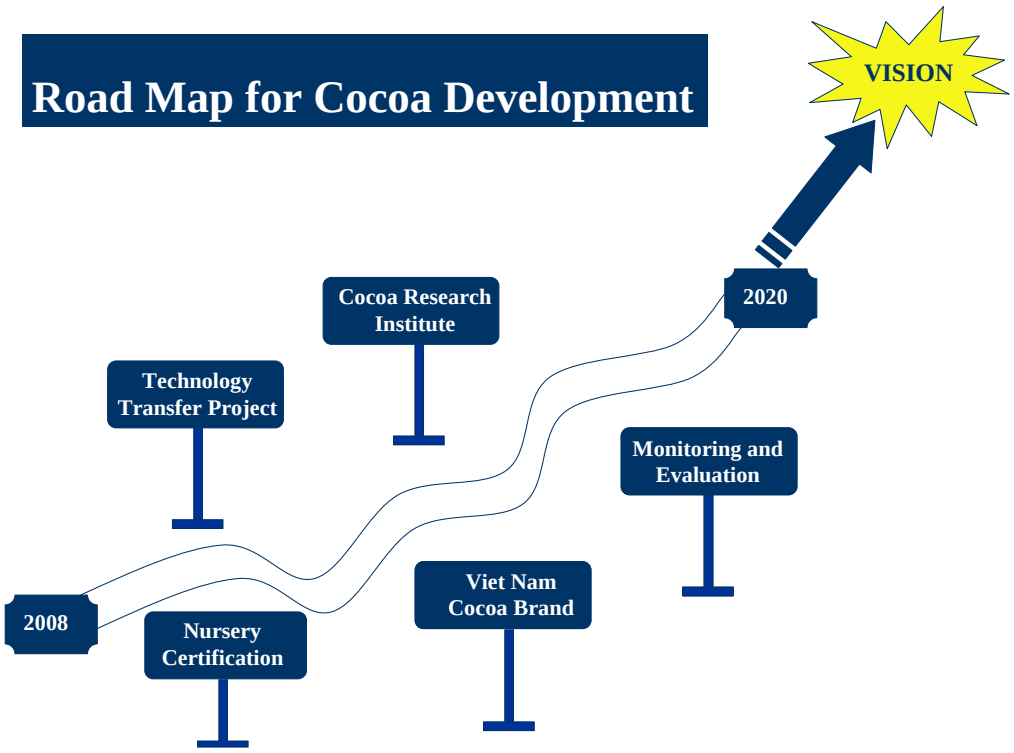


Figure 28 The Road Map for Cocoa Sector Development in Viet Nam

10.8 Action Plan

326. While the Road Map provides a strategic focus for the development of cocoa sector in Viet Nam, the Action Plan indicates the activities, key responsibilities, and partners involved in the implementation of the strategy. The Action Plan is formulated here for three periods: the short term (2009), the medium term (2010 to 2015), and the long term (2016-2020). Table 45 to Table 47 provide the details.

Table 45 Short-Term Activities (2009), Key Responsibilities, and Partners in the Action Plan

No.	Activities	Key Responsibility	Partners
1.	Approve Strategy for Cocoa Development	DCP/MARD	Private Sector, DARD, Research Organizations. Donors, NGO, Farmer Organizations
2.	Formulate National and Provincial Plans	DCP/MARD NAFEC/MARD	Private Sector, Research Organizations. Donors, NGO,

No.	Activities	Key Responsibility	Partners
		DARD	Farmer Organizations
3.	Identify Investment Funds (from Central and Provincial Government, donors and private sector)	DCP/MARD	Donors, Private Sector, PPC
4.	Prepare proposal for Cocoa Research Institute/Program	DST/MARD	Research Organizations
5.	Establish statistical system for cocoa sector	GSO	DCP, DARD
6.	Formulate cocoa courses in the university	NLU	CTU, TNU, Research Organizations
7.	Translation of technical training manuals and literature on cocoa into Vietnamese	NLU	Private Sector, Donors, Research Organizations
8.	Establish cocoa monitoring unit providing quarterly reports on cocoa situation in Viet Nam	DCP	CCC, DARD
9.	Develop regulations for quality assurance systems of cocoa planting material and certification of nurseries	DCP	Private Sector
10.	Develop regulations for quality assurance systems of cocoa exports and Viet Nam Cocoa Denomination (VICOCOA)	DCP/ICD/ NAFIQAD	Private Sector
11.	Development of VIETGAP for Cocoa	DCP	Private Sector
12.	Development of Regulations for Development of Cocoa Agroforestry Systems	DCP/DOF	Private Sector, Research Organizations, NGOs
13.	Proposal for New Research Program on Introduction of New Planting Material from Other Countries and Clonal Trials	DST	Research Organizations, DCP
14.	Training of core group of researchers	DST	Research organizations, Universities, Donors, Private Sector
15.	Training of extension workers and facilitators	NAFEC/SA	DCP, Research Organizations
16.	Mid-term Review of the performance of the sector	DCP	External Reviewers

Table 46 Medium-Term Activities (2010-2015), Key Responsibilities, and Partners in the Action Plan

No.	Activities	Key Responsibility	Partners
1.	National Technology Transfer Program is Implemented	DCP/NAFEC	DARD, Private Sector, NGO, Research Organizations, Farmer Organizations
2.	National and Provincial Plans are approved and implemented	MARD, PPC	DCP, DARD
3.	Agroforestry models are developed in new areas	DOF	DCP, PDOF, Private Sector, NGOs, Research Organizations, Farmer Organizations
4.	Cocoa research institute is established and long-term core funding is assured	DST	Research Organizations
5.	Quality assurance system for planting material and nursery certification is established	DCP/DST	Private Sector

6.	Quality assurance system of cocoa exports and Viet Nam Cocoa Denomination (VICOCOA) is established	DCP/ICD/NAFIQAD	Private Sector
7.	Laboratories for quality and safety control of planting material and cocoa beans are established	DCP	Private Sector, Research Organizations, Auditing Companies
8.	Statistics on cocoa sector are collected regularly and disseminated	GSO	
9.	Monitoring and evaluation of sector performance is carried out regularly	DCP	DARD
10.	Network of buying stations becomes dense	Private sector	DARD
11.	Fermentation companies established	Private sector	PPC
12.	New planting materials (from PNG, India, Ghana and Latin America) is tested and clonal trials are under way	Cocoa Research Institute	DST, DCP, International Associations
13.	VIETGAP for cocoa certification bodies are accredited and certified organizations are established	DCP	Private Sector
14.	Guidance on access of smallholder farmers to medium-term credit for cocoa development	MARD	VBARD, Financial Institutions, Private Sector, NGOs, Farmer Organizations
15.	Review of cocoa products export and import taxes	MOF	MARD, Private Sector
16.	Core group of cocoa researchers has been established	DST	Research Organizations
17.	Mid-term Review of the performance of the sector	DCP	External Reviewers

Table 47 Long-term Activities (2016-2020), Key Responsibilities, and Partners in the Action Plan

No.	Activities	Key Responsibility	Partners
1.	Processing industry develops	Private Sector	Farmer Organizations, PPC
2.	Based on sector performance and evaluation of the medium term National Technology Transfer Program, a new National Technology Transfer Program is formulated and implemented	DCP, PPC	DARD, Private Sector, Donors, NGOs, Research Organizations, Farmer Organizations
3.	New clones of non-Malaysian origins are approved	DST	DCP, Research Organization
4.	VICOCOA is recognized as an important denomination by international markets	DCP/ICD/NAFIQAD	Private Sector, Farmer Organizations
5.	Mid-term Review of the performance of the sector	DCP	External Reviewers

10.9 Policies

327. As already indicated in the Action Plan, several policies should be formulated and approved to promote the development of the cocoa sector. Most of these policies should be formulated and approved in the short (2009) to medium term (2010-2015) and include:

1. Approval of the Strategy for Cocoa Sector Development
2. Action Plans formulation and promulgation by Central and Provincial Governments
3. Establishment of Quality Assurance System for Planting Material and Nursery Certification
4. Approval of VIETGAP for Cocoa
5. Approval of Cocoa Research Institute, Research Program, and Capacity Building of Core Group of Researchers
6. Establishment of Quality Assurance for Export of Cocoa Beans (VICOCOA Denomination)
7. Establishment of a Statistical System for Cocoa
8. Approval of a National Technology Transfer Program
9. Guidance and Instructions about Cocoa Agroforestry Systems Development
10. Review of Cocoa Products Export and Import Taxes
11. Guidance on Access to Medium-Term Credit for Cocoa Development
12. Approval of Research Programs on Introduction of New Planting Material from other countries and Clonal Trials
13. Approval of New Clones

10.10 Partnerships

328. Different actors will play a crucial role in the implementation of the cocoa development strategy for Viet Nam. These include the private sector, NGOs, donor agencies, research organizations, provincial and central government, farmer and community organizations, and international and regional associations. Each has played already an important role in the development of cocoa in Viet Nam. Further contributions are expected in the future.

329. Specific proposals for partnerships between public and private sector will be presented in the Final Report, after consultations during the National Workshop to be held on November 6-7, 2008.

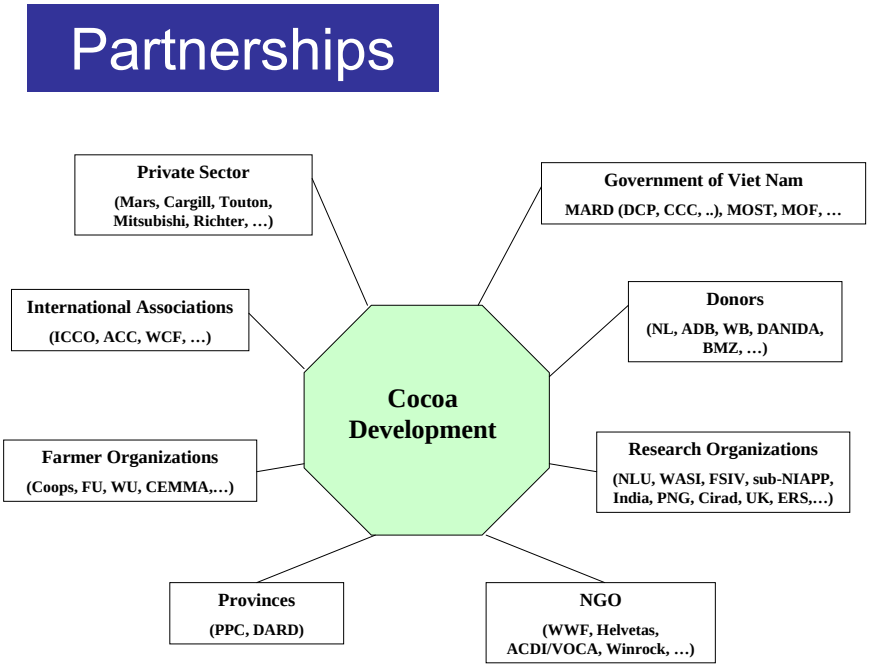


Figure 29 Partners in the Development of the Cocoa Sector

330. **Private sector**. In the past private sector has made important contributions to Viet Nam cocoa industry development in a number of ways, including supporting research and extension activities, capacity building and outreach activities (eg study tours, workshops, and training of scientists), laboratories (eg sensory lab and equipment), input support (eg seedlings), support to agroforestry model (eg SCAS and HFA), and collaboration between international scientists and experts with Vietnamese counterparts. The major players in order of importance (measured by their contributions) have been Mars Incorporated, Cargill, EDF Man, Touton, and Nestle. Other players could soon join including Ritter Sport and Mitsubishi Foods.

331. These contributions are welcome by Government of Viet Nam and are encouraged to continue in the future. A programme for public-private partnerships is one of the basic rationales for the funding by the Dutch Government and this present Study. The Cocoa

Coordination Committee includes private sector members such as Mars Incorporated, WCF, Cargill, and EDF Man.

332. **NGOs**. Four main non-government non-profit organizations – ACDI/VOCA, WWF, Helvetas, and Winrock - have been involved in projects, studies, training, and outreach activities to promote the development of cocoa industry in Viet Nam, the adoption of agroforestry and biodiversity models, and the development of organic and Fair Trade cocoa production. These organizations have considerable experience in project management and working with smallholder farmers. Some of these organizations are member of the Cocoa Coordination Committee (eg WWF).

333. **Donor Agencies**. The major contributions to the cocoa sector in the past have come from GTZ, DANIDA, and USDA. Currently, USAID (through SA), AusAID (through CARD), Dutch Ministry of Agriculture, and JICA are the major donors involved. Given the role played by cocoa to improve livelihood of smallholder farmers, promote biodiversity, adopt sustainable practices, and promote development of SME, other donors might become interested in the future. SECO might be interested in sponsoring organic and Fair Trade Development; World Bank and ADB could contribute to cocoa through the challenge funds to be implemented in the upcoming projects for Agricultural Competitiveness and Market for the Poor Phase II. IFAD through its new country strategy programme focused on integrating the poor in value chain might also be interested in the development of the sector.

334. **Research organizations**. Four research organizations in Viet Nam have been involved in cocoa: NLU, WASI, FSSIV, and Can Tho University. Linkages with research organizations in other countries have been established including the research and development units of the Malaysia Cocoa Board, Reading University in the UK, Indonesia Coffee and Cocoa Research Institute, ERS in US, Cocoa and Coconut Research Institute in PNG, and Central Plantation Crop Research Institute in India. Further linkages have to be developed including CIRAD in France, Cocoa Research Institute in Ghana, Cocoa Research Center in Brazil, and others.

335. **Provinces**. Involvement of provinces is crucial to the development of the sector. Provincial authorities (Provincial People's Committees) and DARDs are the key players in ensuring that cocoa sector could develop in each province. Some of the provinces in the past have been quite active in supporting the sector in collaboration with donor-funded projects; other provinces have been less active or even skeptical. The evidence so far indicates that cocoa development could make an important contribution to livelihoods of farmers, biodiversity, and sustainable practices. A more active involvement of the provinces will be necessary for the further development of the sector.

336. **Central Government**. MARD is the key ministry for agriculture and rural development. The key units at MARD are the Department of Crop Production (DCP) for overall leadership in the cocoa development; the Department of Science and Technology (DST) for approval of standards, clones, and research programs; the International Cooperation Department (ICD) for cooperation with international agencies and donors activities; the Department of Plant Protection (DPP) for integrated pest management and control of agrochemicals; the National Agroforestry and Fisheries Quality and Safety Department (NAFIQAD) for quality and safety control; the Department of Forestry (DOF) for agroforestry and forestry protection; and the National Agricultural Extension Center for extension. MARD is also organizing the Cocoa Coordination Committee. MARD is

responsible for issuing policies and plans for the development of the sector. Outside of MARD, the Ministry of Science and Technology and the standards agency (STAMEQ), the Ministry of Industry and Trade (MOIT), the Ministry of Finance (MOF), and the Ministry of Education and Training (MOET) are key partners for the issuing of national standards, research programs, trade and tax regulations, and university and training programs.

337. **Farmer and Community Organizations**. This is one major missing link in the constellation of partner organizations. Apart from cocoa clubs, organized for the implementation of extension activities within projects such as SA, and one cooperative in Tien Giang, there are no other farmer organizations currently involved in cocoa. In fact, Viet Nam has still to approve a law on associations. There are mass organizations such as the Farmer Union, the Women Union, the Youth Union, and the Committee on Ethnic Minorities and Mountainous People (CEMMA) that could be involved as partners in the cocoa development program.

338. **International and Regional Cocoa Associations**. Viet Nam is an active member of the ASEAN Cocoa Club (recently Viet Nam has hosted the regional meeting of the ACC in Ho Chi Minh City in June 2008). Viet Nam is not a member of the International Cocoa Organization (ICCO). The International Cocoa Organization (ICCO) is a global organization, composed of both cocoa producing and cocoa consuming countries with a membership.World Cocoa Foundation (WCF) is representing a large group of private companies. In the past, it has facilitated the development of the cocoa sector in Viet Nam. The Cocoa Producers' Alliance (COPAL) is an intergovernmental organization instituted in January 1962 with the objectives to (i) Exchange technical and scientific information; (ii) Discuss problems of mutual interest and to advance social and economic relations between producers ; (iii) Ensure adequate supplies to the market at remunerative prices; and (iv) Promote the expansion of consumption. Viet Nam is not a member of COPAL.

10.10.1Action Plan Agreement between MARD and LNV on Public Private Partnership

339. An Action Plan of the Public Private Partnership between MARD and the Ministry of Agriculture, Nature, and Food Quality of the Netherlands for Sustainable Development of the Cocoa Sector was signed at the end of a two-day workshop[33] held in HCMC on November 6-7, 2008. The content of the agreement is presented in Annex L.

340. The Department of Crop Production and the Embassy of the Netherlands in Ha Noi will establish focal points for sustainable development of the cocoa sector. A Partnership Management Office in liaison with the Viet Nam Cocoa Coordination Committee will be established at MARD to coordinate and monitor the progress of the agreed actions on partnerships and will report quarterly to all members of the Public Private Partnership between MARD and the Dutch Ministry of Agriculture, Nature, and Food Quality.

[33] International Cocoa Workshop on Public Private Partnership for Sustainable Cocoa Development in Viet Nam, HCMC, November 6-7, 2008.

10.11 Recommendations

341. The analysis in the previous chapters has identified a number of constraints at different levels in the value chain (from nurseries to traders). The following recommendations address some of these constraints.

Table 48 Recommendations

Actors	Recommendations to Address Constraints of Actors
Nurseries	1. **Establishment of a nursery certification system**. The system will ensure that certified nurseries follow good agricultural practices and have internal control systems. The certified nurseries will be periodically audited and inspected to ensure quality of their products. Certification will be voluntary, but will provide farmers with a quality assurance of the seedlings they buy from certified nurseries. 2. **Development and monitoring of regulations concerning sales of seedlings and planting material**. A Seed Law already exists in Viet Nam and its content is largely applicable to cocoa planting material and seedlings. Enforcement of existing regulations requires a monitoring system of nurseries that is not yet in place. Apart from fines and penalties, one of the most effective ways would be to publish and disseminate widely among farmers the outcomes of monitoring activities and inspection reports. 3. **Facilitate emergence of nursery associations**. Among the functions of the associations would be exchange of information among the members, establishment of codes of conducts, organization of training and outreach activities (workshops, study tours, etc), policy dialogue with the government, and sharing of marketing information. 4. **Establishment of Technical Center for the Development of Cocoa Nurseries**. The Cocoa Center at NLU is the only centers dedicated to cocoa sector. The center is grossly understaffed and tries to address a myriad of technical problems in the sector. A dedicated technical center for the development of cocoa nurseries might be required to address the specific needs of the industry. 5. **Facilitate access to finance**. The financial system is still largely unaware of the cocoa sector and its finance needs. Nurseries will require a massive use of finance to face the increasing demand and growth of the sector. Studies on the sector and periodic analysis of the industry will need to be shared with the financial sector. Business development services to facilitate the emergence of limited companies, business plans, and good management practices of nurseries will provide more confidence to the banking sector in lending to the cocoa nurseries.
Farmers	6. Engage in more active support of smallholder farmers through **sustained effort in technology transfer and extension activities** related to cultivation methods, management of pests of diseases, quality improvement, and fermentation. Rather than subsidizing inputs and promote indiscriminate cocoa expansion, a market approach should be pursued to ensure economic sustainability of the sector and the seizing of economic opportunities by smallholder farmers based on application of good practices that lead to higher productivity.

Actors	Recommendations to Address Constraints of Actors
	7. **Increase support to applied research** activities and farm demonstrations to identify better practices, appropriate pests and diseases management methods (including integrated pest management), test new clones and planting material, and optimal use of fertilizer and water. The research should be based both on experimental farms and on demonstration farms to facilitate technology transfer.
	8. Facilitate the **establishment of a denser network** of buying stations by the private sector to ensure accessibility of farmers to markets.
	9. **Testing and demonstrations of alternative cultivation methods in upland areas**, particularly in the cashew triangle (Binh Phuoc, Dong Nai, Lam Dong, and Central Highlands), monoculture systems in the Central Highlands, and agroforestry models.
	10. **Promotion of cooperatives.** Farmer organizations such as farmer clubs or farmer groups are effective methods to organized farmers for the purpose of training and extension activities. However, the organizations are not sustainable when the promoter or the project that initiated them ceases. Smallholder farmers can benefit from organizations such as cooperatives if they are fully involved in marketing inputs and outputs, contracting with enterprises (nurseries and companies), and get access to finance and better market information.
	11. **Monitor costs of production on a regular basis**. Knowledge about costs of production is tenuous at best. This is partly understandable since the survey work to obtain good data is complex and time consuming. However, this information is critical to farmers' decision to engage in cocoa production, keeping into account alternative crops.
Processors	12. T**echnical transfer in good fermentation techniques**. Farmers and collection agents are learning quickly how to ferment. However, there are still technical issues to be resolved in ensure consistency of quality among smallholder farmers dealing with small volumes, temperature control during the main harvest season in the Central Highlands, and improvements in equipment. Those issues could be tackled with a focused approach to research and demonstrations. The key issue will be to ensure that the technologies are transferred to smallholder farmers and fermentaries.
	13. **Facilitate emergence of fermentation companies**. As volumes of cocoa production increase, there will be an incentive for business providers to specialize in fermentation companies that are capable to produce quality beans and at the same time provide a service to farmers who have small volumes of cocoa production. Economies of scale and efficiency of operations should ensure that the processing fees paid for their services are attractive to smallholder farmers and competitive with the alternative practice of farmers to do fermentation on their own.
	14. **Be cautious about investment in processing factories**. Ensure that information about economic and financial feasibility of establishing cocoa beans processing plants is available to the private or public sector in order to avoid both financial disasters and an unsustainable competition between buyers for the still modest volumes of cocoa beans produced in Viet Nam. Excessive competition might ultimately negatively affect smallholder farmers as it will generate incentives for acquiring habits such as harvesting unripe pods, selling unfermented or partially fermented beans, and use of cultural practices that are damaging to the environment (eg excessive use of agrochemicals, deforestation, un-shaded production, excessive use of water)

Actors	Recommendations to Address Constraints of Actors
	and unsustainable.
Traders	15. **Facilitate the emergence of a denser network of buying stations and collection centers**. Even though famers have access to markets and buyers both for pods and beans, the marketing network lacks density particularly in the Central Highlands and in some provinces of the Southeast.
	16. **Introduce a quality assurance system for exported beans to ensure the emergence of a Viet Nam Cocoa Denomination** that is recognized by international markets and establishes Viet Nam as an exporter of quality fermented beans. Given the dominance of Indonesia in the unfermented bean market, this marketing strategy will provide a sustainable source of income for smallholder farmers. The quality assurance system at the export level could be achieved through traceability systems for exporters to ensure quality and safety at different stages of the value chain. An accredited laboratory to test for quality and safety of cocoa beans destined to exports should be established. The quality assurance system will require the formulation of appropriate policies and the cooperation of the cocoa trading industry. Monitoring systems should be established and use of third party auditor could facilitate the establishment of the Viet Nam Cocoa Denomination

10.12 Risks and Mitigation Strategies

342. The analysis in the previous chapters has identified a number of risks for the development of the cocoa sector. The following table summarizes the risk assessment and options to mitigate the risks.

Table 49 Risk, Assessment, and Options to Mitigate the Risk

Risk Description	Assessment of Risk (low, medium, high)	Options to mitigate the risk
Price of cocoa beans decreases sharply in world markets in the medium-long term	Medium	Adopt good agricultural practices to increase yields and reduce production cost. Maintain a reputation for quality fermented beans supplier and certified safe beans supplier. Develop niche markets such as organic cocoa.
Water scarcity in the Central Highlands due to lowering of water tables and high salinity in the Mekong River Delta.	Medium	Monitoring of water tables and hydrological studies. Land use planning for cocoa production.
Outbreak of pests and diseases	Medium	Research on pests and diseases. Integrated pest management. Quarantine control. Monitoring of pests and diseases.
Monoculture systems to be developed and expanded where the farmers see high profit from cocoa production. To increase productivity, this could lead to **cutting down shade** cocoa to increase area of cocoa. Full-sun monoculture would bring more negative impacts to the environment than of shade system.	Medium	Cocoa farmers should be encouraged to apply shade system at the beginning and well aware of the advantages of such a system via agricultural extension service systems at provincial and district levels
Cocoa agro-forests to be developed and expanded, leading to **deforestation and illegal encroachment** into the protection and special-used forests, when land fund for cocoa becomes scarce	Medium	Existing forest management and protection policies of the central and local levels should be applied towards development and expansion of any cocoa agro-forest project. Illegal encouragement to protection and special used forests should be early discovered and administratively punished.
Fire can happen in case no fire prevention and fight methods to be applied especially in the areas with long dry season	Low	Farmers should be equipped with knowledge on fire fight and prevention for their gardens via trainings. By the end of rain seasons, part of fallen leaves and pruned branches should be used to cover land around cocoa foot and other part to be buried.
Improper treatment of by-products and residues from cocoa production could		Farmers should be trained with knowledge on how to treat by-

Risk Description	Assessment of Risk (low, medium, high)	Options to mitigate the risk
lead to **environmental pollution**	Low	products and residues from cocoa production via training. Organic residues can be used as compost to supplement nutrition to the soil or feeding animals. Non-organic ones should be buried.
Improper land clearance and garden cleaning methods can lead to **soil degradation** and **loss of biodiversity**	Medium	Slash-and-burn method should be totally prohibited in land for cocoa land, especially in the agro-forest system. Usage of chemical materials, especially herbicides, should be limited.
Increase of using chemical materials during cultivation process will lead to more **negative environmental impacts**	Medium	Organic and micro-organism fertilizers should be strongly encouraged in cocoa production. Usages of herbicides should be limited. List of prohibited chemical materials used for agricultural activities should be introduced to the farmers.
Quality of beans reduces due to excessive competition among buyers and an emergent local cocoa beans processing industry	Low	Improved organization of marketing and export through quality control assurance system. Establish regulations for exports of fermented beans and accredited labs to test for quality and safety of beans. Raise awareness on importance of harvesting ripe pods and fermentation. Disseminate good practices in farming, processing, and trading. Disseminate feasibility studies for processing industry.

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A NURSERIES

A.1 Introduction

343. The major thrust to the development of the cocoa nursery industry in Viet Nam occurred in 2004, when several private operators were established as the result of the Success Alliance project. Previous to 2004, very few and small nurseries were present in research organizations (NLU and WASI), in state-owned organizations such as the Plant Breeding Stations and Agricultural Extension Centers (for example in Dak Lak), in State Companies such as Krong Ana in Dak Lak, and in the private sector particularly in Ben Tre. A critical factor to the growth of the industry was the demand of Success Alliance project and the release of 14 commercial clones, of which 8 clones were approved by MARD in 2006.

344. A number of enterprising actors became involved in cocoa nursery, motivated by the prospect of an ambitious plan of cocoa promotion set forth by the National Plan of the Government in 2006 and the continuous presence of the Success Alliance project. By 2008, the Success Alliance had already trained almost 20,000 farmers and dozens of aspiring nursery managers in various provinces of Southern Viet Nam.

345. State-owned nurseries also contributed to the birth of the industry. Nurseries under the Agricultural Extension Center are found in Ba Ria Vung Tau, Binh Phuoc, and Dak Lac. In Tien Giang, two state owned nurseries supplied seedlings to the Success Alliance project during 2005 and 2006. One nursery was run by the Plant Breeding Station belonging to Cho Gao Agriculture Office and the other by the Biotechnology Research Centre, Department of Science and Technology with the production share of 70% and 30% respectively. Cocoa seeds and bud woods were bought from Ben Tre, particularly at Son's farm, Phu Duc, Hai's farm, Tien Thuy, Lap's farm, An Khanh of Chau Thanh district. In 2007, in Ben Tre there were 5 approved private nurseries with capacity between 60,000 and 400,000 seedlings as listed below:

1. Nguyen Cong Thanh Cho Lach 400,000
2. Dang Van Sanh Cho Lach 150,000
3. Duong Van Loi Cho Lach 150,000
4. Ta Van Thanh Chau Thanh 70,000
5. Kim Phuong Cho Lach 60,000

346. Besides approved nurseries, other nurseries that are not approved have also emerged. The current situation is characterized by an industry including about 30 medium and large nurseries in the country, the majority of which are private and perhaps another 20 small nurseries to meet scattered demand. Private nurseries are also the largest ones; some of them have current capacity of producing between 300,000 and 1 million seedlings per year.

347. The survey of nurseries undertaken by the Study Team in July 2008 covered 28 nurseries in seven provinces and could therefore be considered the first and most comprehensive survey so far of the nursery industry.

A.2 General Characteristics of Nurseries

348. The nurseries survey (NUR) aims at characterizing the current status of the cocoa nursery industry in Viet Nam. Out of an estimated total number of 30-35 nurseries, the survey covers 28 nurseries in seven provinces including Ben Tre, Tien Giang, Ba Ria Vung Tau, Binh Phuoc, Dak Lac, Dak Nong, and Dong Nai. The respondents of the survey were the manager/owners of the company who were informed about the activities of the nurseries.

Table 50 Distribution of the Nursery Survey (NUR) sample by gender and age of respondent

Province	Sample	Number		Age		
		Male	Female	<30	30-40	>40
Ben Tre	9	8	1		2	7
Tien Giang	1	1				1
Binh Phuoc	5	5			3	2
Ba Ria Vung Tau	1	1				1
Dak Lak	8	5	3	2	3	3
Dak Nong	2	2		1	1	
Dong Nai	2	2			1	1
Grand Total	**28**	**24**	**4**	**3**	**10**	**15**

Source: ACI NUR Survey, July 2008

349. The large majority (85%) of the nurseries in the sample are managed by men and 15% by women (see **Table 50**). More than half of the nursery managers are older than 40 year, highlighting the fact that some experience is required for running a nursery. With only one exception, all nurseries are owned by people belonging to the main ethnic group (Kinh). More than 64% of the respondents indicate that they started their involvement with cocoa nurseries after 2003. Prior to their involvement in nursery, almost all of them were involved in cocoa farming. For 93% of respondents, their first involvement with cocoa dates after the year 2000.

350. Nursery managers are relatively well educated, with more than 53% of the sample having completed tertiary education (see **Table 51**).

Table 51 Education Level of Nursery Managers

		Lower Secondary	Higher Secondary	Tertiary
Ben Tre	9	3	4	2
Tien Giang	1			1
Binh Phuoc	5		2	3
Ba Ria Vung Tau	1			1
Dak Lak	8	1		7
Dak Nong	2	1		1
Dong Nai	2		2	
Grand Total	**28**	**5**	**8**	**15**

Source: ACI NUR Survey, July 2008

351. In terms of legal organization (see **Table 52**, 75% of the nurseries are household enterprises and only 7% are limited companies. 14% are state companies or cooperatives

(3.6%). Lack of legal status has constrained the expansion of the market to other provinces and also the access to budwoods from recognized sources.

Box 2 Access to budwooods

Big nurseries are the ones who often have gardens of parent trees with the support from the SA project. Besides, they also have received technical assistance from the project. Seven out of 20 nurseries in Ben Tre have benefited from SA. Big nurseries do not have to buy budwoods whereas small nurseries do and sometimes due to a shortage of budwood supply small nurseries may get the budwoods from unclear sources. Shortage of budwood supply from reliable sources is also mentioned by nurseries as one of the main constraints for seedling production. Nurseries that have budwood gardens include: NLU, Loc Ninh (Binh Phuoc), Mr. Sanh, Mr. Thanh (Cho Lach, Ben Tre), Nguyen Loc, Trong Duc (Dong Nai), Krong Ana (Dak Lak). Others nurseries have to buy bud woods or they have their own budwood garden but not enough quantity and have to buy the extra.

Study Team Field Survey, July 2008

Table 52 Type of Enterprise among Nurseries

Province	Sample	Type of enterprise				
		Household without license	Household with license	Limited Company	State Company	Cooperative
Ben Tre	9	2	5		1	1
Tien Giang	1				1	
Binh Phuoc	5		3		2	
Ba Ria Vung Tau	1		1			
Dak Lak	8	7	1			
Dak Nong	2	2				
Dong Nai	2			2		
Grand Total	**28**	**11**	**10**	**2**	**4**	**1**

Source: ACI NUR Survey, July 2008

A.3 Activities, Employment, and Assets

352. Apart from nursery activities, most of the respondents are engaged in cocoa production and cocoa trading and fermentation. The vast majority of cocoa nurseries (85.7%) are also engaged in other farm activities and 28.6% are involved in non-farm activities (see **Table 53**).

Table 53 Type of Activities in which Nursery Owners are involved (% of sample)

Province	Sample	Activities- Cocoa			Activities – No Cocoa	
		Cocoa Nursery	Cocoa Production	Cocoa Trading, Fermentation	Other Farm Activities	Other Non farm activities
Ben Tre	9	100.0	77.8	55.6	88.9	22.2
Tien Giang	1	100.0			100.0	
Binh Phuoc	5	100.0	80.0	20.0	100.0	40.0
Ba Ria Vung Tau	1	100.0				
Dak Lak	8	100.0	25.0	25.0	87.5	50.0
Dak Nong	2	100.0	50.0	50.0	100.0	
Dong Nai	2	100.0	100.0	100.0	50.0	
Grand Total	**28**	**100.0**	**57.1**	**39.3**	**85.7**	**28.6**

Source: ACI NUR Survey, July 2008

353. Nurseries are small enterprises with an average of 9.3 workers (see **Table 54**), of which more than 64% are women. The largest nurseries are based in Dong Nai. Ethnic minority are a marginal fraction of the labor force (2.7%). There are no workers employed by the nurseries who are less than 18 years old.

Table 54 Information about Labor Force

Province	Sample	Information on worker type				
		Average number of workers	% of Women Workers	% Ethnic Minority Workers	% Less than 15 Years Old Workers	% 15-18 Years Old Workers
Ben Tre	9	13.2	73.9			
Tien Giang	1	4.0	25.0			
Binh Phuoc	5	8.4	40.5	4.8		
Ba Ria Vung Tau	1	8.0	75.0			
Dak Lak	8	4.8	76.3			
Dak Nong	2	2.5	40.0			
Dong Nai	2	22.5	55.6	11.1		
Grand Total	**28**	**9.3**	**64.4**	**2.7**		

Source: ACI NUR Survey, July 2008

354. Only few nurseries provided information about male and female average wages. Based on the few responses (see Table 55), women workers in nurseries are paid considerably less than male workers (between 17% and 35% less), a practice that is not unusual in the rural sector in Viet Nam.

Table 55 Average wages of male and female workers in nurseries

Province	Sample	Average Wage (VND/day)	
		Men	Women
Ben Tre	9	50,556	32,778
Ba Ria Vung Tau	1	60,000	50,000

Source: ACI NUR Survey, July 2008

355. Values of physical assets vary greatly between 1.095 and 15.671 VND billion with an average value of 4.852 VND billion (equivalent to USD 291,773). Land is the main component of the assets, representing about 78% of the value of total assets (see Table 56).

Table 56 Average Value of Physical Assets (VND Million)

Province	Own Land	Housing	Other Construction facilities	Motorized transport means	Productive equipment	Live stock	Fish pond	Other	Total
Ben Tre	1,111	258	33	55	61	-	34	6	1,558
Tien Giang	2,000	-	-	-	20	-	-	-	2,020
Binh Phuoc	12,780	646	2,015	137	63	20	10	-	15,671
Ba Ria Vung Tau	-	500	-	-	5,000	-	-	-	5,500
Dak Lak	2,026	199	19	20	6	-	3	-	2,273
Dak Nong	650	400	25	8	-	-	-	13	1,095
Dong Nai	6,000	1,250	50	450	31	10	5	-	7,796
Grand Total	3,765	391	381	81	214	4	14	3	4,852
Percentage of Total	77.6%	8.1%	7.9%	1.7%	4.4%	0.1%	0.3%	0.1%	100%

Source: ACI NUR Survey, July 2008

Table 57 Average Value of Physical Assets in US$

	Own Land	Housing	Other Construction facilities	Motorized transport means	Productive equipment	Livestock	Fish pond	Other	Total
Total	226,372	23,505	22,923	4,843	12,873	258	838	161	291,773

Source: ACI NUR Survey, July 2008

A.4 Production

356. Total seedling production in 2008 is estimated to be 2.479 million, an increase of 46% on average relatively to 2006 (see Table 58). Average production of seedlings in 2008 is 88,536 seedlings per nursery but exhibits a considerable variation across provinces. The largest producers are in Ben Tre and Dong Nai. Interestingly, Dong Nai is a not a large producer of cocoa due to a non favorable policy support by the province for cocoa production; nevertheless two enterprising nurseries in this province are among the leaders of the industry.

Table 58 Production and Sales of Seedlings over 2006-2008

Province	Sample	2006		2007		2008	
		Production	Sales	Production	Sales	Production	Sales
Ben Tre	9	870,000	841,000	887,000	724,000	1,096,000	497,000
Tien Giang	1	300,000	245,000	40,000	20,000	10,000	3,000
Binh Phuoc	5	137,000	7,000	145,000	118,000	260,000	143,000
Ba Ria VT	1	120,000	100,000	70,000	70,000	60,000	30,000
Dak Lak	8	37,000	37,000	128,000	49,500	53,000	95,500
Dak Nong	2	-	-	58,000	-	-	58,000
Dong Nai	2	230,000	100,000	330,000	232,000	1,000,000	848,000
Total	**28**	**1,694,000**	**1,330,000**	**1,658,000**	**1,213,500**	**2,479,000**	**1,674,500**
Average		60,500	47,500	59,214	43,339	88,536	59,804

Source: ACI NUR Survey, July 2008
Note. Data on sales in 2008 are preliminary, given the fact that the survey was taken in July when the sale campaign was not yet completed.

357. Production of seedlings has increased considerably over the past two years, by an average of 23% per year (see Table 59). Total production of seedlings over 2006-2008 by the nurseries in the sample (representing almost all the industry) was 5.831 million. Assuming that only 75% of the production is sold (the remaining might have been unsold stock or poor quality) and is planted at a rate of 600 trees per ha, the seedling production by the nursery industry would correspond to 7,288 ha (see Table 60). Applying the growth rate of seedling production (23%) over the period 2008 to 2015 and 2020, that would imply a potential area

of 31,346 ha in 2015 and 88,861 ha in 2020, respectively, that could be cultivated with the seedlings supplied by the nursery industry.

358. Clearly this extrapolation from seedling production to cultivated area depends on several other factors not considered here, such as policy support, market conditions, emergence of new nurseries, and interest of farmers. The extrapolation should not be interpreted as a causality relation (from nurseries to cultivated area). In fact, past experience has shown that nurseries (both state and private companies) are able to respond to increased demand. Whether this response capacity will be there also in the future depends on various constraints that will be analyzed later in the chapter.

359. The extrapolation only points out that at the current rate of growth of the nursery industry (23% based on last two years observation), the area target for 2015 set by the government (60,000 ha) could not be reached, whereas the government target of 80,000 ha for 2020 could be reached and even surpassed. Whatever area target is set by the Government and actually achieved by the market, it would imply a certain growth rate for the nursery industry. Past growth of the industry is indicative that the Government plan is feasible in the long term (2020) but to be feasible in the medium term (2015) a higher growth (and therefore incentives) for the nursery industry will have to be established.

360. From the point of view of the nursery industry, when asked about plans to expand production over the next 5 years, the respondents seem quite optimistic (see Table 61); 75% of respondents plan to expand considerably their production over the short term (expansion of 133% one year ahead, and expansion of 156% two year ahead). When looking at longer time horizons (3 to 5 years), most of respondents are unable to make a forecast, but those who do, still have ambitious expansion plans (183% for 3-year ahead; 239% for 4-year ahead; and 291% for 5-year ahead).

Table 59 Growth of Production of Seedling over 2006-2008

Province	Sample	Production of Seedlings in 2006	Production of Seedlings Increase from 2006 to 2008	Production of Seedlings Rate of Growth 2006-2008
Ben Tre	9	870,000	226,000	26%
Tien Giang	1	300,000	(290,000)	-97%
Binh Phuoc	5	137,000	123,000	90%
Ba Ria Vung Tau	1	120,000	(60,000)	-50%
Dak Lak	8	37,000	16,000	43%
Dak Nong	2	-	-	
Dong Nai	2	230,000	770,000	335%
Total	28	1,694,000	785,000	46%
Average		60,500	28,036	46%

Source: ACI NUR Survey, July 2008

Table 60 Extrapolation of Current Growth of Nursery Industry in terms of Potential Cocoa Area

Total seedlings produced during 2006-2008	Equivalent area (ha) that could be cultivated, based on 600 seedlings/ha and sales equal to 75% of production	Rate of growth of seedling production based on 2006-2008	Potential cocoa area by 2015 based on seedling production Growth	Potential cocoa area by 2020 based on seedling production growth
5,831,000	7,288	23%	31,346	88,861

Source: ACI NUR Survey, July 2008

Table 61 Forecast of the Nurseries about their plan to produce seedlings for next 5 years

Province		Ben Tre	Binh Phuoc	Ba Ria Vung Tau	Dak Lak	Dak Nong	Dong Nai	Grand Total
Seedling Production (Responses=20)	**Responses**	**6**	**5**	**1**	**5**	**2**	**1**	**20**
	2008	532,000	225,000	68,000	82,000	58,000	200,000	**1,165,000**
	2009	980,000	840,000	100,000	154,000	240,000	400,000	**2,714,000**
	Growth	84%	273%	47%	88%	314%	100%	133%
Seedling Production (Responses=15)	**Responses**	**5**	**1**	**1**	**5**	**2**	**1**	**15**
	2008	482,000	50,000	68,000	82,000	58,000	200,000	**940,000**
	2010	1,025,000	100,000	150,000	214,000	320,000	600,000	**2,409,000**
	Growth	113%	100%	121%	161%	452%	200%	156%
Seedling Production (Responses=8)	**Responses**	**5**			**1**	**1**	**1**	**8**
	2008	482,000			26,000	26,000	200,000	**734,000**
	2011	1,030,000			50,000	400,000	600,000	**2,080,000**
	Growth	114%			92%	1438%	200%	183%
Seedling Production (Responses=8)	**Responses**	**5**			**1**	**1**	**1**	**8**
	2008	482,000			26,000	26,000	200,000	**734,000**
	2012	1,035,000			50,000	800,000	600,000	**2,485,000**
	Growth	115%			92%	2977%	200%	239%
Seedling Production (Responses=7)	**Responses**	**5**			**1**	**1**		**7**
	2008	482,000			26,000	26,000		**534,000**
	2013	1,040,000			50,000	1,000,000		**2,090,000**
	Growth	116%			92%	3746%		291%

Source: ACI NUR Survey, July 2008

A.5 Propagation Technique, Clones and Quality Assurance

361. The two most popular propagation techniques used by nurseries are top grafting and side grafting (see Table 62). Top grafting has been used 51.6% of the cases observed over the period 2006-2008.

Table 62 Percentage of propagation techniques practiced by the respondents (Year 2006, 2007 and 2008)

Province	Sample	Techniques			
		Top Grafting	Side Grafting	Other	Total
Ben Tre	9	15.4	73.1	11.5	100
Tien Giang	1	50.0	50.0		100
Binh Phuoc	5	100.0			100
Baria Vung Tau	1		100.0		100
Dak Lak	8	100.0			100
Dak Nong	2	100.0			100
Dong Nai	2	50.0	50.0		100
Grand Total	**28**	**51.6**	**43.5**	**4.8**	**100**

Source: ACI NUR Survey, July 2008

362. Nurseries produce seedlings from different clones sourced by NLU (see Table 63). The clones most popularly produced are TD5, TD3, and TD10 representing 21.1%, 18.3%, and 14.2% of the total, respectively. Together, these three clones represent 54% of the total clones produced.

363. The color of these 3 clones is red. Farmers feel that red clones have high yield than green ones. This is just a widespread feeling, not a scientific result. Actually the green clones namely TD2, TD8, TD9 (not approved yet) are very promising, especially TD8. Furthermore, the red clone TD6 that is resistant to VSD and high yield is highly recommended. However, survival of TD6 is normally lower than others after grafting; therefore it is among the low percentage of clones produced.

Table 63 Percentage of different clones produced in 2008.

Clones	Province							
	Ben Tre	Tien Giang	Binh Phuoc	Baria Vung Tau	Dak Lak	Dak Nong	Dong Nai	Overall
TD1	6.2	-	11.9	-	8.4	7.8	0.1	4.6
TD2	4.9	-	7.4	-	6.1	7.8	5.0	5.2
TD3	19.9	-	14.0	30.0	17.8	29.0	15.8	18.3
TD5	19.5	-	14.0	30.0	16.5	21.7	25.0	21.1
TD6	15.9	-	8.6	20.0	16.7	7.8	7.5	12.3
TD8	7.2	-	7.7	20.0	7.7	7.8	15.8	10.6
TD10	14.9	-	12.9	-	9.9	7.8	15.8	14.2
TD14	2.6	-	6.8	-	9.3	10.5	15.1	7.7
TD7	-	-	4.5	-	3.5	-	-	0.6
TD9	0.4	-	2.7	-	4.1	-	-	0.6
TD11	8.6	-	2.7	-	-	-	-	4.3
Some TD	-	-	6.7	-	-	-	-	0.6
Total	**100.0**		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: ACI NUR Survey, July 2008

364. Most respondents (93%) claim to have a quality assurance system (see Table 64), but only 64% of the sample have written documents explaining how the quality assurance is done. Surprisingly, even some of the largest nurseries, eg in Dong Nai, do not have a documentation of quality assurance.

Table 64 Quality Assurance System for Nurseries

Province	Sample	Respondents having quality assurance system		If Yes, respondents having document explaining how to assure quality control	
		Yes	No	Yes	No
Ben Tre	9	8	1	8	
Tien Giang	1	1		1	
Binh Phuoc	5	5		4	1
Baria Vung Tau	1	1		1	
Dak Lak	8	7	1	3	4
Dak Nong	2	2			2
Dong Nai	2	2		1	1
Grand Total	**28**	**26**	**2**	**18**	**8**

Source: ACI NUR Survey, July 2008

365. When asked how nurseries assure quality of their product, they point out to various explanations including:

- Certificate of good nursery skills issues by DARD or ACDI/VOCA
- Business license by DARD
- Selection of seedlings with at least 6 leaves
- Obtain budwood from NLU
- Follow TD seedling production protocol
- Follow advice by Cargill
- Follow advice by ACDI/VOCA
- Obtain certificate of origin from NLU
- Have seedling with height more than 25 cm
- Change in potting medium

366. Currently, there is no system of nursery certification for cocoa in Viet Nam. Basically, seedlings could be produced and sold by any person wishing to do so. The system is not strictly controlled as in other countries (eg Ghana). The potential outcome of this situation is that planting material and seedlings could go into distribution without any assurance of quality, a serious risk for the development of the industry. The most important criteria of qualified seedling are (1) right clone and (2) free from pests and diseases.

A.6 Cost of Production

367. Investment cost for the nursery industry I estimated to be 15 VND billion with an average investment by nursery of 556 VND million (see Table 65). The main components of investment are land (78.4%) and transportation means (5.7%). Average investment per nursery varies considerably among provinces from as low as 88 VND Million in Dak Nong to 2.2 VND billion in Dong Nai where the some of the largest nurseries are located.

368. Production cost for the nursery industry totals 5.6 VND billion with an average production cost per nursery of 210 VND million (see Table 66). Average production cost per nursery varies considerably among provinces from as low as 28 VND million in Dak Lac to 870 million VND in Dong Nai.

369. Taking into account depreciation, cost of production per seedling in the nursery industry averages 2,762 VND and varies between 2,537 VND in Dong Nai to 2,946 in Ben Tre (see Table 67).

370. Comparing cost of production to sale price shows that the average margins in the nursery industry are relatively good with an average value of 81% (see Table 68). The margins vary among provinces from 42% in Ba Ria Vung Tau to 126% in Binh Phuoc. This suggests a relatively low breakeven point for the initial investment, on average being less than 3 years (see Table 69).

Table 65 Investment Cost for the Nursery Industry and Average per Nursery

	Total Investment (VND Million)	%	Average Investment per nursery	Depreciation (VND Million/year/ nursery)
Land	11,774.5	78.4%	436.1	21.8
Irrigation and Watering System, Pond/Well, and Tanks	428.3	2.9%	15.9	1.6
Construction, Fence, Sheds, Storage, and Office	1,415.4	9.4%	52.4	5.2
Equipment and Tools, Pumps	529.4	3.5%	19.6	3.5
Transportation means	849.1	5.7%	31.4	3.1
Other	25.0	0.2%	0.9	0.3
	15,021.7	100.0%	556.4	35.6

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

Table 66 Cost of Production of Seedlings, Total and Average per Nursery

Item	Total Production Cost of the Industry (VND Million)	%	Average Production Cost per nursery (VND million)
Rented Land	323	5.7	12
Land Preparation	125	2.2	4.6
Budwood	437	7.7	16.2
Seed for rootstock	192	3.4	7.1
Plotting medium	1029	18.1	38.1
Fertilizer, Pesticides, Medicine, Chemicals	639	11.3	23.6
Labor	1699	29.9	62.9
Transportation	479	8.4	17.7
Marketing	183	3.2	6.8
Bags	430	7.6	15.9
Other	136	2	5
Total	5672	100	210.1

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

Table 67 Average Cost of Production per Seedling

Province	(1) Average Investment Cost per Nursery (Million VND)	(2) Average Production Cost per Nursery (Million VND)	(3) Depreciation	(4) Average Production Cost Plus Depreciation per Nursery	(5) Average Number of Seedling produced over past 12 months per Nursery	(6) Average Cost of Production per Seedling per Nursery (4)/(5)
Ben Tre	577	323	37	359	122000	2946
Binh Phuoc	467	94	30	124	45000	2756
Baria Vung Tau	102	183	7	190	68000	2790
Dak Lak	337	28	22	49	19125	2569
Dak Nong	88	78	6	83	29000	2871
Dong Nai	2263	870	145	1015	400000	2537
Grand Total	556	210	36	246	88963	2762

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

Table 68 Margins in the Nursery Industry

Province	Average Unit Sale Price of Seedling (VND)	Average Cost of Production per Seedling (VND)	Average Gross Margin per Seedling	Gross Margin (%)	Average Gross Margin per Nursery (VND Million)
Ben Tre	4,856	2,946	1,909	65%	233
Binh Phuoc	6,240	2,756	3,484	126%	157
Baria Vung Tau	4,000	2,790	1,210	43%	82
Dak Lak	4,475	2,569	1,906	74%	36
Dak Nong	4,458	2,871	1,586	55%	46
Dong Nai	5,500	2,537	2,963	117%	1,185
Grand Total	4,986	2,762	2,224	81%	198

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

Table 69 Estimated Breakeven Point for Nursery Investment

Province	Sample	Average Investment Cost (Million VND)	Average Gross Margin per Nursery (VND Million)	Number of years to breakeven
Ben Tre	9	577	233	2.47
Binh Phuoc	5	467	157	2.98
Baria Vung Tau	1	102	82	1.24
Dak Lak	8	337	36	9.24
Dak Nong	2	88	46	1.91
Dong Nai	2	2263	1,185	1.91
Grand Total	27	556	198	2.81

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

A.7 Sales and Gross Margins in the Nursery Industry

371. The nursery industry total sales in 2008 are estimated at almost 12 VND billion with a gross margin of 5.3 VND billion (see Table 70).

Table 70 Estimated Sales and Margins in the Nursery Industry

Province	Number Seedlings produced in the most recent crop year	Average Unit sale price of tree (VND/tree)	Expected Value of Sales of the Nursery Industry in 2008 (VND million)	Gross Margins in the Nursery Industry in 2008 (VND million)
Ben Tre	1,098,000	4,856	5,331	2,097
Binh Phuoc	225,000	6,240	1,404	784
Baria Vung Tau	68,000	4,000	272	82
Dak Lak	153,000	4,475	685	292
Dak Nong	58,000	4,458	259	92
Dong Nai	800,000	5,500	4,400	2,371
Grand Total	**2,402,000**	**4,986**	**11,976**	5,342

Source: ACI NUR Survey, July 2008
Note: Tien Giang has been excluded from the calculations, due to non production over the past 12 months.

372. Seedlings are sold on credit by 43% of nurseries; the average percentage of credit sales is 37.4% of total sales (see Table 71).

Table 71 Sales on Credit

Province	Sample	Nurseries who sell on credit		Average % of credit sales
		Number	%	
Ben Tre	9	6	66.7	41.3
Tien Giang	1	-	-	-
Binh Phuoc	5	1	20.0	60.0
Baria Vung Tau	1	-	-	-
Dak Lak	8	2	25.0	5.1
Dak Nong	2	1	50.0	40.0
Dong Nai	2	2	100.0	45.0
Grand Total	28	**12**	42.9	37.4

Source: ACI NUR Survey, July 2008

Box 3 Nurseries and Contracts

In Tien Giang only two nurseries operate on a sporadic basis. In the past, the nursery that belongs to the Department of Science and Technology produced 150,000 seedlings per year and the nursery under the Cho Gao Department of Agriculture produced 350,000 seedlings per year. These nurseries produce cocoa seedlings only if there are contracts from projects. When there is no order from projects these nurseries do not produce cocoa seedlings. This year both nurseries in Tien Giang have stopped producing cocoa seedlings, however Cho Gao nursery still has 10,000 of seedlings produced in 2007 to provide local markets.

There are neither written nor verbal contracts between producers and buyers before or at the beginning of the cropping season. This is one of the difficulties mentioned by the interviewed nurseries. Nursery owners plan their annual seedling production based on their own experience and estimation of the demand. It is reported by one of the biggest nurseries in Ben Tre that last year there was a surplus of seedlings thus this year he did not produce more seedlings. In fact, given the high price of cocoa this year, there is a higher demand by farmers for seedlings and as a result, there is a shortage of seedlings.

Larger private nurseries however do establish contracts with farmers for the sale of seedlings already produced. Typically the contract specifies that half of the value of seedlings should be paid upfront and the remaining part should be repayed back after three years, in terms of cocoa pods. The nurseries sometimes are integrating the value chain from input to output (engaging both in trade of seedlings and in trade and fermentation of pods). In such cases they guarantee farmers that they will buy all the outputs of the farmers at market prices.

Study Team Field Work, July 2008

373. Sales occur mostly in the same districts (23%) or provinces (54%) where the nurseries are located, and about 23% of sale occur outside the provinces (see Table 72).

Table 72 Location of Nursery Sales

Province	Sample	Same district	Out of the district but same province	Other provinces	Total
Ben Tre	9	10.6	68.1	21.3	100
Tien Giang	1	-	100.0	-	100
Binh Phuoc	5	25.0	63.0	12.0	100
Baria Vung Tau	1	-	50.0	50.0	100
Dak Lak	8	39.1	44.6	16.3	100
Dak Nong	2	50.0	-	50.0	100
Dong Nai	2	10.6	68.1	21.3	100
Grand Total	**28**	**23.2**	**54.2**	**22.6**	**100**

Source: ACI NUR Survey, July 2008

374. Most sales (see Table 73) are directly to farmers (57.4%), but they also are made to projects (26.4%), traders (9.3%) and to government (6.9%).

Table 73 Distribution of Nursery Clients

Province	Sample	Selling agencies				
		Farmers	Government	Project	Traders	Total
Ben Tre	9	29.5	3.6	51.3	15.6	100
Tien Giang	1	-	-	100.0	-	100
Binh Phuoc	5	80.0	20.0	-	-	100
Baria Vung Tau	1	20.0	50.0	-	30.0	100
Dak Lak	8	64.1	-	23.8	12.1	100
Dak Nong	2	100.0	-	-	-	100
Dong Nai	2	90.0	4.0	6.0	-	100
Grand Total	**28**	**57.4**	**6.9**	**26.4**	**9.3**	**100**

Source: ACI NUR Survey, July 2008

375. Complaints by clients represent only a small percentage of sales (see Table 74), being 1.3% of sales; about 21% of nurseries received complaints. Typical complaints are expressed in terms of the seedling not being tall enough or not being from suitable clones. It should be noted that this result reflects the opinion of nurseries, not that of farmers. Farmers in BRVT, Binh Phuoc, Tien Giang and recently Dak Lak complaint very much about the quality of cocoa seedlings, in particular their major complaint is that seedlings are too small.

Table 74 Complaints to Nurseries

Province	Sample	Nurseries who received complains for the quality of the seedlings		Average % of sales receiving complains
		Number	%	
Ben Tre	9	3	33.3	1.3
Tien Giang	1	-	-	-
Binh Phuoc	5	1	20.0	-
Baria Vung Tau	1	1	100.0	1.5
Dak Lak	8	-	-	-
Dak Nong	2	-	-	-
Dong Nai	2	1	50.0	-
Grand Total	28	**6**	**21.4**	**1.3**

Source: ACI NUR Survey, July 2008

A.8 Finance

376. Almost 40% of nurseries have received loans (see Table 75), and the reason given by respondents who had not received loans is that they did not apply since they did not need capital.

Table 75 Nurseries receiving loans for nursery activities

Province	Sample	Nurseries receiving loans			
		Yes		No	
		Number	%	Number	%
Ben Tre	9	3	33.3	6	66.7
Tien Giang	1	-	-	1	100.0
Binh Phuoc	5	2	40.0	3	60.0
Baria Vung Tau	1	1	100.0	-	-
Dak Lak	8	3	37.5	5	62.5
Dak Nong	2	-	-	2	100.0
Dong Nai	2	2	100.0	-	-
Grand Total	**28**	**11**	**39.3**	**17**	**60.7**

Source: ACI NUR Survey, July 2008

377. Credit from bank is mostly used by largest nurseries (eg in Dong Nai). Loans from banks are at an average interest rate of 1.3% per month. The total value of loans amount to 2.7 VND billion (**Table 76**). Term of loans vary between 9 and 36 months, with most of the value of loans for the short-term (9 months)

Table 76 Loan Value and Terms

Province	Loans Value (VND million)		Term of the Loan (months)	
	Friends and Relatives	Banks	Friends and Relatives	Banks
	-	280	-	27
Tien Giang	-	-	-	-
Binh Phuoc	-	150	-	18
Baria Vung Tau	-	70	-	36
Dak Lak	40	-	6	-
Dak Nong	-	-	-	-
Dong Nai	-	2,200	-	9
Grand Total	**40**	**2,700**	**6**	**21**

Source: ACI NUR Survey, July 2008

378. In spite of not having used credit in the past, currently 50% of nurseries are seeking further loans (**Table 77**), presumably to expand a business that seems profitable.

Table 77 Nurseries who need further loans

Province	Sample	Nurseries seeking further loans			
		Yes		No	
		Number	%	Number	%
Ben Tre	9	4	44.4	5	55.6
Tien Giang	1	-	-	1	100.0
Binh Phuoc	5	3	60.0	2	40.0
Baria Vung Tau	1	1	100.0	-	-
Dak Lak	8	4	50.0	4	50.0
Dak Nong	2	-	-	2	100.0
Dong Nai	2	2	100.0	-	-
Grand Total	**28**	**14**	**50.0**	**14**	**50.0**

Source: ACI NUR Survey, July 2008

379. Comparing the working capital requirements with the current (mostly short-term) loans indicates under-finance of the nursery industry. Only 41% of total working capital is financed by financial institutions. Even to keep the same level of financing in the future, based on current growth of the nursery industry, would imply an increase of finance of 326% and 1099% from the current 2.7 VND billion to 11.5 VND billion in 2015 and 32.4 VND billion in 2020, respectively (Table 78).

Table 78 Current Finance and Projected Finance Requirements

Finance Requirement	Current Situation (VND million)	Projected 2015 (VND million)	Projected 2020 (VND million)	Increase 2008 to 2015 (%)	Increase 2008 to 2020 (%)
Working Capital requirement	6633	28254	79543	326%	1099%
Current Financing	2700	11500	32376	326%	1099%
Finance as % of Working Capital Requirements	41%	41%	41%		

Note: Projections are based on current seedling production expanding at 23% per year

A.9 Constraints

380. Nurseries have a host of constraints which are indicated in Table 79.

381. The major constraints indicated by respondents are (percentage of respondents in parenthesis):

- High price of inputs (71.4%)
- Diseases and pests (60.7%)
- Lack of government support (50%)
- Market (50%)
- Access to quality budwoods (43%): It should be higher since very few nurseries having their own budwood gardens.

Table 79 Constraints faced by the Nurseries (% of respondents)

Sno	Constraints /	Province							
		Ben Tre	Tien Giang	Binh Phuoc	Baria Vung Tau	Dak Lak	Dak Nong	Dong Nai	Total
	Sample -->	9	1	5	1	8	2	2	28
1	Budwood	22.2	-	20.0	-	75.0	100.0	50.0	42.9
2	Fertilization	22.2	-	-	-	-	-	-	7.1
3	Location of Nursery	-	-	-	-	-	50.0	-	3.6
4	Water	33.3	100.0	-	-	12.5	50.0	-	21.4
5	Diseases	66.7	-	40.0	100.0	62.5	100.0	50.0	60.7
6	Pests	-	-	20.0	100.0	62.5	100.0	-	32.1
7	Wind	-	-	-	-	12.5	-	50.0	7.1
8	Potting medium components	22.2	-	-	100.0	50.0	100.0	50.0	35.7
9	Propagation techniques	11.1	-	40.0	-	37.5	100.0	50.0	32.1
10	Controlling humidity	11.1	-	-	100.0	-	-	50.0	10.7

Sno	Constraints /	Province							
		Ben Tre	Tien Giang	Binh Phuoc	Baria Vung Tau	Dak Lak	Dak Nong	Dong Nai	Total
	Sample -->	9	1	5	1	8	2	2	28
11	Market	44.4	-	40.0	-	75.0	50.0	50.0	50.0
12	Price of inputs	88.9	-	60.0	100.0	62.5	100.0	50.0	71.4
13	Timely producing of seedlings	22.2	-	-	100.0	-	-	-	10.7
14	Infrastructure of Nursery	22.2	-	20.0	-	25.0	50.0	-	21.4
15	Seedlings quality assurance during transportation	-	-	-	-	-	50.0	-	3.6
16	Market Information	33.3	-	-	100.0	37.5	50.0	50.0	32.1
17	Support from Gov. agencies	33.3	-	40.0	100.0	62.5	100.0	50.0	50.0
18	Policy	11.1	-	-	100.0	25.0	100.0	50.0	25.0
19	Others	-	-	20.0	-	25.0	-	50.0	14.3

Source: ACI NUR Survey, July 2008

A.10 Priorities for Government Action

382. Table 80 summarizes the priorities for government action identified by nurseries. The major thrusts of the recommendations by nurseries could be summarize as follows:

1. Clear policy to promote cocoa sector
2. Improve quality control system of nurseries
3. Facilitate access to finance
4. Improve market information

Table 80 Priorities for Government Action Identified by Nurseries

Province	First Priority	Second Priority	Third Priority
Ben Tre	• Policy to promote nurseries • Subsidies on fertilizer, pesticides, gasoline • Inspection of inputs • Provide cocoa market information • Identify clones	• Legality for nurseries • Stabilize input prices • Ensure quality of seedlings • Loan provision • Contracts with nurseries	• Improve quality of cocoa beans
Tien Giang	• Better management of seedlings	•	•
Binh Phuoc	• Subsidize 50% of seedlings to farmers • Facilitated loans	• Subsidize inputs • Improve market for output	• Control of quality of seedlings • Policy for cocoa development • Support and research on pest management
Ba Ria Vung Tau	• Policy on cocoa development	• Control of quality	•
Dak Lak	• Policy on cocoa development • Subsidies on input and concessionary loans • Technical support	• Information on market prices • Import parent trees	• Facilitate loans • Encourage intercropping
Dak Nong	• Facilitate loans • More information on cocoa market	• Better clones • Encourage transformation of cropping patterns	• Training
Dong Nai	• Policy for development of cocoa • Facilitate loans	• Control of quality of seedlings • Procedures to identify parent trees	• Certify trees of nurseries

Source: ACI NUR Survey, July 2008

A.11 Innovations: Integration along the Value Chain and Partnerships

Box 4 Trong Duc Company: a case of integration in the cocoa value chain

Trong Duc Company is one of the largest cocoa nurseries in Viet Nam. The company is located in Dong Nai, a province where cocoa production has not received any support from provincial authorities. Mr My, the owner of Trong Duc is a young entrepreneur (37 years old) who started its involvement in cocoa in the year 2005. With a background in economics, he was fully aware that if he wanted to engage in cocoa, he had to do intensive training and study. He has undertaken self-study to the point that he is now knowledgeable about the technical aspects of cocoa nursery. The main weakness of this nursery is with root disease that has caused death of many seedlings. In the year 2006 he started his own nursery and in only 2 years he has achieved a production of 600,000 seedlings, making him on of the largest nursery in Viet Nam. He currently employs 25 workers.

Apart from his successful nursery business, last year Trong Duc company established an agro-forestry cocoa model on 12 ha of land previously owned by State Forest Enterprise. After only year, with an average density of 800 trees/ha, the cocoa trees grow amazingly well. As a result, many farmers in the neighboring areas start being interested in cocoa.

Trong Duc Company has formed an alliance with other input suppliers in the fertilizer and pesticides industry and established a contract system with 300 farmers. According to the contract, farmers are organized into cocoa clubs and Trong Duc Company is training them in cocoa cultivation technique. In addition he and its partners (chemical and pesticide companies) provide production materials to the farmers via cocoa clubs. 50% of material value is paid by farmers when entering the contractual engagement with the companies and the rest will be paid by beans or husks when the trees start giving pods (normally after 3 years) No interest rate would be applied until the end of the contacts.

If successful, the arrangement could easily transform Tran Duc Company from being a major input supplier (of seedlings) into a major trader of cocoa beans over the next 3 to 5 years. Mr My is quite confident about the approach and also about the prospects for cocoa agroforestry models. In his evaluation, between 10,000 and 20,000 ha of similar agroforestry land similar to the one that he is currently cultivated would be available in the buffer zone around Cat Tien National Park. The agroforestry model would, in his opinion, have the multiple advantages of preserving the forestry, increase livelihood of farmers, and contribute to increasing biodiversity. He is also an enthusiastic support of organic methods and thinks that organic cocoa could be produced in Viet Nam.

In addition to cocoa nursery and production, Mr My has already started production of cocoa powder, cocoa butter, and cocoa liquor, all of acceptable quality. He thinks forward that the company might integrate the various stages of value added from input provision for cocoa to manufacturing of chocolate.

Source: ACI Field Work, July 2008

Box 5 Nurseries as Promoter of Cocoa Industry

In spite of Dong Nai provincial authorities having a skeptical view about cocoa, cocoa production in the province is picking up, mainly as the result of the active role played by nurseries in the provinces such as Nguyen Loc Company and Trong Duc Company. Nguyen Loc started its activities in 2004and can be rightly considered the pioneer of cocoa in the province. Trong Duc started in 2006, but as of 2008 is already a major nursery in Viet Nam. Both companies are the only ones who are registered as limited companies. Both have business plan and a very professional attitude toward the business.

Their role in promoting cocoa has been through training of farmers and providing inputs on credit, under a contractual arrangement in which 50% is paid upon provision of the input and the remaining 50% is provided in kind, as the pods will be maturing. Effectively, most of the risk is taken by the nurseries.

Both companies have buying stations in the province and provide organic fertilizer on credit.

Source: ACI Field Work, July 2008

A.12 Nurseries Management Current Practices and Problems

1. **Pot medium**: the mixture of coconut sawdust, carbonized rice hull, organic manure and soil is commonly practiced and giving good result of seedling growth. However, this organic-rich medium attracts termite after transplanting in the field. This is a main loss particularly in SE areas and Central Highland in the first year of transplanting. To avoid the attack of termite, some nurseries in Binh Phuoc just use soil. This avoids the attraction to termite but the medium is too compact for the development of the seedling.
   Recommendation: Reducing or replacing the organic components in the pod medium by mixing sand or carbonized organic matters.

2. **Disease**. The humid conditions in the nursery favor the development of harmful fungi, especially Phytophthora palmivora. This causes the leaf blight in just few days. The problem becomes severe with old nurseries since diseases have time to accumulate but no proper treatment to eliminate it. Ridomil and Aliette are the two common fungicides used to control this disease. Almost no proper method to treat the potting medium is practiced.
   Recommendation: Nursery sanitation should be strictly practiced by using chemical or heat to eliminate the pathogens.

3. **Grafting**. Two types of grafting are used for asexual cocoa propagation. Nurseries in Ben Tre practice side grafting while in SE areas and Highland practice top grafting. Both techniques are good. More new nurseries are being established in those provinces planting cocoa to meet the increasing demand. It seems that there is not much problem (quantity of grafted seedling) in producing cocoa planting materials as long as the seedlings producers have plans in advance.

   With the increment demand of seedlings, some nurseries in Ben Tre raise the seedlings and graft them in very small bags common for forest tree such as Acacea sp. Small bags can be transported to long distance with low cost. When these plants reach the demanding areas, they are transferred to normal-size bags and kept in nurseries until the scions growth to the height 30 cm or more before being delivered to farmers. However, this method is not technically sound, since the bag is too short for the development of the long root system. Therefore, all the tap roots curve at the base of the short bags. As consequence, these deformed root systems will not develop well later in the farms.

4. **Clones**. The accuracy of recommended clones produced from nurseries is always a problem for all crops and cocoa is among them. Many growers will suffer after many years of hardworking and great expenses to establish their cocoa farm if they get the wrong varieties. Although this is so critical issue, so far there is no effective system to control it.
   Recommendation: Regulations and systems should be established to control quality of clones and planting materials distributed through nurseries.

A.13 Approved Clones

<table>
<tr>
<td>TD 1
  </td>
<td>1. Common name: TD 1
- Parentage: PA 35 x NA 32
- Architecture: Erect
- Color of young leaves: greenish
2. Husk
- Furrow : Intermediate
- Surface texture : Rough
- Shape: Rounded at top
+ Color:
- Young: Green
- Ripe pod: Yellow furrow
- Pod size: length 177.8mm; diameter 75.4mm.
- Pod index: 23.6
3. Bean:
- 1.11 g/bean
- Dry bean/wet bean (% of weight): 37-42
- Bean/pod: 37.75
- Fat content (%): 57.7
4. Pest and disease:
- VSD resistant
+ PPr susceptible
+ Pink disease susceptible
5. Yield (dry bean/ha): 2,4 ton</td>
</tr>
<tr>
<td>TD 2
  </td>
<td>1. Common name: TD 2
- Architecture: Erect
- Young leaves: greenish
2. Husk
- Furrow: Intermediate
- Surface texture: Rough
- Pointed tip
- Color
+ Young pod: Green
+ Ripe pod: Yellow
- Pod size: length187.8mm; diameter 72.1mm.
- Pod index: 23.2
3. Bean:
- 1.10 g/bean
- Dry bean/wet bean (% of weight): 38 - 40
- Beans/pod: 38.5
- Fat content (%): 56.6
VSD resistant, PPr susceptible, Pink disease susceptible
4. Yield (Dry bean/ha/year): 2.2 ton</td>
</tr>
</table>

TD 3 	1. Common name: **TD3** 2. Architecture: Erect, - Color of young leave: red 3. Husk: - Furrow: Shallow - Surface texture: Smooth – slight warty - Pointed tip - Color: Young pod: dark red Ripe pod: Red orange - Pod size: Length 150mm; Diameter 100mm. 4. Bean: - Dry bean/wet bean (% weight): 42 - Bean/ pod:40 - Fat content (% nip): 45-47 5. Disease: VSD moderate resistant, PPr resistant 6. Yield (dry bean/ha/year: 2,6 ton/ha
TD 5 	1. Common name: **TD5** - Parentage: UAWA 18* T>S>15/43.352 2. Architecture: Semi erect - Color of young leave: Reddish 3. Husk: - Furrow: Shallow - Surface texture: Smooth - Rounded tip - Color + Young pod: Red, greenish tinges + Ripe pod: Yellow - Pod index: 24 4. Husk: - 1.09 g/bean - Beans/pod: 38.2 - Fat content (%): 56.9 VSD resistant, PPr susceptible; Pink disease susceptible 5. Yield (dry bean/ha): 2.8 ton/ha

TD 6 	- Common name: **TD6** 1. Architecture: Erect - Color of young leaves: bright red 2. Husk: - Furrow: Shallow - Surface texture: Smooth - Rounded tip - Color: Young pod: Mixture of red and green Ripe pod: Red orange - Pod index: 23 3. Bean: - 1.04 g/bean - Dry bean/wet bean (% of weight): 32.8% - Beans/pod: 42 - Fat content (%): 53.0% VSD resistant, PPr moderate resistant 4. Yield (dry bean/ha): 2,4 ton/ha
TD 8 	- Common name: **TD8** - Architecture: Erect - Color of young leave: Greenish 1. Husk: - Furrow: Shallow - Surface texture: Smooth - Pointed tip - Color +Young pod: Green + Ripe pod: Yellow - Pod index: 23 2. Bean: - 1.04 g/bean - Dry bean/wet bean (% of weight): 32.8% - Beans/pod:42 - Fat content (%): 53.0% VSD resistant, PPr moderate resistant 3. Yield (dry bean/ha): 2,4 ton/ha

<table>
<tr>
<td>TD 10
  </td>
<td>Common name: TD10

1. Parentage: NA31 x PA15
2. Architecture: Semi erect
Color of young leaves: Reddish
3. Husk:
- Furrow: Intermediate
- Surface texture: Rough
-Rounded tip
- Color:
+ Young pod: Pink
+ Ripe pod:
- Pod index: 22
4. Bean:
- 1.28 g/bean
- Dry bean/wet bean (% of weight): 25
- Beans / pod: 36
5. VSD susceptible

6. Yield (dry bean/ha/year): 2.3 ton</td>
</tr>
<tr>
<td>TD 14
  </td>
<td>Common name: TD14

1. Parentage: PA 173 x SCA 9
2. Architecture: Semi erect
Color of young leave: Greenish
3. Husk:
- Furrow: Intermediate
- Rounded tip
- Color:
+ Young pod: Green
+ Ripe pod: Yellow
- Pod index: 27.35
4. Bean:
- 1.0 g/bean
- Dry bean/wet bean (% of weight): 36.80
- Beans / pod: 40.48
- Fat content (%): 59.5
5. VST moderate resistant

6. Yield (dry bean/ha): 2.2 ton</td>
</tr>
</table>

B FARMING PRACTICES

383. Farming practices in cocoa are varied across different locations of Viet Nam, highlighting the complexity of the sector and the resilience of cocoa to adapt to different agroecological environments. In July 2008, the Study Team conducted a survey of cocoa farmers in 7 main cocoa producing provinces, namely Tien Giang and Ben Tre in the Mekong River Delta (MRD); Dong Nai, Ba Ria Vung Tau, and Binh Phuoc in the Southeast (SE) region; and Dak Lac and Dak Nong in the Central Highlands (CH). The total sample of the survey included 103 farmers, of which 72 are relatively new to cocoa, having been involved in cocoa production less than 5 years; and 31 farmers have been involved in cocoa cultivation for at least 5 years. The majority of the relatively new farmers have been involved in the Success Alliance Project which provided considerable training and advisory services to them, in conjunction with the DARDs of the respective provinces and research organizations such as NLU and WASI.

384. The farming practices survey covers different aspects of the cocoa farming systems including production, fermentation, marketing, finance, training, constraints, and expectations of farmers.

385. Respondents are the most knowledgeable person in the household about cocoa cultivation.

B.1 General Characteristics of Farmers

386. The majority of respondents are men (95.2%), with an average age of 52 years (see **Table 81**).

Table 81 Distribution of Respondents by Gender

Provinces Surveyed	Male		Female		Total Respondents	
1. Tien Giang	16	(100.0)			16	(15.5)
2. Binh Phuoc	18	(94.7)	1	(5.3)	19	(18.4)
3. Dong Nai	7	(100.0)			7	(6.8)
4. Ba Ria - Vung Tau	12	(100.0)			12	(11.7)
5. Ben Tre	22	(91.7)	2	(8.3)	24	(23.3)
6. Daknong	12	(100.0)			12	(11.7)
7. Daklak	11	(84.6)	2	(15.4)	13	(12.6)
Total / Overall	**98**	**(95.2)**	**5**	**(4.9)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

387. The largest group of respondents has lower secondary education (47.6%), followed by higher secondary (32%), and primary (13.6%) education (see Table 82). Only a small number of cocoa farmers have just literacy (4.9%) no education (1.9%).

Table 82 Distribution of Respondents by Educational Attainment

Provinces Surveyed	Primary	Lower Secondary	Higher Secondary	Just Literate	No Education	Total Respondents
1. Tien Giang	2 (12.5)	3 (18.8)	9 (56.3)	2 (12.5)		16 (100.0)
2. Binh Phuoc		14 (73.7)	5 (26.3)			19 (100.0)
3. Dong Nai	1 (14.3)	3 (42.9)	3 (42.9)			7 (100.0)
4. Ba Ria - Vung Tau	1 (8.3)	5 (41.7)	4 (33.3)	1 (8.3)	1 (8.3)	12 (100.0)
5. Ben Tre	6 (25.0)	9 (37.5)	8 (33.3)	1 (4.2)		24 (100.0)
6. Daknong	4 (33.3)	7 (58.3)	1 (8.3)			12 (100.0)
7. Daklak		8 (61.5)	3 (23.1)	1 (7.7)	1 (7.7)	13 (100.0)
Total / Overall	**14 (13.6)**	**49 (47.6)**	**33 (32.0)**	**5 (4.9)**	**2 (1.9)**	**103 (100.0)**

Source: Field Survey, 2008, ACI.

388. The distribution of the starting year in which farmers have been involved in cocoa production is indicated in Table 83: 75% of farmers have started cocoa production after 2003.

Table 83 Distribution of Cocoa Farmers by Starting Year

Provinces Surveyed	Before 2001	2001	2002	2003	2004	2005	2006	Total Reporting
1. Tien Giang					2 (12.5)	14 (87.5)		16 (100.0)
2. Binh Phuoc					1 (5.3)	14 (73.7)	4 21.06	19 (100.0)
3. Dong Nai						6 (85.7)	1 14.29	7 (100.0)
4. Ba Ria - VT				2 (16.7)	4 (33.3)	1 (8.3)	5 41.67	12 (100.0)
5. Ben Tre	1 (4.2)		4 (16.7)	5 (20.8)	4 (16.7)	10 (41.7)	-0.01	24 (100.0)
6. Daknong		2 (16.7)	2 (16.7)	3 (25.0)	2 (16.7)		3 24.99	12 (100.0)
7. Daklak	1 (7.7)	1 (7.7)	1 (7.7)	4 (30.8)		1 (7.7)	5 38.47	13 (100.0)
Total / Overall	**2 (1.9)**	**3 (2.9)**	**7 (6.8)**	**14 (13.6)**	**13 (12.6)**	**46 (44.7)**	**18 (17.5)**	**103 (100.0)**

Source: Field Survey, 2008, ACI.

389. About 57% of farmers engaging in cocoa are migrants (see Table 84). With the exception of the MRD (Ben Tre and Tien Giang) where most of the cocoa farmers are originally from the same area, in other provinces, cocoa farmers are migrants from other provinces. In the Central Highlands (Dak Nong, Dak Lac) and in part of the SE (Binh Phuoc and Ba Ria Vung Tau), migrants are more than 90% of the respondents.

Table 84 Migration Status of Cocoa Farmers

Provinces Surveyed	Born in the Province		Migrant		Total Respondents	
1. Tien Giang	15	(93.8)	1	(6.3)	16	(15.5)
2. Binh Phuoc	1	(5.3)	18	(94.7)	19	(18.4)
3. Dong Nai	3	(42.9)	4	(57.1)	7	(6.8)
4. Ba Ria - Vung Tau	1	(8.3)	11	(91.7)	12	(11.7)
5. Ben Tre	23	(95.8)	1	(4.2)	24	(23.3)
6. Daknong	1	(8.3)	11	(91.7)	12	(11.7)
7. Daklak			13	(100.0)	13	(12.6)
Total / Overall	**44**	**(42.7)**	**59**	**(57.3)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

390. Almost 90% of respondents belong to the main ethnic group (Kinh). Other ethnicities include the Tay, the Cao Lan, the Chau Ro, the Hoa, the Dao, and the Nung (Table 85).

Table 85 Distribution of Cocoa Farmers by Ethnicity

Provinces Surveyed	Kinh		Tay		Cao Lan		Chau Ro		Hoa		Dao		Nung		Total reporting	
1. Tien Giang	16	(100.0)													16	(100.0)
2. Binh Phuoc	16	(84.2)	2	(10.5)	1	(5.3)									19	(100.0)
3. Dong Nai	5	(71.4)					1	(14.3)	1	(14.3)					7	(100.0)
4. Ba Ria - VT	12	(100.0)													12	(100.0)
5. Ben Tre	24	(100.0)													24	(100.0)
6. Daknong	7	(58.3)	1	(8.3)	1	(8.3)	1	(8.3)			1	(8.3)	1	(8.3)	12	(100.0)
7. Daklak	12	(92.3)			1	(7.7)									13	(100.0)
Total / Overall	**92**	**(89.3)**	**3**	**(2.9)**	**3**	**(2.9)**	**2**	**(1.9)**	**1**	**(1.0)**	**1**	**(1.0)**	**1**	**(1.0)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

391. Almost 84% of farmers join some association related to cocoa (Table 86). In most cases farmers join at least the cocoa club (87.2% of those who join an organization), but in some cases they also join cocoa groups and cooperatives (Table 87). Cocoa clubs are the most common type of cocoa organization. They are formed mainly as a vehicle for implementing training activities, either by projects such as SA or by DARD and even private nurseries.

Table 86 Number and Percentage Farmers Joining Some Organization

Provinces Surveyed	Joined Some Organization		Did Not Join Any Organization		Total Respondents	
1. Tien Giang	15	(93.8)	1	(6.3)	16	(15.5)
2. Binh Phuoc	18	(94.7)	1	(5.3)	19	(18.4)
3. Dong Nai	4	(57.1)	3	(42.9)	7	(6.8)
4. Ba Ria - Vung Tau	12	(100.0)			12	(11.7)
5. Ben Tre	24	(100.0)			24	(23.3)
6. Daknong	6	(50.0)	6	(50.0)	12	(11.7)
7. Daklak	7	(53.9)	6	(46.2)	13	(12.6)
Total / Overall	**86**	**(83.5)**	**17**	**(16.5)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 87 Types of Cocoa Organizations joined by the Respondents

Provinces Surveyed	Cocoa Producer Club		Co-opeative		Cocoa Group		Joining at Least One	
1. Tien Giang	11	(73.3)	2	(13.3)	10	(66.7)	15	(100.0)
2. Binh Phuoc	18	(100.0)			1	(5.6)	18	(100.0)
3. Dong Nai	3	(75.0)			1	(25.0)	4	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)					12	(100.0)
5. Ben Tre	24	(100.0)			8	(33.3)	24	(100.0)
6. Daknong	4	(66.7)			2	(33.3)	6	(100.0)
7. Daklak	3	(42.9)			5	(71.4)	7	(100.0)
Total / Overall	**75**	**(87.2)**	**2**	**(2.3)**	**27**	**(31.4)**	**86**	**(100.0)**

Source: Field Survey, 2008, ACI.

392. Family size is relatively small, with an average of 3.81 members per household (Table 88). Women represent 58% of family size. Members less than 30 years of age represent 59% of the sample, and those included in the age group 19-60 is 66%.

Table 88 Distribution of Total Population among Surveyed Households by Age

Provinces Surveyed	Less than 10 years		10 - 19 Years		20 - 29 Years		30 - 39 Years		40 - 49 Years		50 - 59 Years		60 - 69 Years		70 Years & Above		Total Members	
1. Tien Giang	0.1	(1.8)	0.8	(11.4)	2.3	(32.5)	0.9	(12.3)	0.7	(9.7)	1.5	(21.1)	0.3	(3.5)	0.6	(7.9)	7.1	(100)
2. Binh Phuoc	0.6	(11.1)	1.1	(20.2)	2.0	(37.4)	0.4	(7.1)	0.6	(12.1)	0.4	(8.1)	0.1	(1.0)	0.2	(3.0)	5.2	(100)
3. Dong Nai	0.6	(10.0)	1.9	(32.5)	1.3	(22.5)	0.6	(10.0)	0.6	(10.0)	0.7	(12.5)	0.1	(2.5)			5.7	(100)
4. Ba Ria - VT			0.8	(20.5)	1.6	(43.2)	0.6	(15.9)	0.3	(9.1)	0.2	(4.6)	0.3	(6.8)			3.7	(100)
5. Ben Tre	0.0	(2.3)	0.3	(18.6)	0.5	(27.9)	0.3	(14.0)	0.3	(14.0)	0.3	(14.0)	0.2	(9.3)			1.8	(100)
6. Daknong	0.3	(16.7)	0.8	(41.7)	0.3	(12.5)	0.2	(8.3)	0.3	(16.7)	0.1	(4.2)					2.0	(100)
7. Daklak	0.2	(10.7)	0.8	(35.7)	0.5	(21.4)	0.2	(7.1)	0.2	(10.7)	0.2	(10.7)			0.1	(3.6)	2.2	(100)
Total / Overall	**0.2**	**(6.4)**	**0.8**	**(21.2)**	**1.2**	**(31.4)**	**0.4**	**(10.7)**	**0.4**	**(11.2)**	**0.5**	**(12.5)**	**0.1**	**(3.3)**	**0.1**	**(3.3)**	**3.8**	**(100)**

Source: Field Survey, 2008, ACI.

393. Almost half (48%) of the household members are involved in cocoa (Table 89).

Table 89 Farmer's Family Members Involved in Cocoa Farming

Provinces Surveyed	Yes		No		Total	
1. Tien Giang	3.69	(51.8)	3.44	(48.3)	7.13	(100.0)
2. Binh Phuoc	2.47	(47.5)	2.74	(52.5)	5.21	(100.0)
3. Dong Nai	2.86	(50.0)	2.86	(50.0)	5.71	(100.0)
4. Ba Ria - Vung Tau	1.08	(29.6)	2.58	(70.5)	3.67	(100.0)
5. Ben Tre	1.17	(65.1)	0.63	(34.9)	1.79	(100.0)
6. Daknong	0.83	(41.7)	1.17	(58.3)	2.00	(100.0)
7. Daklak	0.85	(39.3)	1.31	(60.7)	2.15	(100.0)
Total / Overall	**1.83**	**(48.0)**	**1.98**	**(52.0)**	**3.81**	**(100.0)**

Source: Field Survey, 2008, ACI.

Box 6 Women and Cocoa

In Ben Tre province, cocoa farmers are members of the Farmer Cocoa Clubs which provide regular training on cocoa cultivation methods. Both women and men attend the training courses. However few women attend the training. Even though women are working in cocoa farms often men are the ones who attend the training. Some women said that if the training is conducted by the Farmers' Association their husbands will attend and if it is conducted by the Women's Union they will attend. Sometimes training is attended by both men and women, particularly when the content of training is useful to both men and women. Decisions about growing cocoa are made mostly by women; women are the ones involved in cocoa more than men. When joining the Farmer Clubs, women also join the Women's Union and the Farmers 'Association which coordinate with DARD and the Clubs to organize training. The duration of training is usually half day or one day every month so they think that it is not sufficient for them. They suggest that the technicians of the clubs should come to village more often.

When growing cocoa, women get some extra income and gain higher position within the family. There are less children dropping out of the school. About one third of women have children to help in the cocoa farms outside schooling time. Parents always encourage their children to continue schooling and do not ask them to work in the cocoa farms during school time. Women spend 6-7 hours per day to work in the farm; they spend at least 4 hours for taking care of cocoa trees. Their typical work involves weeding, watering, pruning, applying fertilizers and harvesting; their husbands spray pesticides, are involved in land preparation and planting. Only 2 out of 12 women interviewed are involved in fermentation because the harvested quantity is not sufficient. As a result they mainly sell the cocoa pods directly to the buying stations and receive cash.

Women respondents said that growing cocoa is very suitable to women, particularly married women since taking care of cocoa trees is compatible with taking care of their children, their homes, and also home gardening. Cocoa cultivation does not involve hard work and is suitable for the health of women. At present, no women have yet got sick or injured when working in cocoa cultivation. Women can get income from raising livestock, and growing rice, sugarcane, coconuts and bananas intercropped with cocoa trees. Between 80% and 90% of their income is for daily utilization and for schooling fees and around 10 % is for saving.

Women indicated that when growing cocoa trees the environment becomes better and even the climate feels cooler in the summer time; because of being intercropped with other trees, cocoa does not require additional land, and applying fertilizers for cocoa trees helps other trees to get higher yield.

Source: Study Team, July 2008

B.2 Labor

394. About 61% of households declare to have enough family labor to take care of cocoa production (Table 90). Those who do not have enough labor (39%) in the household partly remedy to their labor requirements by using friends and neighbors' labor (35% of households do that), but the majority of them (65%) hire labor (Table 91). Labor is available for hiring in all provinces. On average 2.5 workers per household are hired (Table 92).

395. Labor days hired are on average 137 per year (Table 93), with the highest average number of days in Binh Phuoc (262) and Dak Nong (178). The highest average wage rates are in Dak Lak (67,000 VND/day) and the lowest ones are in Tien Giang (45,000 VND/day). Wage rates differ considerably between men and women, ranging between 10,000 and 15,000 VND/day).

Table 90 Households having Enough Family Labor for Cocoa Farming

Provinces Surveyed	Yes		No		Total	
1. Tien Giang	12	(75.0)	4	(25.0)	16	(100.0)
2. Binh Phuoc	11	(57.9)	8	(42.1)	19	(100.0)
3. Dong Nai	1	(14.3)	6	(85.7)	7	(100.0)
4. Ba Ria - Vung Tau	6	(50.0)	6	(50.0)	12	(100.0)
5. Ben Tre	17	(70.8)	7	(29.2)	24	(100.0)
6. Daknong	8	(66.7)	4	(33.3)	12	(100.0)
7. Daklak	8	(61.5)	5	(38.5)	13	(100.0)
Total / Overall	**63**	**(61.2)**	**40**	**(38.8)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 91 Households who Seek Labor from Friends and Relatives

Provinces Surveyed	Yes		No		Total	
1. Tien Giang			4	(100.0)	4	(100.0)
2. Binh Phuoc	2	(25.0)	6	(75.0)	8	(100.0)
3. Dong Nai	4	(66.7)	2	(33.3)	6	(100.0)
4. Ba Ria - Vung Tau	3	(50.0)	3	(50.0)	6	(100.0)
5. Ben Tre	3	(42.9)	4	(57.1)	7	(100.0)
6. Daknong	2	(50.0)	2	(50.0)	4	(100.0)
7. Daklak			5	(100.0)	5	(100.0)
Total / Overall	**14**	**(35.0)**	**26**	**(65.0)**	**40**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 92 Number of Worker Hired for Cocoa Farming

Provinces Surveyed	One	Two	Three	Four	Five	Ten	Total Reporting	Average No. of Workers Hired
1. Tien Giang	2 (50.0)			1 (25.0)	1 (25.0)		4 (100.0)	2.8
2. Binh Phuoc	4 (50.0)	2 (25.0)	1 (12.5)	1 (12.5)			8 (100.0)	1.9
3. Dong Nai	5 (83.3)	1 (16.7)					6 (100.0)	1.2
4. Ba Ria - Vung Tau	3 (50.0)	1 (16.7)			2 (33.3)		6 (100.0)	2.5
5. Ben Tre	1 (14.3)	4 (57.1)		2 (28.6)			7 (100.0)	2.4
6. Daknong		2 (50.0)	1 (25.0)		1 (25.0)		4 (100.0)	3.0
7. Daklak	1 (20.0)	1 (20.0)	1 (20.0)			1 (20.0)	5 (100.0)	4.8
Total / Overall	**16 (40.0)**	**11 (27.5)**	**3 (7.5)**	**4 (10.0)**	**4 (10.0)**	**1 (2.5)**	**40 (100.0)**	**2.5**

Table 93 Average Use of Hired Labor and Daily Wage Rate

Provinces Surveyed	Average Labor Days Hired	Wage Daily Rate (VND/ Day)
1. Tien Giang	6	45,000
2. Binh Phuoc	262	51,250
3. Dong Nai	91	55,000
4. Ba Ria - Vung Tau	127	51,667
5. Ben Tre	133	51,429
6. Daknong	178	62,500
7. Daklak	84	67,000
Total / Overall	**137**	**54,375**
Source: Field Survey, 2008, ACI.		

396. Labor use per ha over the first 5 year period of cocoa cultivation follows a familiar V-shape with a relatively high first year use (mostly for land preparation), a through in year 2 and a progressive increase up to year 5 when harvesting and other activities such as fermentation become important (**Figure 30**). At the beginning of the production period, labor requirements average at 103 days/ha, they dip at 73 days/ha in the second year and they progressively increase up to 133 days/ha in the third year where activities such as harvesting and fermentation absorb more labor (Table 94. Watering plants is consistently a major labor absorbing activity throughout the production stages.

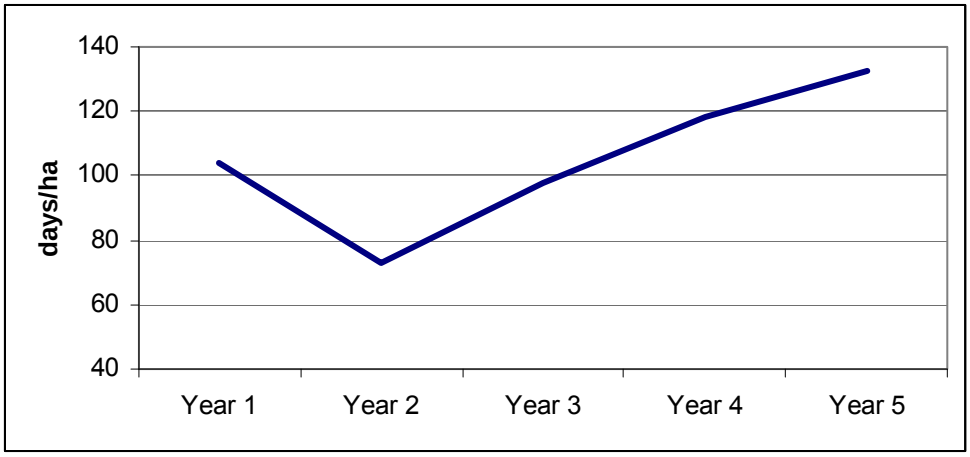


Figure 30 Labor use over the first 5 years of cocoa cultivation (days/ha)

Table 94 Average Annual Per Hectare Labor Use for Cocoa Farm

Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Average Over Time
1. Land Preparation	17.2	11.3	13.3			16.7
2. Weeding and Other	17.1	15.3	12.1	10.5	10.4	14.5
3. Hauling	2.2	0.6				2.2
4. Planting	11.5	4.3				11.3
5. Watering	36.4	34.7	35.1	37.5	40.8	36.3
6. Applying Fertilizer	10.9	10.3	8.9	7.8	8.4	9.7
7. Pruning	9.3	10.4	17.7	21.4	25.8	15.7
8. Spraying Pesticides	6.4	5.5	6.0	5.6	5.7	5.9
9. Harvesting		3.0	17.3	29.1	34.5	23.0
10. Fermentation & Drying		2.4	20.4	33.8	38.5	26.8
11 Total/ Overall	**103.9**	**72.9**	**97.5**	**118.3**	**132.6**	**98.9**

Source: Field Survey, 2008, ACI.

397. Only 18.5% of farmers report hiring women and only 2.9% report hiring workers less than 18 years of age.

Table 95 Women and Child Workers Hired for Cocoa Farming

Provinces Surveyed	Women Hired for Cocoa		Workers Less than 15 Years Hired for Cocoa		Workers Less than 15 Years (Both Hired and Family) Working on Cocoa		Workers Aged 15 - 18 Years Hired for Cocoa	
	HH Reporting	Average Hired	HH Reporting	Average Hired	HH Reporting	Average Hired	HH Reporting	Average Hired
1. Tien Giang	3 (18.8)	1.7						
2. Binh Phuoc	4 (21.1)	2.3						
3. Dong Nai								
4. Ba Ria - Vung Tau	1 (8.3)	1.0						
5. Ben Tre	5 (20.8)	2.0	1 (4.2)	1.0	1 (4.2)	1.0	1 (4.2)	1.0
6. Daknong	3 (25.0)	1.7						
7. Daklak	3 (23.1)	2.7					1 (7.7)	1.0
Total / Overall	**19 (18.5)**	**2.0**	**1 (1.0)**	**1.0**	**1 (1.0)**	**1.0**	**2 (1.9)**	**1.0**

Source: Field Survey, 2008, ACI.

Box 7 Children and Cocoa

Consistently with the Law on the Child's Rights which prohibits to hire or use children labor under the stipulated ages to work (more than 15 years of age), there are virtually no children found as hired labor on cocoa farms. Children can voluntarily work in the cocoa farms outside the schooling time but most parents want to create an opportunity for the children to study in order to get a better job in the future. In the MRD it is difficult to hire young people to work in the cocoa farms as they prefer to work in the industrial zones, factories and companies. During harvest season, farmers are able to hire only women or middle aged men/retired men.

Chau Thanh commune is one of the poorest communes in Giong Trom district. A focus group discussion with children indicated that children who work in cocoa farms of their family, do so outside the schooling time said and are involved in activities such as harvesting and weeding. Children indicated that growing cocoa provides extra income to their families and because of this the children feel more inclined to ask their parents for schooling fees, the living conditions are better, they can have more meat, fish or other nutrient foodstuff and sufficient rice to eat everyday. Children said that they want to get higher education and study in the city in order to earn higher income and get better jobs. Given the choice, they do not want to work in the farms.

Source: Study Team Focus Group Discussion in Ben Tre, July 2008

B.3 Activities

398. Almost all cocoa farmers conduct other farm activities besides cocoa production (Table 96); 21.4% of farmers are engaged in cocoa fermentation and trading. About 30% percent of the cocoa farmers are also engaged in non-farm activities. Among other farm activities, most of the cocoa farmers are engaged in other cash crops (such as coffee, pepper, and cashews) or fruit crops. A relatively small number of farmers are cultivating rice and even less are engaged in livestock activities.

Table 96 Households Reporting Cocoa Activities, Other Farm and Non-Farm Activities

Provinces Surveyed	Cocoa Activities						Other Farm Activities		Other Non-Farm Activities	
	Cocoa Nursery		Cocoa Production		Cocoa Trading/ Fermentation					
1. Tien Giang			16	(100.0)	2	(12.5)	15	(93.8)	7	(43.8)
2. Binh Phuoc	2	(10.5)	19	(100.0)	4	(21.1)	19	(100.0)	2	(10.5)
3. Dong Nai			7	(100.0)			7	(100.0)	2	(28.6)
4. Ba Ria - Vung Tau			12	(100.0)	3	(25.0)	12	(100.0)	1	(8.3)
5. Ben Tre			24	(100.0)	10	(41.7)	24	(100.0)	10	(41.7)
6. Daknong			12	(100.0)	2	(16.7)	11	(91.7)	3	(25.0)
7. Daklak			13	(100.0)	1	(7.7)	13	(100.0)	6	(46.2)
Total / Overall	**2**	**(1.9)**	**103**	**(100.0)**	**22**	**(21.4)**	**101**	**(98.1)**	**31**	**(30.1)**

Source: Field Survey, 2008, ACI.

B.4 Assets

399. Cocoa households own various assets for an average total estimated value of 1.2 VND billion (Table 97). About 90% of the assets value is represented by land (74%) and house (16%). The cocoa farmers interviewed on average are not among the poorest households in rural Viet Nam. Given the relatively novelty of the crop, it is expected that most of the farmers who try a new crop are not among the worse off and asset-poor.

Table 97 Assets Owned by the Households (VND million)

Provinces Surveyed	Land	House	Other Construction Facilities	Home Appliances	Motorized Transportation	Productive Farm Equipment	Livestock	Fish Pond	Total
1. Tien Giang	720	108	6	4	16	1	8	0.4	863
2. Binh Phuoc	1094	121	15	8	18	22	24	12.9	1314
3. Dong Nai	1107	1084	3	8	714	10	3		2929
4. Ba Ria - Vung Tau	765	153	17	8	16	6	18		983
5. Ben Tre	1141	118	7	4	3	37	13	0.8	1322
6. Daknong	808	173	18	4	18	6	30	17.2	1074
7. Daklak	530	207	38	8	34	5	22	6.9	851
Total / Overall	**905**	**204**	**14**	**6**	**63**	**15**	**17**	**5.5**	**1231**
Percentage of Total	73.5%	16.6%	1.1%	0.5%	5.1%	1.2%	1.4%	0.4%	100%

Source: Field Survey, 2008, ACI.

B.5 Land cultivated

400. The average size of cultivated land is 2.32 ha, which is considerably above the national average Table 98). The cocoa cultivated area averages 1.07 ha and represents 44% of total cultivated land.

Table 98 Average Size of Land Owned by Category and Usage

Provinces Surveyed	Total Cultivated Land (ha)	Total Own Cultivated Land (ha)	Rented-in Cultivated Land (ha)	Area Cocoa (Including Intercropping) (ha)	Area Under Other Crops (ha)
1. Tien Giang	1.27	1.26	0.01	0.72	0.55
2. Binh Phuoc	4.61	4.61		1.51	3.10
3. Dong Nai	2.09	1.98	0.11	1.40	0.69
4. Ba Ria - Vung Tau	1.45	1.34		0.85	0.60
5. Ben Tre	1.03	0.90		0.89	0.14
6. Daknong	3.53	3.53		0.95	2.52
7. Daklak	3.15	2.88	0.28	1.32	1.84
Total / Overall	**2.41**	**2.32**	**0.04**	**1.07**	**1.33**
Percentage of Total	100%	96%	2%	44%	55%

Source: Field Survey, 2008, ACI.

401. Soil types vary by location (Table 99). In the MRD soils of land cultivated with cocoa are alluvial, in the Binh Phuoc, Ba Ria Vung Tau, and Dong Nai are mostly red, in Ba Ria Vung Tau are mixed (red and black), in other provinces are either black (Dak Nong) or a mixture of black and mostly sandy in Eaka, and Lak districts of Dak Lak.

Table 99 Number and Percentage Households Reporting Soil Type of Land Used to Cultivate Cocoa

Provinces Surveyed	Alluvial	Red	Black	Sandy	Total reporting
1. Tien Giang	16 (100.0)				16 (100.0)
2. Binh Phuoc		18 (94.7)	1 (5.3)		19 (100.0)
3. Dong Nai		7 (100.0)			7 (100.0)
4. Ba Ria - Vung Tau		10 (83.3)	2 (16.7)		12 (100.0)
5. Ben Tre	24 (100.0)				24 (100.0)
6. Daknong		10 (83.3)	2 (16.7)		12 (100.0)
7. Daklak		5 (38.5)		8 (61.5)	13 (100.0)
Total / Overall	**40 (38.8)**	**50 (48.5)**	**5 (4.9)**	**8 (7.8)**	**103 (100.0)**

Source: Field Survey, 2008, ACI.

402. Salinity problems are reported only in the MRD in the months between Jan and May with a peak during March and April.

403. About 82% of farmers declare to have sufficient water during the dry months (Table 100). The farmers experiencing most problems with water during dry months are those in Tien Giang, Dong Nai and Binh Phuoc.

Table 100 Number and Percentage Households Reporting Water Sufficiency in Land Used to Cultivate Cocoa

Provinces Surveyed	Sufficient		Not Sufficient		Total Reporting	
1. Tien Giang	10	(62.5)	6	(37.5)	16	(100.0)
2. Binh Phuoc	14	(73.7)	5	(26.3)	19	(100.0)
3. Dong Nai	5	(71.4)	2	(28.6)	7	(100.0)
4. Ba Ria - Vung Tau	11	(91.7)	1	(8.3)	12	(100.0)
5. Ben Tre	24	(100.0)			24	(100.0)
6. Daknong	8	(66.7)	4	(33.3)	12	(100.0)
7. Daklak	13	(100.0)			13	(100.0)
Total / Overall	**85**	**(82.5)**	**18**	**(17.5)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

404. Windbreaks are used by 68% of farmers (Table 101). Tien Giang's farmers do not use windbreak presumably because wind is not a major issue in the province.

Table 101 Number and Percentage for Farmers having Windbreak in Land Used to Cultivate Cocoa

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang			16	(100.0)	16	(100.0)
2. Binh Phuoc	17	(89.5)	2	(10.5)	19	(100.0)
3. Dong Nai	7	(100.0)			7	(100.0)
4. Ba Ria - Vung Tau	11	(91.7)	1	(8.3)	12	(100.0)
5. Ben Tre	15	(62.5)	6	(25.0)	21	(87.5)
6. Daknong	7	(58.3)	5	(41.7)	12	(100.0)
7. Daklak	13	(100.0)			13	(100.0)
Total / Overall	**70**	**(68.0)**	**30**	**(29.1)**	**100**	**(97.1)**

Source: Field Survey, 2008, ACI.

405. Most farmers (98.1%) have good drainage (Table 102). Farmers in Tien Giang and Dak Nong do not have good drainage during Monsoon period.

Table 102 Number and Percentage Farmers Reporting Drainage in Land Used to Cultivate Cocoa

Provinces Surveyed	Well Drained		Problem in Monsoon		Total Reporting	
1. Tien Giang	15	(93.8)	1	(6.3)	16	(100.0)
2. Binh Phuoc	19	(100.0)			19	(100.0)
3. Dong Nai	7	(100.0)			7	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)			12	(100.0)
5. Ben Tre	24	(100.0)			24	(100.0)
6. Daknong	11	(91.7)	1	(8.3)	12	(100.0)
7. Daklak	13	(100.0)			13	(100.0)
Total / Overall	**101**	**(98.1)**	**2**	**(1.9)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

406. Almost 80% of farmers cultivate cocoa on flat land (Table 103). In the highlands a large number of farmers cultivate on sloping land, mostly in moderate slope, but occasionally (Binh Phuoc) on steep slopes as well.

Table 103 Number and Percentage Farmers Reporting Slope of Land Used to Cultivate Cocoa

Provinces Surveyed	Flat		Moderate Slope		Very Steep		Total Reporting	
1. Tien Giang	16	(100.0)					16	(100.0)
2. Binh Phuoc	9	(47.4)	9	(47.4)	1	(5.3)	19	(100.0)
3. Dong Nai	5	(71.4)	2	(28.6)			7	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)					12	(100.0)
5. Ben Tre	24	(100.0)					24	(100.0)
6. Daknong	7	(58.3)	5	(41.7)			12	(100.0)
7. Daklak	9	(69.2)	4	(30.8)			13	(100.0)
Total / Overall	**82**	**(79.6)**	**20**	**(19.4)**	**1**	**(1.0)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

407. Intercropping cocoa with other crops is practiced by 87.4% of farmers (Table 104). Monoculture is practiced in the highlands and South East (Dong Nai). In terms of cultivated area intercropping represents 85.4%% of total cultivated cocoa area.

Table 104 Number and Percentage Farmers Reporting Cocoa Cultivation Method

Provinces Surveyed	Monoculture		Inter-cropping		Total Reporting	
1. Tien Giang			27	(168.8)	27	(168.8)
2. Binh Phuoc			25	(131.6)	25	(131.6)
3. Dong Nai	6	(85.7)	6	(85.7)	11	(157.1)
4. Ba Ria - Vung Tau	5	(41.7)	7	(58.3)	11	(91.7)
5. Ben Tre			14	(58.3)	14	(58.3)
6. Daknong	2	(16.7)	5	(41.7)	7	(58.3)
7. Daklak	3	(23.1)	6	(46.2)	8	(61.5)
Total / Overall	**16**	**(15.5)**	**90**	**(87.4)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

408. The density of cocoa trees in intercropping farming system is 673 trees/ha and in monoculture is 1003/ha (Table 105).

Table 105 Average Number of Cocoa Trees under Different Cultivation Practices

	Trees/household						Trees/ha		
Provinces Surveyed	Monoculture		Inter-cropping		Total		Monoculture	Inter-cropping	Total
1. Tien Giang			835	(100.0)	835	(100.0)		637	637
2. Binh Phuoc			1233	(100.0)	1233	(100.0)		670	670
3. Dong Nai	1261	(58.0)	914	(42.0)	2175	(100.0)	1051	743	895
4. Ba Ria - Vung Tau	317	(56.0)	249	(44.0)	566	(100.0)	1022	755	871
5. Ben Tre			313	(100.0)	313	(100.0)		548	548
6. Daknong	92	(16.9)	450	(83.1)	542	(100.0)	1019	900	918
7. Daklak	215	(41.5)	304	(58.5)	519	(100.0)	979	707	799
Total / Overall	**160**	**(20.8)**	**612**	**(79.2)**	**772**	**(100.0)**	**1003**	**673**	**722**

Source: Field Survey, 2008, ACI.

409. Almost 83% of farmers have trees aged 2-5 years, 31% have trees less than 2 years old, and 25% of households have trees aged 5 years and more (Table 106 to Table 108). In terms of stock of trees, trees aged between 2 and 5 years represent 62% of the total, those aged less than 2 years represent 16% of the total, and those 5 years and more represent 22% of the total (Table 109).

Table 106 Farmers having Cocoa Trees Less than 2 Years

	Number and Percentage of Farmers having Cocoa Trees Less than 2 Years						Average Number of Cocoa Trees under 2 Years (tree/hh)					
Provinces Surveyed	Monoculture		Inter-cropping		Total Reporting		Monoculture		Inter-cropping		Total	
1. Tien Giang			9	(56.3)	9	(56.3)			79	(100.0)	79	(100.0)
2. Binh Phuoc			9	(47.4)	9	(47.4)			252	(100.0)	252	(100.0)
3. Dong Nai	4	(57.1)	3	(42.9)	7	(100.0)	171	(44.4)	214	(55.6)	386	(100.0)
4. Ba Ria - Vung Tau	2	(16.7)	1	(8.3)	2	(16.7)	117	(82.4)	25	(17.7)	142	(100.0)
5. Ben Tre			4	(16.7)	4	(16.7)			56	(100.0)	56	(100.0)
6. Daknong												
7. Daklak	1	(7.7)			1	(7.7)	77	(100.0)			77	(100.0)
Total / Overall	**7**	**(6.8)**	**26**	**(25.2)**	**32**	**(31.1)**	**35**	**(28.1)**	**89**	**(71.9)**	**124**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 107 Farmers having Cocoa Trees aged 2-5 Years

	Number and Percentage of Farmers having Cocoa Trees Aged 2-5 Years						Average Number of Cocoa Trees aged 2-5 Years (tree/hh)					
Provinces Surveyed	Monoculture		Inter-cropping		Total Reporting		Monoculture		Inter-cropping		Total	
1. Tien Giang			25	(156.3)	25	(156.3)			570	(100.0)	570	(100.0)
2. Binh Phuoc			22	(115.8)	22	(115.8)			889	(100.0)	889	(100.0)
3. Dong Nai	5	(71.4)	4	(57.1)	8	(114.3)	550	(56.0)	431	(44.0)	981	(100.0)
4. Ba Ria - Vung Tau	2	(16.7)	6	(50.0)	7	(58.3)	88	(32.4)	183	(67.6)	270	(100.0)
5. Ben Tre			12	(50.0)	12	(50.0)			233	(100.0)	233	(100.0)
6. Daknong	2	(16.7)	3	(25.0)	5	(41.7)	92	(31.4)	200	(68.6)	292	(100.0)
7. Daklak	1	(7.7)	5	(38.5)	6	(46.2)	100	(34.7)	188	(65.3)	288	(100.0)
Total / Overall	**10**	**(9.7)**	**77**	**(74.8)**	**85**	**(82.5)**	**71**	**(14.9)**	**405**	**(85.1)**	**475**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 108 Farmers having Cocoa Trees aged 5 years and more

	Number and Percentage of Farmers having Cocoa Trees Aged 5 years and more						Average Number of Cocoa Trees aged 5 Years and more (tree/hh)					
Provinces Surveyed	Monoculture		Inter-cropping		Total Reporting		Monoculture		Inter-cropping		Total	
1. Tien Giang			10	(62.5)	10	(62.5)			186	(100.0)	186	(100.0)
2. Binh Phuoc			3	(15.8)	3	(15.8)			71	(100.0)	71	(100.0)
3. Dong Nai	2	(28.6)	3	(42.9)	4	(57.1)	539	(66.8)	269	(33.2)	808	(100.0)
4. Ba Ria - Vung Tau	3	(25.0)	1	(8.3)	4	(33.3)	113	(73.0)	42	(27.0)	154	(100.0)
5. Ben Tre			2	(8.3)	2	(8.3)			23	(100.0)	23	(100.0)
6. Daknong			2	(16.7)	2	(16.7)			250	(100.0)	250	(100.0)
7. Daklak	1	(7.7)	1	(7.7)	1	(7.7)	38	(25.0)	115	(75.0)	154	(100.0)
Total / Overall	**6**	**(5.8)**	**22**	**(21.4)**	**26**	**(25.2)**	**55**	**(32.4)**	**114**	**(67.6)**	**169**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 109 Composition of the Stock of Cocoa Tree

	Mono	Inter	Total	Mono	Inter	Total
	Trees/household			Percentages %		
Less than 2 years	35	89	124	21.8%	14.7%	16.2%
2 to 5 years	71	405	475	44.2%	66.5%	61.9%
More than 5 years	55	114	169	34.0%	18.8%	21.9%
	160	608	769	100.0%	100.0%	100.0%

Source: Calculations based on Field Survey, 2008, ACI.

410. 84.5% of farmers have productive trees, at different stages of production (Table 110). Average productive area per household is 0.88 ha (Table 111). The average productive area for intercropping is considerably higher (0.76 ha per household) than for monoculture (0.12 ha).

411. Cocoa pods productivity is 4.6 tonnes per household and 5.2 tonnes/ha (Table 112). Productivity in monoculture is slightly higher in monoculture than in intercropping (6.3 tonnes/ha versus 5.1 tonnes/ha). Considering however that in monoculture there is a higher number of trees per ha than in intercropping, the average productivity per tree is higher in intercropping system (Table 113), a reflection partly of the age composition of trees and partly of cultivation techniques and planting material.

Table 110 Number and Percentage Farmers Reporting Cocoa Productive Area

Provinces Surveyed	Monoculture		Inter-cropping		Total Reporting	
1. Tien Giang			27	(100.0)	27	(168.8)
2. Binh Phuoc			21	(100.0)	21	(110.5)
3. Dong Nai	6	(54.6)	6	(54.6)	11	(157.1)
4. Ba Ria - Vung Tau	3	(42.9)	4	(57.1)	7	(58.3)
5. Ben Tre			13	(100.0)	13	(54.2)
6. Daknong	1	(25.0)	3	(75.0)	4	(33.3)
7. Daklak	2	(66.7)	2	(66.7)	3	(23.1)
Total / Overall	**12**	**(14.0)**	**76**	**(88.4)**	**86**	**(83.5)**

Source: Field Survey, 2008, ACI.

Table 111 Average Productive Area Under Cocoa (Hectare/household)

Provinces Surveyed	Monoculture		Inter-cropping		Total Reporting	
1. Tien Giang			1.31	(100.0)	1.31	(100.0)
2. Binh Phuoc			1.46	(100.0)	1.46	(100.0)
3. Dong Nai	1.20	(49.4)	1.23	(50.6)	2.43	(100.0)
4. Ba Ria - Vung Tau	0.17	(47.6)	0.18	(52.4)	0.35	(100.0)
5. Ben Tre			0.51	(100.0)	0.51	(100.0)
6. Daknong	0.03	(7.2)	0.32	(92.8)	0.35	(100.0)
7. Daklak	0.14	(41.9)	0.19	(58.1)	0.33	(100.0)
Total / Overall	**0.12**	**(13.8)**	**0.76**	**(86.2)**	**0.88**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 112 Average Productivity (tonnes of pod/household and tonnes/ha)

	Unit: Tonnes/household						Unit: Tonnes/ha		
Provinces Surveyed	Mono culture		Inter-cropping		Total Reporting		Mono culture	Inter-cropping	Total Reporting
1. Tien Giang			7.7	(100.0)	7.7	(100.0)		5.9	5.9
2. Binh Phuoc			5.9	(100.0)	5.9	(100.0)		4.1	4.1
3. Dong Nai	5.8	(54.7)	4.8	(45.3)	10.7	(100.0)	4.9	3.9	4.4
4. Ba Ria - Vung Tau	1.6	(47.1)	1.8	(52.9)	3.5	(100.0)	9.6	10.2	10.0
5. Ben Tre			2.7	(100.0)	2.7	(100.0)		5.3	5.3
6. Daknong	0.0	(1.3)	2.6	(98.7)	2.6	(100.0)	1.3	8.1	7.5
7. Daklak	1.3	(65.8)	0.7	(34.2)	2.0	(100.0)	9.2	3.5	5.9
Total / Overall	**0.8**	**(16.4)**	**3.8**	**(83.6)**	**4.6**	**(100.0)**	**6.3**	**5.1**	**5.2**

Source: Field Survey, 2008, ACI.

Table 113 Average productivity (kg of pod/tree)

	Trees/ha			Productivity per tree (kg/tree)		
Provinces Surveyed	Monoculture	Inter-cropping	Total	Monoculture	Inter-cropping	Total
1. Tien Giang		637	637		9.2	9.2
2. Binh Phuoc		670	670		6.1	6.1
3. Dong Nai	1051	743	895	4.6	5.3	4.9
4. Ba Ria - Vung Tau	1022	755	871	9.4	13.5	11.4
5. Ben Tre		548	548		9.6	9.6
6. Daknong	1019	900	918	1.3	9.0	8.1
7. Daklak	979	707	799	9.4	5.0	7.4
Total / Overall	**1003**	**673**	**722**	6.2	7.5	7.2

B.6 Clones

412. TD3, TD5, and TD6 are the most common clones used, with 76.6%, 75.7%, and 63.1% of farmers utilizing them, respectively (Table 114). A large number of farmers (77.7%) use planting material other than approved clones.

Table 114 Number and Percentage Farmers Using Different Types of Cocoa Seedlings

Provinces Surveyed	TD1		TD2		TD3		TD5		TD6		TD8		TD10		TD14		Other	
1. Tien Giang	12	(75.0)	2	(12.5)	15	(93.8)	16	(100.0)	16	(100.0)	1	(6.3)	1	(6.3)	1	(6.3)	14	(87.5)
2. Binh Phuoc	3	(15.8)	4	(21.1)	16	(84.2)	15	(79.0)	11	(57.9)	13	(68.4)	12	(63.2)	8	(42.1)	13	(68.4)
3. Dong Nai	2	(28.6)	3	(42.9)	7	(100.0)	7	(100.0)	4	(57.1)	4	(57.1)	6	(85.7)	3	(42.9)	4	(57.1)
4. Ba Ria - VT	10	(83.3)	4	(33.3)	11	(91.7)	10	(83.3)	8	(66.7)	5	(41.7)	3	(25.0)	4	(33.3)	5	(41.7)
5. Ben Tre	20	(83.3)	10	(41.7)	24	(100.0)	23	(95.8)	23	(95.8)	19	(79.2)	10	(41.7)	6	(25.0)	19	(79.2)
6. Daknong	2	(16.7)	2	(16.7)	3	(25.0)	4	(33.3)	2	(16.7)	2	(16.7)	2	(16.7)	2	(16.7)	12	(100.0)
7. Daklak			1	(7.7)	3	(23.1)	3	(23.1)	1	(7.7)	1	(7.7)	1	(7.7)			13	(100.0)
Total / Overall	**49**	**(47.6)**	**26**	**(25.2)**	**79**	**(76.7)**	**78**	**(75.7)**	**65**	**(63.1)**	**45**	**(43.7)**	**35**	**(34.0)**	**24**	**(23.3)**	**80**	**(77.7)**

413. The declared preferred clones are TD6, TD9, TD5, and TD3, respectively. The reasons for the preference for a certain clone are the combination of various factors including yield, resistance to disease, and resistance to pest, shape, and other. In the case of TD3, the reasons are illustrated in Table 115. The result of the interview is quite surprising and hard to match with the data from nurseries, who indicate TD3 and TD5 as the most common clones. Perhaps an explanation of this anomaly in the data is that farmers are not very clear about clones differences. For example TD3 and TD6 clones look similar; TD2, TD8, and TD10 also look similar and farmers might get confused as to the exact clones they are using.

Table 115 Primary Preference of Cocoa Clones

Sample	**16**		**19**		**7**		**12**		**24**		**12**		**13**		**103**	
	Tien Giang		Binh Phuoc		Dong Nai		Ba Ria - Vung Tau		Ben Tre		Daknong		Daklak		Total / Overall	
1. TD 1							1	(8.3)					1	(9.1)	2	(2.3)
2. TD 2							1	(8.3)	1	(4.4)			2	(18.2)	4	(4.5)
3. TD 3			1	(7.1)			2	(16.7)	5	(21.7)			1	(9.1)	9	(10.1)
4. TD 4					1	(14.3)									1	(1.1)
5. TD 5			2	(14.3)	1	(14.3)	3	(25.0)	2	(8.7)	3	(37.5)	1	(9.1)	12	(13.5)
6. TD 6	8	(57.1)	3	(21.4)			2	(16.7)	8	(34.8)	2	(25.0)	1	(9.1)	24	(27.0)
7. TD 7					1	(14.3)	1	(8.3)							2	(2.3)
8. TD 8					2	(28.6)							1	(9.1)	3	(3.4)
9. TD 9	6	(42.9)	3	(21.4)	1	(14.3)	2	(16.7)	4	(17.4)					16	(18.0)
10. TD 10			4	(28.6)					2	(8.7)					6	(6.7)
11. cay ghep											3	(37.5)	2	(18.2)	5	(5.6)
12. Total/ Overall	14	(100.0)	14	(100.0)	7	(100.0)	12	(100.0)	23	(100.0)	8	(100.0)	11	(100.0)	89	(100.0)

Source: Field Survey, 2008, ACI.

Table 116 Reasons for Primary Preference of clone TD3

Provinces Surveyed	High yield	Resistance to disease	Resistance to pest	Shape / architecture	Others	Total Reporting
1. Tien Giang						
2. Binh Phuoc	1 (100.0)					1 (5.3)
3. Dong Nai						
4. Ba Ria - Vung Tau	1 (50.0)			1 (50.0)		2 (16.7)
5. Ben Tre	4 (80.0)	1 (20.0)	1 (20.0)	2 (40.0)	2 (40.0)	5 (20.8)
6. Daknong						
7. Daklak	1 (100.0)	1 (100.0)			1 (100.0)	1 (7.7)
Total / Overall	**7 (77.8)**	**2 (22.2)**	**1 (11.1)**	**3 (33.3)**	**3 (33.3)**	**9 (8.7)**

Source: Field Survey, 2008, ACI.

B.7 Intercropping

414. Households intercrop cocoa with a number of other plants. The most common types of plants include coconut, cashew nut, coffee, pepper, durian, other fruit trees, and other trees (Table 117).

Table 117 Number and Percentage of HH Reporting Other Trees Intercropped with Cocoa

Provinces Surveyed	Coconut	Cashew Nut	Coffee	Pepper	Durian	Fruits	Other Trees	Total Reporting
1. Tien Giang	15 (93.8)					3 (18.8)		16 (100.0)
2. Binh Phuoc	3 (15.8)	16 (84.2)	3 (15.8)	2 (10.5)				19 (100.0)
3. Dong Nai		5 (71.4)	2 (28.6)	1 (14.3)	4 (57.1)	2 (28.6)	1 (14.3)	7 (100.0)
4. Ba Ria - VT		5 (45.5)	4 (36.4)	10 (90.9)	3 (27.3)	2 (18.2)	1 (9.1)	11 (100.0)
5. Ben Tre	17 (70.8)				2 (8.3)	19 (79.2)	11 (45.8)	24 (100.0)
6. Daknong		1 (14.3)	1 (14.3)		4 (57.1)	3 (42.9)		7 (100.0)
7. Daklak		7 (77.8)	2 (22.2)		1 (11.1)	1 (11.1)	1 (11.1)	9 (100.0)
Total / Overall	**35 (37.6)**	**34 (36.6)**	**12 (12.9)**	**13 (14.0)**	**14 (15.1)**	**30 (32.3)**	**14 (15.1)**	**93 (100.0)**

Source: Field Survey, 2008, ACI.

B.8 Use of Fertilizers and Pesticides, and By-products

415. Farmers use different types of fertilizers. Most of them use chemical fertilizer (96.1%) and organic fertilizer (78.6%). About half of them use micro-organism fertilizer (Table 118).

416. In spite of the possibility of using by-products in a number of ways (fertilizer, compost, feed, liquor, etc.) there is a relatively large number of farmers doing nothing (Table 120 to Table 124) with by-products such as leaves (35.9% of farmers do nothing with it), branches (34%), husk (33.3%), placenta (54.7%), and mucilage juice (86.5%). Several farmers use leaves and branches for mulching. For example, considerable amount of nutrients losses could be avoided by utilizing pods (**Figure 31**).

417. Farmers use a large variety of chemical treatments as pesticides or medicines for plant diseases. Some of the products are actually prohibited, but still used. These include Methyl, Motox, Monitor, and Vofatoc.

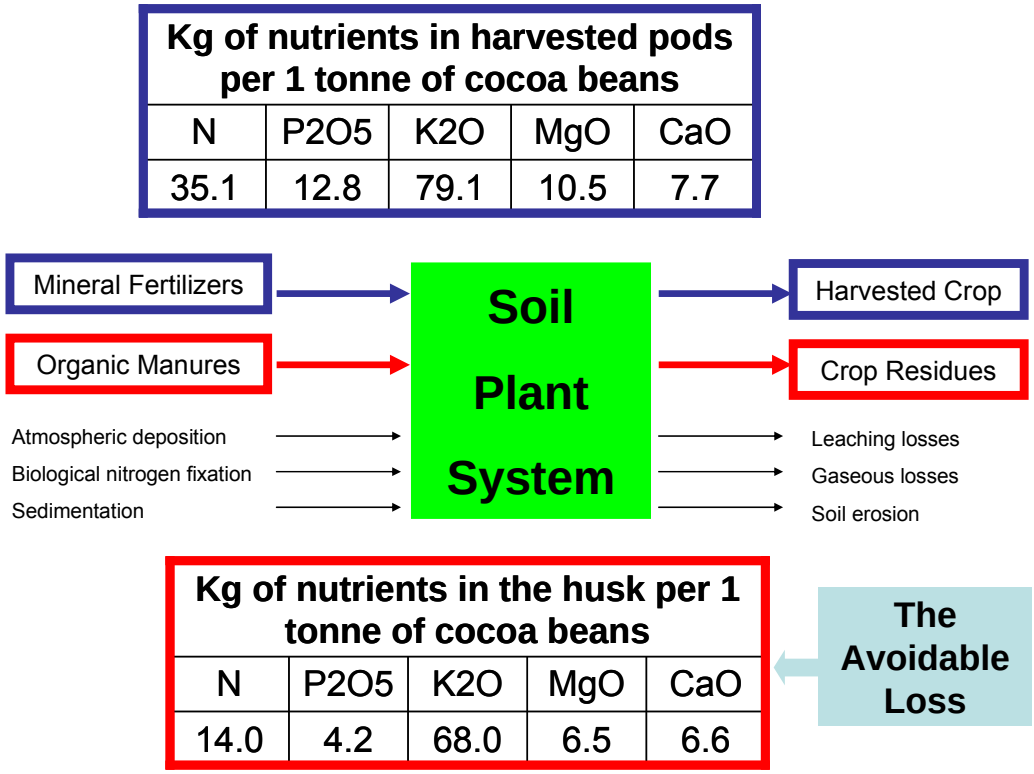
418. As regards use of containers of fertilizers and pesticides (Table 125), farmers take care of them by burying them (40.8%) or burning them (18.5%). A large number of farmers,

however, either throw them away or sell them to recycling collectors. The husk is used for organic fertilizer. Placenta, leaves, and husks are used as feed for fish, pig, and goat.

Table 118 Number and Percentage of HH Using Different Types of Fertilizers

Provinces Surveyed	Chemical Fertilizer		Organic		Micro-Organism		Total Reporting	
1. Tien Giang	16	(100.0)	15	(93.8)	7	(43.8)	16	(100.0)
2. Binh Phuoc	18	(94.7)	14	(73.7)	14	(73.7)	19	(100.0)
3. Dong Nai	5	(71.4)	5	(71.4)	2	(28.6)	7	(100.0)
4. Ba Ria - Vung Tau	11	(91.7)	9	(75.0)	12	(100.0)	12	(100.0)
5. Ben Tre	24	(100.0)	21	(87.5)	9	(37.5)	24	(100.0)
6. Daknong	12	(100.0)	7	(58.3)	5	(41.7)	12	(100.0)
7. Daklak	13	(100.0)	10	(76.9)	6	(46.2)	13	(100.0)
Total / Overall	**99**	**(96.1)**	**81**	**(78.6)**	**55**	**(53.4)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.



Source: Communication from Peter van Griesven

Figure 31 Nutrient content and nutrient losses

Table 119 Pesticides and Medicines Used by Farmers

Pesticides and Medicines Used for Diseases	Tien Giang	Binh Phuoc	Dong Nai	Ba Ria - Vung Tau	Ben Tre	Daknong	Daklak	Total / Overall
actara		1 (2.9)						1 (0.9)
agrifoot						1 (12.5)		1 (0.9)
aliette	1 (4.2)	5 (14.3)				1 (12.5)		7 (6.1)
alphacua 10ec		1 (2.9)						1 (0.9)
amara		1 (2.9)						1 (0.9)
actara					1 (5.9)			1 (0.9)
atarin							1 (7.7)	1 (0.9)
bassa	1 (4.2)	1 (2.9)	1 (12.5)	2 (20.0)	1 (5.9)		2 (15.4)	8 (7.0)
basudin	2 (8.3)			3 (30.0)	2 (11.8)			7 (6.1)
bi 58		1 (2.9)	1 (12.5)				1 (7.7)	3 (2.6)
bodemol		1 (2.9)						1 (0.9)
busa, tungrin			1 (12.5)					1 (0.9)
cacben							1 (7.7)	1 (0.9)
caronthrin ?	1 (4.2)							1 (0.9)
cheuylum ?			1 (12.5)					1 (0.9)
confidor	1 (4.2)	3 (8.6)					2 (15.4)	6 (5.2)
confidor; lentrek		1 (2.9)						1 (0.9)
coc 85		1 (2.9)			2 (11.8)	3 (37.5)	1 (7.7)	7 (6.1)
cymerin		1 (2.9)		1 (10.0)				2 (1.7)
dargon	1 (4.2)							1 (0.9)
furadan							1 (7.7)	1 (0.9)
fastac	1 (4.2)				1 (5.9)			2 (1.7)
fertox		2 (5.7)		1 (10.0)				3 (2.6)
fuzan							1 (7.7)	1 (0.9)
icon		1 (2.9)						1 (0.9)
karate		1 (2.9)			2 (11.8)	1 (12.5)		4 (3.5)
koside		1 (2.9)						1 (0.9)
lenfos		1 (2.9)						1 (0.9)
methyl P				1 (10.0)				1 (0.9)
monitor P	1 (4.2)							1 (0.9)
motox P		4 (11.4)						4 (3.5)
my dan		1 (2.9)						1 (0.9)
mocap		1 (2.9)					1 (7.7)	2 (1.7)
norshield	1 (4.2)	1 (2.9)						2 (1.7)
wofatoc P						1 (12.5)	2 (15.4)	3 (2.6)
pastacsec ?		1 (2.9)						1 (0.9)
regent	1 (4.2)			1 (10.0)	3 (17.6)			5 (4.3)
ridomin	2 (8.3)				1 (5.9)			3 (2.6)
sapenalpha ?	1 (4.2)							1 (0.9)
sherpa						1 (12.5)		1 (0.9)
sherbush			1 (12.5)					1 (0.9)
sherpa			1 (12.5)					1 (0.9)
siberin ?	1 (4.2)							1 (0.9)
sikor, matalaxi	1 (4.2)							1 (0.9)
southsher					1 (5.9)			1 (0.9)
suprathion			1 (12.5)					1 (0.9)
supracid	3 (12.5)	2 (5.7)			2 (11.8)			7 (6.1)
tactac					1 (5.9)			1 (0.9)

Pesticides and Medicines Used for Diseases	Tien Giang	Binh Phuoc	Dong Nai	Ba Ria - Vung Tau	Ben Tre	Daknong	Daklak	Total / Overall
tricoderma	3 (12.5)							3 (2.6)
tungrin		1 (2.9)						1 (0.9)
uplao			1 (12.5)					1 (0.9)
validacine		1 (2.9)						1 (0.9)
vibasu	1 (4.2)			1 (10.0)				2 (1.7)
vitasilk	1 (4.2)							1 (0.9)
Total	24 (100.0)	35 (100.0)	8 (100.0)	10 (100.0)	17 (100.0)	8 (100.0)	13 (100.0)	115 (100.0)

Source: Field Survey, 2008, ACI.

P: Prohibited

Table 120 Number and Percentage of HH Reporting Use of By-products and Waste - Leaves

Provinces Surveyed	Bury	Burn	Nothing	Other	Total Reporting
1. Tien Giang	1 (6.3)	1 (6.3)	1 (6.3)	13 (81.3)	16 (100.0)
2. Binh Phuoc	3 (15.8)	3 (15.8)	11 (57.9)	3 (15.8)	19 (100.0)
3. Dong Nai		3 (42.9)	4 (57.1)		7 (100.0)
4. Ba Ria - Vung Tau	1 (8.3)	1 (8.3)	6 (50.0)	4 (33.3)	12 (100.0)
5. Ben Tre	3 (12.5)		1 (4.2)	20 (83.3)	24 (100.0)
6. Daknong	1 (8.3)	3 (25.0)	8 (66.7)	1 (8.3)	12 (100.0)
7. Daklak	5 (38.5)		6 (46.2)	2 (15.4)	13 (100.0)
Total / Overall	**14 (13.6)**	**11 (10.7)**	**37 (35.9)**	**43 (41.8)**	**103 (100.0)**

Source: Field Survey, 2008, ACI.

Table 121 Number and Percentage of HH Reporting Use of By-products and Waste - Branches

Provinces Surveyed	Bury	Burn	Nothing	Other	Total Reporting
1. Tien Giang	1 (6.7)	1 (6.7)	1 (6.7)	12 (80.0)	15 (93.8)
2. Binh Phuoc	3 (15.8)	5 (26.3)	10 (52.6)	1 (5.3)	19 (100.0)
3. Dong Nai		4 (57.1)	3 (42.9)		7 (100.0)
4. Ba Ria - Vung Tau	1 (8.3)	3 (25.0)	4 (33.3)	4 (33.3)	12 (100.0)
5. Ben Tre	3 (18.8)	1 (6.3)	2 (12.5)	10 (62.5)	16 (66.7)
6. Daknong	1 (8.3)	4 (33.3)	6 (50.0)	2 (16.7)	12 (100.0)
7. Daklak	3 (23.1)		6 (46.2)	4 (30.8)	13 (100.0)
Total / Overall	**12 (12.8)**	**18 (19.2)**	**32 (34.0)**	**33 (35.1)**	**94 (91.3)**

Source: Field Survey, 2008, ACI.

Table 122 Number and Percentage of HH Reporting Use of By-products and Waste - Husk

Provinces Surveyed	Bury		Burn		Nothing		Other		Total Reporting	
1. Tien Giang							2	(100.0)	2	(12.5)
2. Binh Phuoc	1	(6.7)	2	(13.3)	5	(33.3)	7	(46.7)	15	(79.0)
3. Dong Nai					3	(60.0)	2	(40.0)	5	(71.4)
4. Ba Ria - Vung Tau	2	(22.2)			3	(33.3)	4	(44.4)	9	(75.0)
5. Ben Tre	2	(18.2)	1	(9.1)	2	(18.2)	7	(63.6)	11	(45.8)
6. Daknong			1	(10.0)	4	(40.0)	5	(50.0)	10	(83.3)
7. Daklak					3	(37.5)	5	(62.5)	8	(61.5)
Total / Overall	**5**	**(8.3)**	**4**	**(6.7)**	**20**	**(33.3)**	**32**	**(53.3)**	**60**	**(58.3)**

Source: Field Survey, 2008, ACI.

Table 123 Number and Percentage of HH Reporting Use of By-products and Waste - Placenta

Provinces Surveyed	Bury		Burn		Nothing		Other		Total Reporting	
1. Tien Giang							2	(100.0)	2	(12.5)
2. Binh Phuoc			1	(8.3)	9	(75.0)	2	(16.7)	12	(63.2)
3. Dong Nai					3	(60.0)	2	(40.0)	5	(71.4)
4. Ba Ria - Vung Tau	1	(11.1)			4	(44.4)	4	(44.4)	9	(75.0)
5. Ben Tre	2	(25.0)	1	(12.5)	2	(25.0)	3	(37.5)	8	(33.3)
6. Daknong			1	(10.0)	6	(60.0)	3	(30.0)	10	(83.3)
7. Daklak					5	(71.4)	2	(28.6)	7	(53.9)
Total / Overall	**3**	**(5.7)**	**3**	**(5.7)**	**29**	**(54.7)**	**18**	**(34.0)**	**53**	**(51.5)**

Source: Field Survey, 2008, ACI.

Table 124 Number and Percentage of HH Reporting Use of By-products and Waste - Mucilage Juice

Provinces Surveyed	Bury		Burn	Nothing		Other		Total Reporting	
1. Tien Giang				1	(50.0)	1	(50.0)	2	(12.5)
2. Binh Phuoc				14	(100.0)			14	(73.7)
3. Dong Nai				3	(60.0)	2	(40.0)	5	(71.4)
4. Ba Ria - Vung Tau	1	(11.1)		6	(66.7)	2	(22.2)	9	(75.0)
5. Ben Tre				4	(80.0)	1	(20.0)	5	(20.8)
6. Daknong				10	(100.0)			10	(83.3)
7. Daklak				7	(100.0)			7	(53.9)
Total / Overall	**1**	**(1.9)**		**45**	**(86.5)**	**6**	**(11.5)**	**52**	**(50.5)**

Source: Field Survey, 2008, ACI.

Table 125 Number and Percentage of HH Reporting Use of By-products and Waste - Containers for Fertilizer and Pesticides

Provinces Surveyed	Bury		Burn		Nothing		Other		Total Reporting	
1. Tien Giang	8	(50.0)	5	(31.3)			8	(50.0)	16	(100.0)
2. Binh Phuoc	9	(47.4)	4	(21.1)	1	(5.3)	13	(68.4)	19	(100.0)
3. Dong Nai	2	(28.6)	1	(14.3)			5	(71.4)	7	(100.0)
4. Ba Ria - Vung Tau	5	(41.7)			1	(8.3)	10	(83.3)	12	(100.0)
5. Ben Tre	11	(45.8)	6	(25.0)	1	(4.2)	10	(41.7)	24	(100.0)
6. Daknong	1	(8.3)					12	(100.0)	12	(100.0)
7. Daklak	6	(46.2)	3	(23.1)			12	(92.3)	13	(100.0)
Total / Overall	**42**	**(40.8)**	**19**	**(18.5)**	**3**	**(2.9)**	**70**	**(68.0)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

B.9 Change in Environment and Bio-diversity

419. Farmers observe improvement in different environmental and bio-diversity indicators including (Table 126 to Table 136). These improvements in biodiversity have also some negative effects. For example, more squirrels and rats destroy the pods; more insects can create numerous damages. The following figures show the percentage of farmers indicating improving in various environmental and biodiversity indicators.

- Soil quality (63.1%)
- Birds (40%)
- Reptiles (13.4%)
- Mammals (30.6%)
- Amphibians (6.4%)
- Butterflies (37.5%)
- Insects (63.4%)
- Other (20.5%)

420. No improvement in water quality and fish population was perceived.

421. Declines were observed in air quality by 30.1% of farmers, presumably because of the bad odor associated with large use of manure.

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422. Only a small number of farmers (1.9%) have experienced fires in the cocoa garden (Table 137) and 14.9% of farmers have received training in fire prevention (Table 138).

Table 126 Number and Percentage of HH Reporting Changes in Soil Quality

Provinces Surveyed	No Change		Better		Worse		Total Reporting	
1. Tien Giang	5	(31.3)	11	(68.8)			16	(100.0)
2. Binh Phuoc	6	(31.6)	13	(68.4)			19	(100.0)
3. Dong Nai	4	(57.1)	3	(42.9)			7	(100.0)
4. Ba Ria - Vung Tau	6	(50.0)	6	(50.0)			12	(100.0)
5. Ben Tre	3	(12.5)	21	(87.5)			24	(100.0)
6. Daknong	7	(58.3)	5	(41.7)			12	(100.0)
7. Daklak	6	(46.2)	6	(46.2)	1	(7.7)	13	(100.0)
Total / Overall	**37**	**(35.9)**	**65**	**(63.1)**	**1**	**(1.0)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 127 Number and Percentage of HH Reporting Changes in Water Quality (Both Surface Water and Ground Water)

Provinces Surveyed	No Change		Better	Worse		Total Reporting	
1. Tien Giang	16	(100.0)				16	(100.0)
2. Binh Phuoc	19	(100.0)				19	(100.0)
3. Dong Nai	7	(100.0)				7	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)				12	(100.0)
5. Ben Tre	22	(95.7)		1	(4.4)	23	(95.8)
6. Daknong	12	(100.0)				12	(100.0)
7. Daklak	13	(100.0)				13	(100.0)
Total / Overall	**101**	**(99.0)**		**1**	**(1.0)**	**102**	**(99.0)**

Source: Field Survey, 2008, ACI.

Table 128 Number and Percentage of HH Reporting Changes in Air

Provinces Surveyed	No Change		Better		Worse		Total Reporting	
1. Tien Giang	16	(100.0)					16	(100.0)
2. Binh Phuoc	15	(79.0)			4	(21.1)	19	(100.0)
3. Dong Nai	6	(85.7)			1	(14.3)	7	(100.0)
4. Ba Ria - Vung Tau	11	(91.7)			1	(8.3)	12	(100.0)
5. Ben Tre	9	(37.5)			15	(62.5)	24	(100.0)
6. Daknong	6	(50.0)	1	(8.3)	5	(41.7)	12	(100.0)
7. Daklak	7	(53.9)	1	(7.7)	5	(38.5)	13	(100.0)
Total / Overall	**70**	**(68.0)**	**2**	**(1.9)**	**31**	**(30.1)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 129 Number and Percentage of HH Reporting Changes in Biodiversity - Birds

Provinces Surveyed	No Change		Better		Worse	Total Reporting	
1. Tien Giang	12	(75.0)	4	(25.0)		16	(100.0)
2. Binh Phuoc	9	(50.0)	9	(50.0)		18	(94.7)
3. Dong Nai	4	(66.7)	2	(33.3)		6	(85.7)
4. Ba Ria - Vung Tau	8	(72.7)	3	(27.3)		11	(91.7)
5. Ben Tre	16	(66.7)	8	(33.3)		24	(100.0)
6. Daknong	2	(16.7)	10	(83.3)		12	(100.0)
7. Daklak	9	(69.2)	4	(30.8)		13	(100.0)
Total / Overall	**60**	**(60.0)**	**40**	**(40.0)**		**100**	**(97.1)**

Source: Field Survey, 2008, ACI.

Table 130 Number and Percentage of HH Reporting Changes in Biodiversity - Reptiles

Provinces Surveyed	No Change		Better		Worse	Total Reporting	
1. Tien Giang	15	(93.8)	1	(6.3)		16	(100.0)
2. Binh Phuoc	17	(94.4)	1	(5.6)		18	(94.7)
3. Dong Nai	5	(83.3)	1	(16.7)		6	(85.7)
4. Ba Ria - Vung Tau	11	(100.0)				11	(91.7)
5. Ben Tre	19	(90.5)	2	(9.5)		21	(87.5)
6. Daknong	8	(66.7)	4	(33.3)		12	(100.0)
7. Daklak	9	(69.2)	4	(30.8)		13	(100.0)
Total / Overall	**84**	**(86.6)**	**13**	**(13.4)**		**97**	**(94.2)**

Source: Field Survey, 2008, ACI.

Table 131 Number and Percentage of HH Reporting Changes in Biodiversity - Mammals

Provinces Surveyed	No Change		Better		Worse	Total Reporting	
1. Tien Giang	1	(6.3)	15	(93.8)		16	(100.0)
2. Binh Phuoc	15	(83.3)	3	(16.7)		18	(94.7)
3. Dong Nai	5	(71.4)	2	(28.6)		7	(100.0)
4. Ba Ria - Vung Tau	5	(45.5)	6	(54.6)		11	(91.7)
5. Ben Tre	20	(90.9)	2	(9.1)		22	(91.7)
6. Daknong	10	(90.9)	1	(9.1)		11	(91.7)
7. Daklak	12	(92.3)	1	(7.7)		13	(100.0)
Total / Overall	**68**	**(69.4)**	**30**	**(30.6)**		**98**	**(95.2)**

Source: Field Survey, 2008, ACI.

Table 132 Number and Percentage of HH Reporting Changes in Biodiversity - Amphibians

Provinces Surveyed	No Change		Better		Worse		Total Reporting	
1. Tien Giang	15	(93.8)	1	(6.3)			16	(100.0)
2. Binh Phuoc	16	(88.9)	2	(11.1)			18	(94.7)
3. Dong Nai	5	(83.3)	1	(16.7)			6	(85.7)
4. Ba Ria - Vung Tau	11	(100.0)					11	(91.7)
5. Ben Tre	19	(100.0)					19	(79.2)
6. Daknong	10	(90.9)	1	(9.1)			11	(91.7)
7. Daklak	12	(92.3)	1	(7.7)			13	(100.0)
Total / Overall	**88**	**(93.6)**	**6**	**(6.4)**			**94**	**(91.3)**

Source: Field Survey, 2008, ACI.

Table 133 Number and Percentage of HH Reporting Changes in Biodiversity - Butterflies

Provinces Surveyed	No Change		Better		Worse		Total Reporting	
1. Tien Giang	14	(87.5)	2	(12.5)			16	(100.0)
2. Binh Phuoc	7	(38.9)	11	(61.1)			18	(94.7)
3. Dong Nai	4	(66.7)	2	(33.3)			6	(85.7)
4. Ba Ria - Vung Tau	3	(27.3)	7	(63.6)	1	(9.1)	11	(91.7)
5. Ben Tre	16	(80.0)	4	(20.0)			20	(83.3)
6. Daknong	6	(50.0)	6	(50.0)			12	(100.0)
7. Daklak	9	(69.2)	4	(30.8)			13	(100.0)
Total / Overall	**59**	**(61.5)**	**36**	**(37.5)**	**1**	**(1.0)**	**96**	**(93.2)**

Source: Field Survey, 2008, ACI.

Table 134 Number and Percentage of HH Reporting Changes in Biodiversity - Insects

Provinces Surveyed	No Change		Better		Worse		Total Reporting	
1. Tien Giang	6	(37.5)	10	(62.5)			16	(100.0)
2. Binh Phuoc	4	(22.2)	14	(77.8)			18	(94.7)
3. Dong Nai	1	(16.7)	5	(83.3)			6	(85.7)
4. Ba Ria - Vung Tau	1	(8.3)	10	(83.3)	1	(8.3)	12	(100.0)
5. Ben Tre	12	(50.0)	11	(45.8)	1	(4.2)	24	(100.0)
6. Daknong	2	(16.7)	10	(83.3)			12	(100.0)
7. Daklak	8	(61.5)	4	(30.8)	1	(7.7)	13	(100.0)
Total / Overall	**34**	**(33.7)**	**64**	**(63.4)**	**3**	**(3.0)**	**101**	**(98.1)**

Source: Field Survey, 2008, ACI.

Table 135 Number and Percentage of HH Reporting Changes in Biodiversity - Fish

Provinces Surveyed	No Change		Better		Worse		Total Reporting	
1. Tien Giang	16	(100.0)					16	(100.0)
2. Binh Phuoc	18	(100.0)					18	(94.7)
3. Dong Nai	6	(100.0)					6	(85.7)
4. Ba Ria - Vung Tau	11	(100.0)					11	(91.7)
5. Ben Tre	19	(86.4)			3	(13.6)	22	(91.7)
6. Daknong	11	(100.0)					11	(91.7)
7. Daklak	12	(100.0)					12	(92.3)
Total / Overall	**93**	**(96.9)**			**3**	**(3.1)**	**96**	**(93.2)**

Source: Field Survey, 2008, ACI.

Table 136 Number and Percentage of HH Reporting Changes in Biodiversity - Other

Provinces Surveyed	No Change		Better		Worse	Total Reporting	
1. Tien Giang	13	(100.0)				13	(81.3)
2. Binh Phuoc	5	(100.0)				5	(26.3)
3. Dong Nai							
4. Ba Ria - Vung Tau	5	(83.3)	1	(16.7)		6	(50.0)
5. Ben Tre	4	(100.0)				4	(16.7)
6. Daknong	4	(66.7)	2	(33.3)		6	(50.0)
7. Daklak	4	(40.0)	6	(60.0)		10	(76.9)
Total / Overall	**35**	**(79.6)**	**9**	**(20.5)**		**44**	**(42.7)**

Source: Field Survey, 2008, ACI.

Table 137 Number and Percentage of HH Experiencing Fires in Cocoa Garden

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang			16	(100.0)	16	(100.0)
2. Binh Phuoc			19	(100.0)	19	(100.0)
3. Dong Nai			7	(100.0)	7	(100.0)
4. Ba Ria - Vung Tau			12	(100.0)	12	(100.0)
5. Ben Tre	1	(4.2)	23	(95.8)	24	(100.0)
6. Daknong	1	(8.3)	11	(91.7)	12	(100.0)
7. Daklak			13	(100.0)	13	(100.0)
Total / Overall	**2**	**(1.9)**	**101**	**(98.1)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 138 Number and Percentage of HH Receiving Trainings on Fire Fighting and Prevention

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang			16	(100.0)	16	(100.0)
2. Binh Phuoc	5	(26.3)	14	(73.7)	19	(100.0)
3. Dong Nai			7	(100.0)	7	(100.0)
4. Ba Ria - Vung Tau	5	(41.7)	7	(58.3)	12	(100.0)
5. Ben Tre	2	(9.1)	20	(90.9)	22	(100.0)
6. Daknong	2	(16.7)	10	(83.3)	12	(100.0)
7. Daklak	1	(7.7)	12	(92.3)	13	(100.0)
Total / Overall	**15**	**(14.9)**	**86**	**(85.2)**	**101**	**(100.0)**

Source: Field Survey, 2008, ACI.

B.10 Yield Performance

423. For the sample of farmers who have undertaken cocoa production for at least 5 years (COP survey), the yield productivity parameters are indicated in Table 139a in terms of pods (tonnes/ha) and in Table 139b in terms of beans (kg/ha). Productivity varies considerably. On average one can see a growing productivity with the age of tree, reaching a steady state around year 5 or 6. In the case of pods, the average starts at 0.758 tonnes/ha (equivalent to 63 kg of beans/ha) in year 2 and reaches 11.216 tonnes/ha in year 5 (equivalent to 927 kg of beans/ha).

424. The averages however hide considerable variation among provinces. In Ben Tre, where the farming system is intercropping and more support from extension work has been given to farmers through SA and DARDs, the performance in each year is above average.

425. In the Central Highlands the prevailing farming system is monoculture. Planting materials utilized by farmers are old and not well performing. So far, there has not been effective extension work to transfer technologies to farmers; as a result average productivity is low, even though there are notable exceptions and considerable variation. In Dak Nong, some farmers have been able to obtain relatively good yields at year 5 (17 tonnes of pods/ha), whereas in Dak Lak farmers (mostly engaged in previous state owned enterprises) have not followed good farming practices, have applied low levels of fertilizers, and underperformed in terms of yield. When looking at the performance in terms of beans, the situation is even more evident. With high conversion rates (implying small bean size or poor fermentation technique), the yield advantage of Dak Nong relatively to Ben Tre (in terms of pods at year 5 it is 17 tonnes versus 15.2 tonnes/ha) is lost (1,360 kg versus 1,423 kg).

426. If good farming practices were to be followed in the Central Highlands, the average yields both In Dak Lak and Dak Nong could reach at least 2 tonnes/ha in terms of beans. This is in fact what has already been achieved by some of the best farmers in the area.

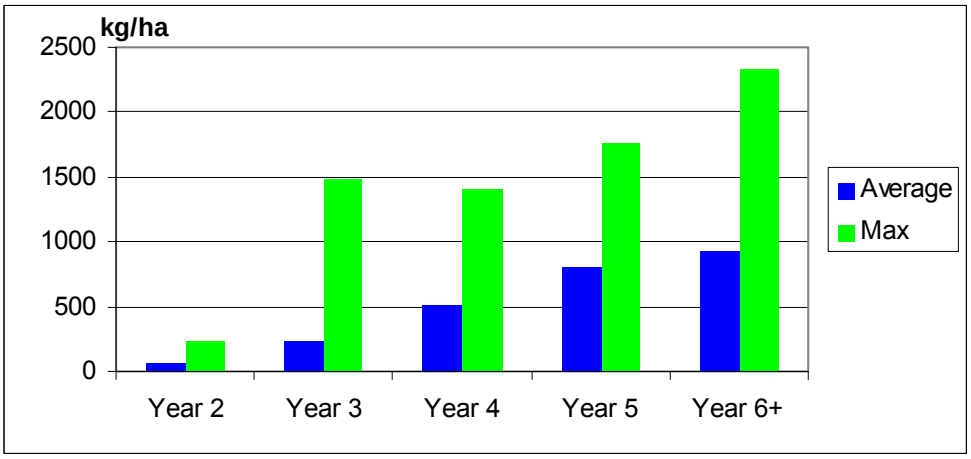
Table 139a Yield of Cocoa Farms at Different Stages of Production (pods tonnes/ha)

Province	Yield of 2 years old cocoa farms (pods tonnes/ha)	Yield of 3 years old cocoa farms (pods tonnes/ha)	Yield of 4 years old cocoa farms (pods tonnes/ha)	Yield of 5 years old cocoa farms (pods tonnes/ha)	Yield of more than 5 years old cocoa farms (pods tonnes/ha)
Tien Giang		2.979	3.087		
Binh Phuoc	0.238	1.968			
Dong Nai	0.250	6.445			
Ba Ria - Vung Tau	3.000		7.694	8.750	
Ben Tre		3.229	8.375	10.253	15.231
Dak Nong			5.350	12.988	17.000
Daklak	0.060	0.320			5.744
Total	0.757	2.779	6.121	9.652	11.216

Table 140b Yield of Cocoa Farms at Different Stages of Production (beans kg/ha)

Province	Yield of 2 years old cocoa farms (beans kg/ha)	Yield of 3 years old cocoa farms (beans kg/ha)	Yield of 4 years old cocoa farms (beans kg/ha)	Yield of 5 years old cocoa farms (beans kg/ha)	Yield of more than 5 years old cocoa farms (beans kg/ha)	Conversion Rate (kg pods/kg beans)
Tien Giang		252	262			11.8
Binh Phuoc	20	165				11.9
Dong Nai	21	537				12.0
Ba Ria - Vung Tau	238		611	694		12.6
Ben Tre		302	783	958	1423	10.7
Dak Nong		0	428	1039	1360	12.5
Daklak	4	24			422	13.6
Total	63	230	506	798	927	12.1

Table 141 Maximum and average yields in terms of beans (kg/ha) in the sample of farmers



B.11 Revenues

427. Being a perennial crop needing 4 to 5 years to reach full productivity potentials, it is not surprising that for farmers who have been engaged less than 4 years in cocoa production, the revenues are still a small proportion of their total revenues. For the farmers, revenues from cocoa production, trading and fermentation reaches 6.6% of total revenues and non-farm activities represent 16.8% of the total (Table 142). For cocoa farmers with at least five years experience in cocoa cultivation, cocoa activities (production, trading, and fermentation) generates almost 35% of total revenues, while non-farm activities generate almost 30% of the total (Table 143). In the early years of production, cocoa does not generate high revenues. Other farm activities and non-farm activities are more important.

428. As cocoa production reaches its maturity, several things seem to happen:
1. cocoa becomes a bigger generator of revenues
2. other non-cocoa farm activities decline relatively to cocoa
3. other non-farm activities increase, perhaps due to freeing labor for non-farm activities (something that the focus group discussions have pointed out)

Table 142 Revenue from other non-cocoa nursery activities during 2007 (VND million per household) – Farmers with less than 5 years cultivation

Provinces Surveyed	Cocoa Production	Cocoa Trading/ Fermentation	Other non-cocoa farm activities	Other non-farm activities	HH Reporting
1. Tien Giang	1 (1.7)	0 (0.9)	47 (87.6)	5 (9.8)	54 (100.0)
2. Binh Phuoc	4 (2.7)	0 (0.1)	156 (96.5)	1 (0.6)	162 (100.0)
3. Dong Nai	12 (18.3)		54 (79.2)	2 (2.6)	68 (100.0)
4. Ba Ria - Vung Tau			119 (97.5)	3 (2.5)	122 (100.0)
5. Ben Tre	10 (10.9)	13 (13.4)	57 (60.2)	14 (15.4)	94 (100.0)
6. Daknong	11 (5.7)		124 (63.5)	60 (30.9)	195 (100.0)
7. Daklak	3 (1.9)		80 (44.5)	97 (53.6)	181 (100.0)
Total / Overall	**5 (4.6)**	**2 (2.0)**	**92 (76.6)**	**20 (16.8)**	**120 (100.0)**

Source: Field FAR Survey, 2008, ACI.

Table 143 Revenue from other non-cocoa nursery activities during 2007 (VND million per household) – Farmers with 5 years cultivation or more

Provinces Surveyed	Cocoa Production	Cocoa Trading/ Fermentation	Other non-cocoa farm activities	Other non-farm activities	Total
1. Ben Tre	45 (31.4)	29 (20.5)	57 (39.8)	12 (8.3)	144 (100.0)
2. Ba Ria - Vung Tau	27 (30.1)	0 (0.2)	62 (69.8)		89 (100.0)
3. Dak Lak	20 (14.1)	66 (47.2)	41 (29.0)	14 (9.7)	140 (100.0)
4. Dak Nong	21 (8.4)	6 (2.2)	37 (15.0)	185 (74.4)	248 (100.0)
5. Binh Phuoc			100 (92.6)	8 (7.4)	108 (100.0)
6. Dong Nai			29 (40.9)	42 (59.2)	71 (100.0)
8. Total/ Overall	**29 (19.9)**	**22 (15.0)**	**52 (35.4)**	**44 (29.7)**	**148 (100.0)**

Source: Field COP Survey, 2008, ACI.

B.12 Marketing

429. In roughly equal percentages (45.3% and 41.5%) farmers sell cocoa pods at buying stations and at farmgate, respectively (Table 144). This is different from the case of cocoa beans, in so far as buying stations are the main places of selling (47.5% of respondent sell at buying station and only 15% sell at farmgate).

430. The distance to the selling place for pods is on average 6.6 km and for beans is 56.7 km(

431. Table 145). In the upland areas distance to sell beans are much higher than in the MRD. On average farmers have access to 3.2 buyers for pods and to 1.7 buyers for beans (Table 146).

432. While for pods 64.2% of farmers sell to assemblers/collectors and only 7.6% to companies, an opposite behavior occurs for beans, with 70% of farmers selling to companies and 22.5% selling to assemblers/collectors (Table 147). The reason is that collectors feel it risky to buy fermented beans since they can not check the quality of the fermented beans and they are not sure about the quality of fermentation of other farmers. If they buy pods and ferment themselves they are more confident in the quality of fermented beans. With regards to farmers they want to have higher price therefore they sell directly to the companies.

433. The market for pods and beans appear clearly different: companies are interested in beans and assemblers are interested in pods. Creating the capacity for fermentation at the farm level has then two advantages: (i) increase in value added and income for farmers; (ii) direct relation between farmers and companies and less need of intermediaries in the value chain.

434. Buying pod is not a normal activity of companies. When they buy pods, companies do it because they want to support the young cocoa industry in Vietnam and farmers feel more comfortable in selling their products, either beans or pods. Once market channels are established firmly, companies such as EDF Man[34] and Armajaro will stop buying pods.

Table 144 Number and Percentage of Households Reporting Selling Place of Pods and Beans

	Places of Selling Pods								Places of Selling Beans							
Provinces Surveyed	Buying Station		Farmgate		Other Places		HH Reporting		Buying Station		Farmgate		Other Places		HH Reporting	
1. Tien Giang	5	(35.7)	6	(42.9)	3	(21.4)	14	(87.5)	2	(100.0)					2	(12.5)
2. Binh Phuoc	1	(20.0)	2	(40.0)	2	(40.0)	5	(26.3)	1	(10.0)	2	(20.0)	7	(70.0)	10	(52.6)
3. Dong Nai	6	(85.7)			1	(14.3)	7	(100.0)					1	(100.0)	1	(14.3)
4. Ba Ria - Vung Tau	4	(100.0)	1	(25.0)			4	(33.3)	5	(100.0)	1	(20.0)			5	(41.7)
5. Ben Tre	6	(35.3)	10	(58.8)	1	(5.9)	17	(70.8)	6	(75.0)	2	(25.0)			8	(33.3)
6. Daknong			2	(100.0)			2	(16.7)	3	(33.3)	1	(11.1)	5	(55.6)	9	(75.0)
7. Daklak	2	(50.0)	1	(25.0)	1	(25.0)	4	(30.8)	2	(40.0)			3	(60.0)	5	(38.5)
Total / Overall	**24**	**(45.3)**	**22**	**(41.5)**	**8**	**(15.1)**	**53**	**(51.5)**	**19**	**(47.5)**	**6**	**(15.0)**	**16**	**(40.0)**	**40**	**(38.8)**

Source: Field Survey, 2008, ACI.

[34] EDF Man has recently withdrawn from cocoa in Viet Nam. Its buying stations are currently by DakMan.

Table 145 Distance to the Selling Place

	Farmers selling Pods		Farmers selling beans	
Provinces Surveyed	Total reporting	Average Distance from selling point (Km)	Total reporting	Average Distance from selling point (Km)
1. Tien Giang	7 (43.8)	4.3	2 (12.5)	5.8
2. Binh Phuoc	2 (10.5)	27.5	6 (31.6)	166.8
3. Dong Nai	7 (100.0)	9.3	1 (14.3)	20.0
4. Ba Ria - Vung Tau	4 (33.3)	1.4	5 (41.7)	2.1
5. Ben Tre	10 (41.7)	5.9	6 (25.0)	18.0
6. Daknong			8 (66.7)	49.9
7. Daklak	3 (23.1)	0.5	5 (38.5)	64.0
Total / Overall	**33 (32.0)**	**6.6**	**33 (32.0)**	**56.7**

Table 146 Number of accessible buyers and buying stations

Provinces Surveyed	Total Reporting (pods)	Average Number of Accessible Buyers/ Buying Stations (pods)	Total Reporting (beans)	Average Number of Accessible Buyers/ Buying Stations (beans)
1. Tien Giang	7 (43.8)	2.4	2 (12.5)	1.5
2. Binh Phuoc	5 (26.3)	2.8	10 (52.6)	1.0
3. Dong Nai	7 (100.0)	1.0	1 (14.3)	1.0
4. Ba Ria - Vung Tau	4 (33.3)	1.8	5 (41.7)	2.0
5. Ben Tre	16 (66.7)	5.4	7 (29.2)	3.4
6. Daknong	2 (16.7)	1.5	9 (75.0)	1.4
7. Daklak	3 (23.1)	2.4	5 (38.5)	1.2
Total / Overall	**44 (42.7)**	**3.2**	**39 (37.9)**	**1.7**

Table 147 Number and Percentage of Households Reporting Buyers of Pods and Beans

	Pods					**Beans**				
Provinces Surveyed	Assembler/ Collector	Company	Co-operatives	Other	Total Reporting	Assembler/ Collector	Company	Co-operatives	Other	Total Reporting
1. Tien Giang	5 (35.7)		7 (50.0)	2 (14.3)	14 (87.5)			2 (100.0)		2 (12.5)
2. Binh Phuoc	3 (60.0)			2 (40.0)	5 (26.3)	1 (10.0)	9 (90.0)			10 (52.6)
3. Dong Nai	5 (71.4)	2 (28.6)			7 (100.0)		1 (100.0)			1 (14.3)
4. Ba Ria - VT	3 (75.0)	1 (25.0)			4 (33.3)	5 (100.0)				5 (41.7)
5. Ben Tre	16 (94.1)			1 (5.9)	17 (70.8)	1 (12.5)	6 (75.0)		1 (12.5)	8 (33.3)
6. Daknong				2 (100.0)	2 (16.7)	1 (11.1)	8 (88.9)			9 (75.0)
7. Daklak	2 (50.0)	1 (25.0)		1 (25.0)	4 (30.8)	1 (20.0)	4 (80.0)			5 (38.5)
Total / Overall	**34 (64.2)**	**4 (7.6)**	**7 (13.2)**	**8 (15.1)**	**53 (51.5)**	**9 (22.5)**	**28 (70.0)**	**2 (5.0)**	**1 (2.5)**	**40 (38.8)**

Source: Field Survey, 2008, ACI.

B.13 Market information

435. Farmers have access to price information from various sources (Table 148), of which the most important are radio/TV (44.6%), local collectors/assemblers (33.7%), telephone (24.8%), and buying stations (20.8%).

436. Most farmers know price information about their local areas; however 45.4% of farmers have price information also in other areas (Table 149).

Table 148 Number and Percentage of Households Reporting Sources of Price Information

Provinces Surveyed	Local Collectors		Buying Stations		Radio/ TV		Internet		Telephone		Other Sources		HH Reporting	
1. Tien Giang	5	(31.3)	1	(6.3)	6	(37.5)					10	(62.5)	16	(100.0)
2. Binh Phuoc	4	(22.2)			10	(55.6)			9	(50.0)	4	(22.2)	18	(94.7)
3. Dong Nai	3	(42.9)	5	(71.4)	1	(14.3)							7	(100.0)
4. Ba Ria - Vung Tau	5	(41.7)	5	(41.7)	4	(33.3)			4	(33.3)	2	(16.7)	12	(100.0)
5. Ben Tre	16	(69.6)	8	(34.8)	6	(26.1)	1	(4.4)	3	(13.0)	5	(21.7)	23	(95.8)
6. Daknong			1	(8.3)	8	(66.7)	1	(8.3)	5	(41.7)			12	(100.0)
7. Daklak	1	(7.7)	1	(7.7)	10	(76.9)			4	(30.8)			13	(100.0)
Total / Overall	**34**	**(33.7)**	**21**	**(20.8)**	**45**	**(44.6)**	**2**	**(2.0)**	**25**	**(24.8)**	**21**	**(20.8)**	**101**	**(98.1)**

Source: Field Survey, 2008, ACI.

Table 149 Number and Percentage of Farmers having Price Information in Other Areas and Other Buyers

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	9	(60.0)	6	(40.0)	15	(93.8)
2. Binh Phuoc	6	(33.3)	12	(66.7)	18	(94.7)
3. Dong Nai			7	(100.0)	7	(100.0)
4. Ba Ria - Vung Tau	2	(22.2)	7	(77.8)	9	(75.0)
5. Ben Tre	18	(78.3)	5	(21.7)	23	(95.8)
6. Daknong	5	(41.7)	7	(58.3)	12	(100.0)
7. Daklak	4	(30.8)	9	(69.2)	13	(100.0)
Total / Overall	**44**	**(45.4)**	**53**	**(54.6)**	**97**	**(94.2)**

Source: Field Survey, 2008, ACI.

B.14 Fermentation

437. 46.5% of respondents are involved in fermenting cocoa beans (Table 150). Among those who do not ferment (53.5%), the majority (54.7%) intend to ferment in the future (Table 151).

438. The main reason for not fermenting is small volumes of production, rather than lack of technique or equipment. Farmers can get knowledge about fermentation mainly through training organized by various projects and DARD.

439. The average conversion rate from pods to beans is 12.1 kg of pods per 1 kg of beans (Table 152).

440. Before fermenting, farmers store pods about 7.3 days, and take about 6 days for fermentation (Table 153 and Table 154).

441. Batches of fermentation are generally small with an average of 43 kg (Table 155) per batch, which does not allow a professional fermentation service to emerge.

442. The main reason for not fermenting is small quantity of production (Table 156). Equipment is also mentioned as a difficulty for fermentation by 27% of farmers.

Table 150 Number and Percentage of Farmers Fermenting Cocoa Beans

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	3	(18.8)	13	(81.3)	16	(100.0)
2. Binh Phuoc	12	(70.6)	5	(29.4)	17	(89.5)
3. Dong Nai	1	(14.3)	6	(85.7)	7	(100.0)
4. Ba Ria - Vung Tau	6	(60.0)	4	(40.0)	10	(83.3)
5. Ben Tre	8	(33.3)	16	(66.7)	24	(100.0)
6. Daknong	9	(75.0)	3	(25.0)	12	(100.0)
7. Daklak	7	(53.9)	6	(46.2)	13	(100.0)
Total / Overall	**46**	**(46.5)**	**53**	**(53.5)**	**99**	**(96.1)**

Source: Field Survey, 2008, ACI.

Table 151 Number and Percentage of Farmers Intending to Ferment Cocoa Beans in Future

Provinces Surveyed	Yes		No		Not Reporting		Total Reporting	
1. Tien Giang	3	(23.1)	7	(53.9)	3	(23.1)	13	(100.0)
2. Binh Phuoc	4	(80.0)	1	(20.0)			5	(100.0)
3. Dong Nai	3	(50.0)	1	(16.7)	2	(33.3)	6	(100.0)
4. Ba Ria - Vung Tau	3	(75.0)			1	(25.0)	4	(100.0)
5. Ben Tre	9	(56.3)	3	(18.8)	4	(25.0)	16	(100.0)
6. Daknong	3	(100.0)					3	(100.0)
7. Daklak	4	(66.7)			2	(33.3)	6	(100.0)
Total / Overall	**29**	**(54.7)**	**12**	**(22.6)**	**12**	**(22.6)**	**53**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 152 Average conversion rates (kg of pods per 1 kg of beans)

Provinces Surveyed	Average Conversion Rate (Pods to Beans)
1. Tien Giang	11.8
2. Binh Phuoc	11.9
3. Dong Nai	12.0
4. Ba Ria - Vung Tau	12.6
5. Ben Tre	10.7
6. Daknong	12.5
7. Daklak	13.6
Total / Overall	**12.1**

Source: Field Survey, 2008, ACI.

Table 153 Average Minimum and Maximum Days of Pod Storage

Provinces Surveyed	Average of Minimum	Average of Maximum	Average of Both Minimum and Maximum
1. Tien Giang	7.7	9.7	8.7
2. Binh Phuoc	7.3	8.0	7.7
3. Dong Nai	7.0	8.0	7.5
4. Ba Ria - Vung Tau	6.7	7.0	6.8
5. Ben Tre	7.8	8.5	8.1
6. Daknong	6.0	7.3	6.7
7. Daklak	5.9	6.3	6.1
Total / Overall	**6.9**	**7.7**	**7.3**

Source: Field Survey, 2008, ACI.

Table 154 Average Minimum and Maximum Days Left for Beans to Ferment

Provinces Surveyed	Average of Minimum	Average of Maximum	Average of Both Minimum and Maximum
1. Tien Giang	6.0	6.0	6.0
2. Binh Phuoc	5.7	5.8	5.8
3. Dong Nai	6.0	6.0	6.0
4. Ba Ria - Vung Tau	5.5	5.8	5.7
5. Ben Tre	5.8	5.8	5.8
6. Daknong	5.9	6.1	6.0
7. Daklak	6.3	6.6	6.4
Total / Overall	**5.8**	**6.0**	**5.9**

Source: Field Survey, 2008, ACI.

Table 155 Minimum, Maximum and Minimum Weight of Fermentation Batch

Provinces Surveyed	Minimum (Kg)	Maximum (Kg)	Average (Kg)
1. Tien Giang	10.0	10.9	10.5
2. Binh Phuoc	0.7	10.0	5.4
3. Dong Nai	9.1	9.1	9.1
4. Ba Ria - Vung Tau	0.4	50.0	19.0
5. Ben Tre	4.9	700.0	157.1
6. Daknong	1.0	100.0	28.6
7. Daklak	0.5	90.1	22.9
Total / Overall	**0.4**	**700.0**	**42.7**

Source: Field Survey, 2008, ACI.

Table 156 Number and Percentage of Farmers Reporting Main Difficulties in Fermentation

Provinces Surveyed	Technique		Small Quantity		Equipment		Other		Total Reporting	
1. Tien Giang					1	(100.0)	1	(100.0)	1	(100.0)
2. Binh Phuoc			10	(90.9)	4	(36.4)			11	(100.0)
3. Dong Nai										
4. Ba Ria - Vung Tau			5	(100.0)	2	(40.0)			5	(100.0)
5. Ben Tre					1	(33.3)	2	(66.7)	3	(100.0)
6. Daknong			1	(20.0)			4	(80.0)	5	(100.0)
7. Daklak	1	(20.0)	3	(60.0)			2	(40.0)	5	(100.0)
Total / Overall	**1**	**(3.3)**	**19**	**(63.3)**	**8**	**(26.7)**	**9**	**(30.0)**	**30**	**(100.0)**

Source: Field Survey, 2008, ACI.

B.15 Quality

443. Knowledge about quality is limited among farmers (Table 157). For those who know quality indicators, the average value are reported (Table 158). In general though, farmers who sell beans to companies are more informed about quality indicators, since the companies themselves base their pricing on these indicators. Companies like Cargill give written statements with the results of test of quality of beans.

444. Most farmers (64.1%) do not know about bean count. Of those who know, they report an average of 101 beans/100 grams.

445. Most farmers (71.8%) do not know about humidity. Of those who know, they report an average of 7.3%.

446. Most farmers (78.6%) do not know about proportion of fully fermented beans. Of those who know, they report an average of 85.2%.

447. Most farmers (89.3%) do not know about proportion of partly fermented beans. Of those who know, they report an average of 41.4%.

448. Most farmers (89.3%) do not know about fully violet proportion. Of those who know, they report an average of 9.9%.

449. Most farmers (88.4%) do not know about proportion of slaty beans. Of those who know, they report an average of 2.4%.

450. Most farmers (91.3%) do not know about proportion of moldy beans. Of those who know, they report an average of 2%.

451. Most farmers (89.3%) do not know about proportion of germinated/infested beans. Of those who know, they report an average of 1.9%.

452. Most farmers (92.2%) do not know about proportion of foreign matter. Of those who know, they report an average of 0.5%.

453. Farmers do not know about proportion of fat or shell or pH. These indicators are not given by the companies.

Table 157 Farmers not knowing about quality indicators (% of respondents)

Provinces Surveyed	Bean count	Humidity	Fully fermented beans	Partially Fermented beans	Fully violet beans	Slaty beans	Moldy Beans	Germinated/ infested beans	Foreign matter	Fat	Shell	Acidity
1. Tien Giang	81.3	81.3	81.3	93.8	87.5	87.5	87.5	87.5	93.8	100	100	100
2. Binh Phuoc	57.9	63.2	73.7	94.7	100.0	89.5	89.5	94.7	89.5	100	100	100
3. Dong Nai	85.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100	100	100
4. Ba Ria - Vung Tau	66.7	91.7	83.3	83.3	91.7	91.7	100.0	100.0	91.7	100	100	100
5. Ben Tre	66.7	66.7	66.7	87.5	83.3	83.3	87.5	83.3	91.7	100	100	100
6. Daknong	33.3	50.0	75.0	66.7	75.0	83.3	83.3	75.0	83.3	100	100	100
7. Daklak	61.5	69.2	92.3	100.0	92.3	92.3	100.0	92.3	100.0	100	100	100
Total / Overall	64.1	71.8	78.6	89.3	89.3	88.4	91.3	89.3	92.2	100	100	100

Source: Field Survey, 2008, ACI.

Table 158 Average quality indicators reported by farmers who declare they know

Provinces Surveyed	Bean count	Humidity	Fully fermented beans	Partially Fermented beans	Fully violet beans	Slaty beans	Moldy Beans	Germinated/ infested beans	Foreign matter	Fat	Shell	Acidity
1. Tien Giang	102.3	7.0	94.0	5.0	5.0	5.0	5.0	3.5				
2. Binh Phuoc	97.2	7.4	95.7	95.0		1.2	3.0		0.9			
3. Dong Nai	100.0											
4. Ba Ria - Vung Tau	110.0	10.0	92.5	1.3	80.0	2.5			0.5			
5. Ben Tre	95.6	7.0	84.2	23.5	1.6			0.5	0.1			
6. Daknong	104.1	7.3	58.0	77.2	3.3		0.3		0.5			
7. Daklak	102.0	7.4			2.0	1.5		1.5				
Total / Overall	101.0	7.3	85.2	41.4	9.9	2.4	2.0	1.9	0.5			

Source: Field Survey, 2008, ACI.

454. In spite of most farmers not knowing the quality indicators, 84.8% think that the average quality of the beans they produce is good (Table 159).

455. Farmers are aware that the market and most notably the buying stations give a premium for higher quality. In fact 81% of farmers report that a premium for higher quality exists (Table 160).

Table 159 number and Percentage of Households Reporting the Quality of Cocoa Beans Produced

Provinces Surveyed	Good		Average		Poor		Total Reporting	
1. Tien Giang	3	(100.0)					3	(18.8)
2. Binh Phuoc	9	(75.0)	2	(16.7)	1	(8.3)	12	(63.2)
3. Dong Nai								
4. Ba Ria - Vung Tau	5	(100.0)					5	(41.7)
5. Ben Tre	7	(77.8)	2	(22.2)			9	(37.5)
6. Daknong	8	(88.9)	1	(11.1)			9	(75.0)
7. Daklak	7	(87.5)	1	(12.5)			8	(61.5)
Total / Overall	**39**	**(84.8)**	**6**	**(13.0)**	**1**	**(2.2)**	**46**	**(44.7)**

Source: Field Survey, 2008, ACI.

Table 160 Farmers are Paid Premium on the Average Price if Supplied Good Quality Beans

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	2	(100.0)			2	(100.0)
2. Binh Phuoc	8	(88.9)	1	(11.1)	9	(100.0)
3. Dong Nai			1	(100.0)	1	(100.0)
4. Ba Ria - Vung Tau	3	(60.0)	2	(40.0)	5	(100.0)
5. Ben Tre	6	(75.0)	2	(25.0)	8	(100.0)
6. Daknong	9	(100.0)			9	(100.0)
7. Daklak	6	(75.0)	2	(25.0)	8	(100.0)
Total / Overall	**34**	**(81.0)**	**8**	**(19.1)**	**42**	**(100.0)**

Source: Field Survey, 2008, ACI.

B.16 Training and Support to Farmers

456. More than half of farmers (55%) first learned about cocoa from 2004 onward (Table 161), mostly as the result of the Success Alliance project. They average almost 7 year of knowledge of the sector.

Table 161 Year when the Farmers Learnt First about Cocoa

Provinces Surveyed	Year of First Learning																Average Years of Knowledge
	Before 2001		2001		2002		2003		2004		2005		2006		Total Reporting		
1. Tien Giang	2	(12.5)	1	(6.3)	1	(6.3)	1	(6.3)	2	(12.5)	9	(56.3)			16	(100.0)	8.2
2. Binh Phuoc									1	(5.3)	16	(84.2)	2	(10.5)	19	(100.0)	3.0
3. Dong Nai	1	(14.3)					1	(14.3)	1	(14.3)	4	(57.1)			7	(100.0)	7.0
4. Ba Ria - Vung Tau	2	(16.7)					3	(25.0)	3	(25.0)	1	(8.3)	3	(25.0)	12	(100.0)	7.8
5. Ben Tre	7	(29.2)	2	(8.3)	2	(8.3)	7	(29.2)	5	(20.8)	1	(4.2)			24	(100.0)	9.8
6. Daknong	4	(33.3)	3	(25.0)	1	(8.3)	1	(8.3)			2	(16.7)	1	(8.3)	12	(100.0)	6.0
7. Daklak	3	(23.1)			2	(15.4)	2	(15.4)			1	(7.7)	5	(38.5)	13	(100.0)	5.9
Total / Overall	**19**	**(18.5)**	**6**	**(5.8)**	**6**	**(5.8)**	**15**	**(14.6)**	**12**	**(11.7)**	**34**	**(33.0)**	**11**	**(10.7)**	**103**	**(100.0)**	**6.9**
Source: Field Survey, 2008, ACI.																	

457. During this period, most of them (95.2%) have received considerable training (Table 162) from various organizations including ACDI/VOCA, DARD, NLU, private companies (such as the nurseries Nguyen Loc Ltd, Trong Duc Ltd, and Cargill). Training in many cases has been intensive and sustained over a long period of time, and consisting of several days of training. Most farmers find the training very useful.

Table 162 Number and Percentage of Households Receiving Training on Cocoa

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	16	(100.0)			16	(100.0)
2. Binh Phuoc	19	(100.0)			19	(100.0)
3. Dong Nai	5	(71.4)	2	(28.6)	7	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)			12	(100.0)
5. Ben Tre	24	(100.0)			24	(100.0)
6. Daknong	11	(91.7)	1	(8.3)	12	(100.0)
7. Daklak	11	(84.6)	2	(15.4)	13	(100.0)
Total / Overall	**98**	**(95.2)**	**5**	**(4.9)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

458. In addition to training, 72% of farmers have received technical assistance and advice on cocoa from professionals in the same organizations mentioned above (Table 163).

Table 163 Number and Percentage of Households Receiving Technical Assistance/ Advice on Cocoa Apart from Training

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	9	(56.3)	7	(43.8)	16	(100.0)
2. Binh Phuoc	8	(47.1)	9	(52.9)	17	(100.0)
3. Dong Nai	3	(50.0)	3	(50.0)	6	(100.0)
4. Ba Ria - Vung Tau	10	(83.3)	2	(16.7)	12	(100.0)
5. Ben Tre	22	(91.7)	2	(8.3)	24	(100.0)
6. Daknong	12	(100.0)			12	(100.0)
7. Daklak	8	(61.5)	5	(38.5)	13	(100.0)
Total / Overall	**72**	**(72.0)**	**28**	**(28.0)**	**100**	**(100.0)**

Source: Field Survey, 2008, ACI.

459. A large number of farmers (73.2%) have received assistance in terms of inputs (Table 164), from various agencies including ACDI/VOCA, DARDs and private organizations (eg private nurseries). The assistance has included inputs, particularly in seeds and fertilizer, and credit (Table 165).

Table 164 Number and Percentage of Households Receiving Support in Inputs

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	5	(45.5)	6	(54.6)	11	(100.0)
2. Binh Phuoc	16	(88.9)	2	(11.1)	18	(100.0)
3. Dong Nai	3	(42.9)	4	(57.1)	7	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)			12	(100.0)
5. Ben Tre	21	(87.5)	3	(12.5)	24	(100.0)
6. Daknong	7	(58.3)	5	(41.7)	12	(100.0)
7. Daklak	7	(53.9)	6	(46.2)	13	(100.0)
Total / Overall	**71**	**(73.2)**	**26**	**(26.8)**	**97**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 165 Number and Percentage of Households Reporting Various Input Support Received

Provinces Surveyed	Small equipment		Capital		Fertilizer		Seeds		Pesticide		Total Reporting	
1. Tien Giang	1	(20.0)	2	(40.0)	2	(40.0)	3	(60.0)			5	(100.0)
2. Binh Phuoc					10	(62.5)	16	(100.0)			16	(100.0)
3. Dong Nai	1	(33.3)			1	(33.3)	2	(66.7)			3	(100.0)
4. Ba Ria - Vung Tau	7	(58.3)	2	(16.7)			5	(41.7)			12	(100.0)
5. Ben Tre	7	(33.3)	1	(4.8)	2	(9.5)	13	(61.9)	1	(4.8)	21	(100.0)
6. Daknong	3	(42.9)	2	(28.6)	4	(57.1)	2	(28.6)	2	(28.6)	7	(100.0)
7. Daklak	3	(42.9)	2	(28.6)			6	(85.7)			7	(100.0)
Total / Overall	**22**	**(31.0)**	**9**	**(12.7)**	**19**	**(26.8)**	**47**	**(66.2)**	**3**	**(4.2)**	**71**	**(100.0)**

Source: Field Survey, 2008, ACI.

B.17 Finance

460. Most farmers do not borrow for the purpose of cocoa activities (Table 166). Those who do represent about one quarter of farmers. The reasons for not borrowing does not seem to be related to high interest rate or difficulty in access to credit (Table 167), but rather to the fact that most farmers (85.5%) had sufficient capital at the time they started cocoa.

461. Those who borrowed had received credit from banks (52%) and suppliers (48%). Bank area however the main source in terms of size of loans (Table 168). Banks provide on average VND 25.5 million, suppliers only VND 1.3 million. Banks give an average term of 22 months, suppliers 28 months. Banks give a monthly interest rate of 1.3%. Suppliers do not charge an interest rate explicitly. However, implicitly they do. In fact the price for seedlings when sold on credit is considerably higher than that when sold on cash: if sold on credit the price is VND6000/seedling, however when sold on fresh cash the price is VND5000/seedling or even less.

462. Most of the respondents indicate no need of further loans (Table 169). Of those (18.5%) who require further loans, the capital needs are on average VND 60 million.

Table 166 Number and Percentage of Households Borrowing for Cocoa

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	14	(87.5)	2	(12.5)	16	(100.0)
2. Binh Phuoc	2	(10.5)	17	(89.5)	19	(100.0)
3. Dong Nai	1	(14.3)	6	(85.7)	7	(100.0)
4. Ba Ria - Vung Tau	2	(16.7)	10	(83.3)	12	(100.0)
5. Ben Tre	5	(20.8)	19	(79.2)	24	(100.0)
6. Daknong	1	(8.3)	11	(91.7)	12	(100.0)
7. Daklak	2	(15.4)	11	(84.6)	13	(100.0)
Total / Overall	**27**	**(26.2)**	**76**	**(73.8)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 167 Number and Percentage of Households Giving Reasons for Not Borrowing for Cocoa

Provinces Surveyed	No Need	High Interest Rate	No Collateral	Complicated Procedure	Other	Total Reporting
1. Tien Giang	2 (100.0)					2 (100.0)
2. Binh Phuoc	13 (76.5)	1 (5.9)		1 (5.9)	4 (23.5)	17 (100.0)
3. Dong Nai	4 (66.7)		1 (16.7)	1 (16.7)		6 (100.0)
4. Ba Ria - Vung Tau	10 (100.0)					10 (100.0)
5. Ben Tre	18 (94.7)				1 (5.3)	19 (100.0)
6. Daknong	8 (72.7)			1 (9.1)	2 (18.2)	11 (100.0)
7. Daklak	10 (90.9)				1 (9.1)	11 (100.0)
Total / Overall	**65 (85.5)**	**1 (1.3)**	**1 (1.3)**	**3 (4.0)**	**8 (10.5)**	**76 (100.0)**

Source: Field Survey, 2008, ACI.

Table 168 Source and Amounts of Loans

	Number and Percentage of Households reporting Loans from various sources			**Amount of loans (VND Million)**		
Provinces Surveyed	Banks	Suppliers	Total Reporting	Banks	Suppliers	Total Reporting
1. Tien Giang	1 (7.1)	13 (92.9)	14 (100.0)	10.0	1.4	2.0
2. Binh Phuoc	2 (100.0)		2 (100.0)	60.0		60.0
3. Dong Nai	1 (100.0)		1 (100.0)	14.0		14.0
4. Ba Ria - Vung Tau	2 (100.0)		2 (100.0)	45.0		45.0
5. Ben Tre	5 (100.0)		5 (100.0)	7.8		7.8
6. Daknong	1 (100.0)		1 (100.0)	20.0		20.0
7. Daklak	2 (100.0)		2 (100.0)	32.5		32.5
Total / Overall	**14 (51.9)**	**13 (48.2)**	**27 (100.0)**	**25.6**	**1.4**	**13.9**

Table 169 Number and Percentage of Households Requiring Further Loans to Finance Cocoa

Provinces Surveyed	Yes	No	Total Reporting	Average Size of Additionally Required Loan (VND)
1. Tien Giang		14 (100.0)	14 (100.0)	-
2. Binh Phuoc	1 (50.0)	1 (50.0)	2 (100.0)	100,000,000
3. Dong Nai		1 (100.0)	1 (100.0)	-
4. Ba Ria - Vung Tau	2 (100.0)		2 (100.0)	40,000,000
5. Ben Tre	1 (20.0)	4 (80.0)	5 (100.0)	100,000,000
6. Daknong		1 (100.0)	1 (100.0)	-
7. Daklak	1 (50.0)	1 (50.0)	2 (100.0)	20,000,000
Total / Overall	**5 (18.5)**	**22 (81.5)**	**27 (100.0)**	**60,000,000**

Source: Field Survey, 2008, ACI.

B.18 Constraints and Priorities

463. Pests and diseases, seedlings, and lack of government support are the constraints reported more often (Table 170) by farmers (52.9%, 51%, and 44.1% of farmers indicating these as constraints).

464. For seedling, farmers characterize the constraint (Table 171) in terms of quality (64%) and availability (26%). For diseases and pest (Table 172), the constraint is characterized in terms of phytophthora (70.4%), and helopeltis (59.3%). For government support (Table 173), the constraint is characterized in terms of no support (40% of respondents), or limited support (55.6%). Farmers believe that government support should go mainly to input support, credit, and prices.

Table 170 Constrains Reported by Farmers (percentage of respondents)

Sample	**16**		**19**		**7**		**12**		**24**		**12**		**13**		**103**	
Constraints	Tien Giang		Binh Phuoc		Dong Nai		Ba Ria - Vung Tau		Ben Tre		Daknong		Daklak		Total / Overall	
1. Seedlings	6	(40.0)	6	(31.6)			5	(41.7)	19	(79.2)	8	(66.7)	8	(61.5)	52	(51.0)
2. Land, Soil	2	(13.3)					3	(25.0)	3	(12.5)	3	(25.0)	4	(30.8)	15	(14.7)
3. Water	8	(53.3)	4	(21.1)	2	(28.6)	1	(8.3)	3	(12.5)	2	(16.7)			20	(19.6)
4. Wind			1	(5.3)							4	(33.3)	3	(23.1)	8	(7.8)
5. Diseases and pests	2	(13.3)	13	(68.4)	6	(85.7)	10	(83.3)	5	(20.8)	10	(83.3)	8	(61.5)	54	(52.9)
6. Cultivation techniques	2	(13.3)	4	(21.1)	4	(57.1)	2	(16.7)	3	(12.5)	6	(50.0)	5	(38.5)	26	(25.5)
7. Market			5	(26.3)	2	(28.6)	1	(8.3)	2	(8.3)	5	(41.7)	5	(38.5)	20	(19.6)
8. Price	3	(20.0)	2	(10.5)	1	(14.3)	7	(58.3)	7	(29.2)	2	(16.7)	1	(7.7)	23	(22.6)
9. Pod Storage			2	(10.5)			1	(8.3)	2	(8.3)	1	(8.3)			6	(5.9)
10. Fermentation			5	(26.3)			2	(16.7)	3	(12.5)	1	(8.3)	1	(7.7)	12	(11.8)
11. Drying	1	(6.7)	6	(31.6)			5	(41.7)	2	(8.3)	3	(25.0)	2	(15.4)	19	(18.6)
12. Market information	5	(33.3)	6	(31.6)	5	(71.4)	8	(66.7)			5	(41.7)	1	(7.7)	30	(29.4)
13. Labor	2	(13.3)	6	(31.6)			3	(25.0)	3	(12.5)	3	(25.0)	4	(30.8)	21	(20.6)
14. Transport	1	(6.7)	3	(15.8)	1	(14.3)					8	(66.7)	2	(15.4)	15	(14.7)
15. Support from government	8	(53.3)	6	(31.6)	5	(71.4)	8	(66.7)	4	(16.7)	8	(66.7)	6	(46.2)	45	(44.1)
16. Other	5	(33.3)	3	(15.8)	1	(14.3)	1	(8.3)	9	(37.5)	2	(16.7)	3	(23.1)	24	(23.5)
18. At Least One	15	(93.8)	19	(100.0)	7	(100.0)	12	(100.0)	24	(100.0)	12	(100.0)	13	(100.0)	102	(99.0)

Source: Field Survey, 2008, ACI.

Table 171 Number and Percentage of Households Reporting Seedlings as Constraints

Provinces Surveyed	Yes Seedlings is Constraint		Reasons for Talking as Constraint							
			Quality		Availability		Other Reasons		Total reporting	
1. Tien Giang	6	(37.5)	4	(80.0)			2	(40.0)	5	(100.0)
2. Binh Phuoc	6	(31.6)	4	(80.0)			1	(20.0)	5	(100.0)
3. Dong Nai										
4. Ba Ria - Vung Tau	5	(41.7)	5	(100.0)			2	(40.0)	5	(100.0)
5. Ben Tre	19	(79.2)	11	(57.9)	7	(36.8)	8	(42.1)	19	(100.0)
6. Daknong	8	(66.7)	4	(50.0)	5	(62.5)	2	(25.0)	8	(100.0)
7. Daklak	8	(61.5)	4	(50.0)	1	(12.5)	4	(50.0)	8	(100.0)
Total / Overall	**52**	**(50.5)**	**32**	**(64.0)**	**13**	**(26.0)**	**19**	**(38.0)**	**50**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 172 Number and Percentage of Households Reporting Disease and Pest as Constraints

Provinces Surveyed	Yes It is a Constraint		Reasons for Talking as Constraint							
			Phytophtora		Helopeltis		Other Reasons		Total reporting	
1. Tien Giang	2	(12.5)	1	(50.0)			1	(50.0)	2	(100.0)
2. Binh Phuoc	13	(68.4)	10	(76.9)	9	(69.2)	7	(53.9)	13	(100.0)
3. Dong Nai	6	(85.7)	4	(66.7)	4	(66.7)	3	(50.0)	6	(100.0)
4. Ba Ria - Vung Tau	10	(83.3)	9	(90.0)	6	(60.0)	3	(30.0)	10	(100.0)
5. Ben Tre	5	(20.8)	4	(80.0)	4	(80.0)	1	(20.0)	5	(100.0)
6. Daknong	10	(83.3)	7	(70.0)	6	(60.0)	4	(40.0)	10	(100.0)
7. Daklak	8	(61.5)	3	(37.5)	3	(37.5)	5	(62.5)	8	(100.0)
Total / Overall	**54**	**(52.4)**	**38**	**(70.4)**	**32**	**(59.3)**	**24**	**(44.4)**	**54**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 173 Number and Percentage of Households Reporting Support from Government Agencies as Constraints

Provinces Surveyed	Yes It is a Constraint		Reasons for Talking as Constraint							
			No Support		Limited Support		Other Reasons		Total reporting	
1. Tien Giang	8	(50.0)			7	(87.5)	1	(12.5)	8	(100.0)
2. Binh Phuoc	6	(31.6)	4	(66.7)	1	(16.7)	1	(16.7)	6	(100.0)
3. Dong Nai	5	(71.4)	5	(100.0)					5	(100.0)
4. Ba Ria - Vung Tau	8	(66.7)	4	(50.0)	4	(50.0)			8	(100.0)
5. Ben Tre	4	(16.7)	1	(25.0)	3	(75.0)			4	(100.0)
6. Daknong	8	(66.7)	1	(12.5)	7	(87.5)			8	(100.0)
7. Daklak	6	(46.2)	3	(50.0)	3	(50.0)			6	(100.0)
Total / Overall	**45**	**(43.7)**	**18**	**(40.0)**	**25**	**(55.6)**	**2**	**(4.4)**	**45**	**(100.0)**

Source: Field Survey, 2008, ACI.

B.19 Favorite method of cultivation and plans

465. Almost 80% of farmers declare intercropping as their favorite method of cocoa cultivation, 16% prefer monoculture, and 4% prefer agroforestry (Table 175).

466. Only 30% of farmers plan to change from their current method of cultivation to a different method of cultivation (Table 176). In their view, each method has main advantages and disadvantages which are indicated as follows (Table 174):

Table 174 Advantages and Disadvantages of Different Cocoa Farming Systems Reported by Farmers

	Main advantages	Main disadvantages
Monoculture	Relatively easy to master technology High yield Relatively low labor cost	Pests and diseases Price variability
Intercropping	Opportunity to increase economic returns from same land	Lower yield for each crop

467. Most farmers (94.2%) have bright expectations about cocoa (Table 177). In fact, 48% of farmers plan to expand cocoa cultivated area (Table 178). Those who do not plan to do so give as the main reason their unavailability of land.

Table 175 Number and Percentage of Households Reporting the Most Favorite Method of Cocoa Cultivation

Provinces Surveyed	Monoculture		Intercropping		Agroforestry		Total Reporting	
1. Tien Giang	2	(12.5)	14	(87.5)			16	(100.0)
2. Binh Phuoc			17	(89.5)	2	(10.5)	19	(100.0)
3. Dong Nai	2	(28.6)	5	(71.4)			7	(100.0)
4. Ba Ria - Vung Tau	2	(16.7)	10	(83.3)			12	(100.0)
5. Ben Tre	2	(8.3)	22	(91.7)			24	(100.0)
6. Daknong	5	(41.7)	6	(50.0)	1	(8.3)	12	(100.0)
7. Daklak	4	(30.8)	8	(61.5)	1	(7.7)	13	(100.0)
Total / Overall	**17**	**(16.5)**	**82**	**(79.6)**	**4**	**(3.9)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 176 Number and Percentage of Households Planning to Adopt Other Cultivation Methods in Future Other than the one Currently Followed

Provinces Surveyed	Yes		No		Total Reporting	
1. Tien Giang	4	(25.0)	12	(75.0)	16	(100.0)
2. Binh Phuoc	7	(36.8)	12	(63.2)	19	(100.0)
3. Dong Nai	1	(16.7)	5	(83.3)	6	(100.0)
4. Ba Ria - Vung Tau	2	(20.0)	8	(80.0)	10	(100.0)
5. Ben Tre	3	(14.3)	18	(85.7)	21	(100.0)
6. Daknong	6	(54.6)	5	(45.5)	11	(100.0)
7. Daklak	6	(46.2)	7	(53.9)	13	(100.0)
Total / Overall	**29**	**(30.2)**	**67**	**(69.8)**	**96**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 177 Farmers Expectation on Future of Cocoa Cultivation

Provinces Surveyed	Bright		Uncertain		Other		Total Reporting	
1. Tien Giang	14	(87.5)			2	(12.5)	16	(100.0)
2. Binh Phuoc	18	(94.7)			1	(5.3)	19	(100.0)
3. Dong Nai	6	(85.7)	1	(14.3)			7	(100.0)
4. Ba Ria - Vung Tau	12	(100.0)					12	(100.0)
5. Ben Tre	24	(100.0)					24	(100.0)
6. Daknong	12	(100.0)					12	(100.0)
7. Daklak	11	(84.6)	2	(15.4)			13	(100.0)
Total / Overall	**97**	**(94.2)**	**3**	**(2.9)**	**3**	**(2.9)**	**103**	**(100.0)**

Source: Field Survey, 2008, ACI.

Table 178 Number and Percentage of Households Planning to Expand the Cocoa Cultivation Area

Provinces Surveyed	Yes		No		Total Reporting		Average Area Planned for Expansion (Ha)	Estimated Number of Additional Workers Required for Expansion
1. Tien Giang	7	(43.8)	9	(56.3)	16	(100.0)	0.59	1.71
2. Binh Phuoc	12	(63.2)	7	(36.8)	19	(100.0)	1.36	1.08
3. Dong Nai	3	(42.9)	4	(57.1)	7	(100.0)	0.63	1.00
4. Ba Ria - Vung Tau	4	(33.3)	8	(66.7)	12	(100.0)	0.63	1.25
5. Ben Tre	9	(37.5)	15	(62.5)	24	(100.0)	0.35	0.22
6. Daknong	8	(72.7)	3	(27.3)	11	(100.0)	1.81	0.63
7. Daklak	6	(46.2)	7	(53.9)	13	(100.0)	1.75	1.17
Total / Overall	**49**	**(48.0)**	**53**	**(52.0)**	**102**	**(100.0)**	**1.08**	**0.96**

Source: Field Survey, 2008, ACI.

B.20 Competitive Crops

468. The main competitive crops indicated by farmers include:
   1. Cash crops: coffee, rubber, pepper, cashews
   2. Fruit: durian, pomelo, mangosteen, longan, lemon, orange, rambutan, coconut

B.21 Innovations

Box 8 Diversifying out of Coffee in the Highlands

Mr. Dam Van Tuan is a young and dynamic farmer living in Hamlet No.4, Dak Rla commune, Dak Min District, Dak Nong province. Dak Min is a well known area of coffee in the highland. However, his specific area is not suitable for coffee due to shortage of water. In the past Mr Tuan did try coffee but failed. Thereafter, he used land just for two crops of corn during rainy season. This annual crop is laborious and provides low income.

In 2001, within the context of a project sponsored by WCF, the Nong Lam cocoa team gave a cocoa workshop in this area. Mr Tuan attended the workshop and found it extremely interested to learn that cocoa needs less water than coffee because the fruit setting happens mainly in the rainy season. To his request, Nong Lam cocoa team provided him 500 commercial cocoa grafted seedlings.

In the first 2 years, he intercropped cocoa with corn and using crotalaria as temporary shade. To his surprise, cocoa grew well with the limited water that was not enough for coffee in the past.

At the end of 3rd year after planting he harvested 0.6 ton (1.2 ton/ha) of cocoa bean in his 0.5 ha and 1.0 ton (2 ton/ha) in the following year. Last year (2007) Mr. Tuan got 1.2 ton (2.4 tons/ha) of dry bean from his farm. Many farmers have visited his farm to share with him his experience in planting cocoa. His farm was also used as a cocoa field school for many projects (WCF, PSOM, and GTZ). In addition to having good income from high yield cocoa beans, Mr. Tuan also sells budwoods to cocoa nurseries. Currently, he starts to engage in cocoa business by buying ripe pods to produce fermented dry cocoa bean.

When visitors asked him how difficult to plant the new crop he said: "I have planted coffee, corn, soy-bean but it seems to me that planting cocoa is much easier. I just spend one hour or two every day to take care of the farm. I still have a lot of time to run my small shop near the road side. Furthermore, the income from cocoa is not bad as compared with the one of coffee. If only I had more land to expand this interesting crop." Asking if he is satisfied with the production he said that if he can afford to drill a well to supply enough water for his cocoa farm during the dry season the production will be higher.

Source: Study Team

Box 9 Cocoa Farmer Rising from Poverty

Located in the remote commune of Chau Thanh district, Ben Tre province, Mr. Son planted one ha of cocoa (1000 trees) since 1999 under longan canopy. The seedlings come from unidentified seeds. Three years after planting, cocoa trees did not perform well, and showed poor and small pods. In May 2002, a Nong Lam University cocoa team brought 21 commercial clones that were imported and locally selected under the WCF-NLU Cocoa Development Project to rehabilitate those trees by side grafting. Just 8 months later, most of the grafted trees produced a lot of pods.

Before planting cocoa, Mr. Son's family relied only on longan. However, the price of longan has fluctuated from year to year and in many years it was hard to him to support his poor family including sick mother and two children (one of them affected by orange agent).

With the extra income from cocoa, his life has improved gradually. In 2003, he produced 20 000 hybrid seedlings and 10 000 grafted seedlings to supply the ED&F Man seedlings project.

In 2004 he was selected as training facilitator for Success Alliance project. During this time, all his rehabilitated cocoa trees were very productive and his farm became a well known site for those who are interested in cocoa. His cocoa farm is one of the reliable sources of registered commercial budwoods to supply nurseries that produced grafted seedlings for Success Alliance project in Ben Tre and Tien

Giang provinces. In addition, he sold pods for root stock and the good looking cocoa pods are sold as fruit trees at high price and the rests are fermented to produce dry cocoa beans. He also started a trading business by buying cocoa pods from other cocoa farmers to conduct the fermentation in his small fermentary.

Nowadays, with income from cocoa, he is able to shoulder the expenses for medicine of his mother, give treatment to his sick child and repair his house from the old muddy one.
In 2005, Mr. Son was selected as good cocoa farmer to attend the Second Annual Success Alliance International Conference in the Philippines. "This is really a dream comes true", Mr. Son said. "I spent more time and effort when planting longan but could not escape from the poverty that always followed my family. I feel lucky and very thankful in participating in the cocoa project from the beginning. Therefore I have chance to diversify my activities from producing seedling, selling budwood and now setting up the fermentary".

Source: Study Team

Box 10 Cocoa Farmer becoming Entrepreneur

Mr. Nguyen Van Loc lives in Xuan Thanh Commune, Long Khanh District, Dong Nai province. In 2003, after hearing the news on the radio, he went to Nong Lam University to ask about cocoa. After being provided information related to cocoa by NLU cocoa team, he decided to intercrop cocoa into his four hectares of black pepper, durian, and fruit trees (pomelo, rambutan, star fruit …). NLU cocoa project provided him seedlings of one ha of cocoa clones and 3 ha of cocoa hybrids. Since then, Mr. Loc is the frequent visitor of NLU cocoa project. He attended most seminars and workshops offered at Nong Lam University: pest and disease management, fermentation, planting materials, plant propagation, etc. Realizing the potential of the future of cocoa industry, Mr. Loc established his own company to engage in business and investment. He set up the fermentary to buy ripe pods and conducting the fermentation. At the same time, he set up the nursery to produce the approved cocoa clones. Cocoa farmers pay half of the seedlings price, and pay the rest in king (cocoa beans) when trees produce the pods. By this way, in 2007 he is producing 500 000 grafted seedlings to invest in Da Huoai district, Lam Dong province. So far, his cocoa nursery is one of the biggest ones in the country. Currently, he rented two hectares of land in the industrial zone at Long Khanh, Dong Nai to be ready for the next step, investing in cocoa processing.

Source: Study Team

C FERMENTATION

C.1 Introduction

469. The cocoa processing industry in Viet Nam is still at its infancy. Some domestic companies make candies, chocolates, and beverages but they use imported cocoa liquor. They rarely use cocoa produced in Vietnam as input for their products. Recently, a private company, VINACACAO is planning to build a factor (Thanh Phat) in Gialong industrial zone of Ben Tre that will produce chocolate and cocoa liquor.

470. Most of the industry is small scale and artisanal. Some farmers produce cocoa wine for their own consumption. Other farmers expressed interest in making cocoa wine but do not know the technique. Some farmers have made cocoa powder to sell to the local market but in very small quantity. The quality of the cocoa powder is low and has a strong acidic flavor.

471. The main processing activity that involves a large number of farmers and collectors is cocoa bean fermentation. Given the still limited volume of production, fermentation by farmers is done in small batches. The activity is attractive to famers given that the investment is modest and leisure time could be used to ferment small quantities. A number of fermentaries have been established as indicated in **Table 179.**

Table 179 Number of Fermentaries by Province

Province	Number ff Fermentaries
Baria-Vung Tau	31
Binh Phuoc	18
Tien Giang	34
Dak Lak and Dak Nong	102
Ben Tre	118

Source: Phuoc. Collected in December 2007

472. Batch size varies from just tens kg to hundreds of kg for some fermentation stations owned by traders or cooperatives. An average batch of 42 kg was estimated in the farmer survey conducted by the Study Team, across seven provinces.

473. Due to limitation in pod quantity the time for storing pods also varies a lot. On average farmers leave pods to store before fermentation for a period of 6 days, but sometimes farmers keep pods for 10-15 days before fermentation[35].

C.2 Economics of Fermentation

474. The economics of fermentation is linked to batch size. The larger the batch the higher the benefits that could be made out of fermentation. An illustration using an example studied by the Study Team can make this clear.

[35] This gives an higher incidence of black pod disease and more opportunity for rat attacks.

475. On July 22, 2008, the Cho Gao coop in Ben Tre was buying pods at prices varying between VND 3,400/kg (for I Class), VND 3,200/kg (for II Class), and VND 2,600/kg (for III Class). Pods are classified based on size and maturity/ripeness. These criteria affect the conversion ratio of pods to beans. Interview with local traders reveals that 1st class pods (big size and ripe pods) have a conversion ratio of 10-10.5 to 1; medium class pods have a conversion ratio of 11 to 1; third class pods may need 13-14 kg, or even 15 kg of pods to produce 1 kg of dry beans. The farmers tend to harvest pods before it is ripe because they are afraid that squirrels may destroy the pods. Moreover, pods that are green/not ripe are heavier and farmer hope to gain more money on a per kg basis.

476. Based on a basic price of beans at VND 39,600 and given premium for bean size (related to class of pods) and quality of fermented beans (fully fermented), the gross margins vary (see Table 180) between 12.1% of beans price (for class III pods) to 18.9% (for class I pods).

Table 180 Gross Margins in Fermentation

Indicator	Unit	I class pods	II class pods	III class pod
Price of Pods	VND/kg	3,400	3,200	2,600
Conversion ratio	Kg of pods for 1 kg of beans	10.5	11	14
Expense on pods	VND/kg	35,700	35,200	36,400
Selling price of beans	VND/kg	39,600	39,600	39,600
Margin (sale price - buying price)	VND/kg	3,900	4,400	3,200
Premium (Bean size)	%	5%	3%	0
Premium (fermented beans)	%	1,600	1,600	1,600
Total gross margin	VND/kg	7,480	7,188	4,800
Margin as % of selling price	%	18.9%	18.2%	12.1%

Source: Study Team

477. The net margins (taking into account of labor costs) very much depend on the batch size and labor requirements. Taking the norm of 1 person day of labor for 1 batch of 60 kg, the net margins for batches of 100kg, 50kg, and 10kg are illustrated in Table 181.

Table 181 Gross Margins in Fermentation

Batch size	kg	100	50	10
Pod Class	Class	I	II	III
Wage rate	VND/day	85,000	85,000	85,000
Labor cost	VND/batch	141,667	70,833	14,167
Gross Margin	VND/batch	748,000	359,400	48,000
Net Margin	VND/batch	606,333	288,567	33,833

478. Even though small in absolute terms for small batches, they provide additional income to farmers and provide a stable flow of cash. Moreover, farmers consider the return to their labor in addition to the net margins as part of their income.

479. For larger operators, able to ferment between 1 and 10 tons per year, fermentation could be a good source of income (providing and additional 6 and 60 VND million). It is not

surprising that some cocoa producers and small nurseries are now shifting to trading and fermentation as their main activity[36].

C.3 Some technical issues related to fermentation

480. **Temperature**. Low temperature is a problem only in the Central Highlands during main crop (December, January). To address this problem, it is recommended to use wooden boxes with polysterene layer surrounding the box to keep the heat during fermentation.

481. **Size of boxes**. Some of the parameters include:

- Volume of wet bean 100 kg and above is good for quality fermentation.
- Depth: 50 cm to keep the cocoa mass at 45 cm
- Length: 80 cm
- Width: 40 cm

482. This box contains 100 kg of wet beans and is the smallest one recommended to have good fermentation. The bigger boxes (up to 1000 kg of wet bean) are also acceptable as long as the depth of box is not higher than 50 cm.

483. **Duration**. With the volume of 100 kg or higher of wet bean the duration of fermentation is 5-6 days. With smaller volume duration can last longer depending on each specific batch. As a consequence, smaller volumes of wet beans do not give consistent results after fermentation.

Box 11 Fermentation

Although cocoa flavor is determined by genetic factor, naturally, cocoa flavor does not exist on its own. The cocoa flavor can only be developed through the fermentation process. In other words, there simply is no chocolate flavor without fermentation. Therefore, the quality of the cocoa bean will be a significant determining factor in the flavor following the fermentation process. Additional factors that determine the quality of the flavor include the duration of fermentation, quantity of cocoa seed, time of pod storage, degree of pod ripeness and environmental conditions. Experiments to determine the optimal fermentation process have been conducted and include:

- Fermentation of different varieties (clones) done in Ben Tre province.
- Fermentation of different cocoa quantities (10 kg, 30 kg, 50kg, 100kg of wet bean) done in Quang Ngai, Ben Tre and Daklak province.
- Fermentation of different durations of pod storage (storage for 0, 3, 5, 7 and 9 days) done at NLU, Ben Tre and Quang Ngai.
- Fermentation of different materials using as containers for cocoa bean (basket, box and heap) conducted at NLU, Quang Ngai and Ben Tre.
- Fermentation of different environments particularly temperature (high temperature – Ben Tre and low temperature – DakLak).
- Different duration of fermentation (5 days with 1 turn, 6 days with 2 turns, and 5 days with 2 turns, 6 days with 1 turn) conducted at Quang Ngai and NLU

The first experiments of fermentation have been conducted since 2002 by cocoa research teams at NLU. It was determined that fermentation using a box measuring 80 cm x 50 cm x 40 cm, containing about 100 kg of fresh cocoa beans yields the highest quality. Additionally, the optimal temperature for fermentation is (50°C) after the second day. Therefore, for fermentation experiments, recording the

[36] Mr Thanh from Ba Ria Vung Tau is a small nursery who is thinking to expand his trading and fermentation activities.

temperature during fermentation is required. Normally, temperature is recorded three times a day (i.e. in the morning, at noon and in the afternoon). To record more detailed results, especially during nighttime's fermentation, to attain better interpretive results, boxes with digital temperature record are constructed. These boxes gauge temperatures at 30 minute intervals.

Source: Overview of Vietnam's Cocoa Sector, WWF

D TRADERS

484. There are three main types of actors in the marketing of cocoa in Viet Nam: (i) trading and processing companies; (ii) collection and fermentation points; and (iii) collectors.

485. **Trading and processing companies**. These companies buy beans from cocoa collection and fermentation points for export or further processing. Cargill, EDF Man, Armajaro are the biggest cocoa buyers. Recently, a local company, Thai Duong, also buys cocoa beans to make chocolates and liquor. Cargill buys only quality dry beans for export whereas EDF Man buys both beans and pods. Cargill has established buying stations in Ben Tre and Dak Lac. EDF Man[37] has a buying station in Ben Tre and in Dak Lac uses its coffee buying station to also buy cocoa. Other companies buy beans from middlemen.

486. **Collection and fermentation points**. Several collection and fermentation points have been established with the initial support from SA. These actors collect pods, ferment beans and sell dry beans to the trading and processing companies. There are 37 collection and fermentation points operating in Tien Giang, the majority of them are members of the Cho Gao cocoa coop. In Ben Tre there are 103 collection and fermentation points. The Cho Gao coop buys pods directly from farmers as well as from local collectors and ferments beans. The coop also buys and sells beans to Cargill in Ben Tre. Unlike Tien Giang where 37 satellites serve the only "buying station", namely the Cho Gao cocoa coop, there are several collectors and buyers in Ben Tre.

487. **Collectors**. Besides the collection and fermentation points there are several collectors. These actors buy pods from distant farmers and sell to fermentation points. A relatively large number of collectors have made competition in cocoa trading in Ben Tre higher than in Tien Giang. High competition among traders implies that farmers are paid high prices for their pods/beans. The margins for cocoa traders are in the range of 2-5% only. Sometimes traders get no margin but only the premium from the companies. Given the fact that the buyers buy whatever the farmers have, either ripe or unripe pods, either fermented or unfermented beans at almost the same price[38] (especially when there is high competition) farmers would have no incentives to improve the quality of their products.

488. At present, it is said that the companies buy beans following the price in the world market. No information is available on how the companies set the price for beans. A recent study tour of a Vietnamese delegation to Indonesia at the end of June 2008 found out that the price of fermented beans in Vietnam is lower than the price for unfermented beans in Indonesia. At the time of the study tour the price of dry fermented beans in Vietnam was 48,000 VND/kg but in Indonesia the price was 54,000 VND/kg for unfermented beans (approximately equivalent to 57,000 VND/kg for fermented beans). The difference of 9000 VND/kg in the price between Vietnamese and Indonesian cocoa beans is explained by Cargill as the high transaction cost associated with low level of quantity in Vietnam.

[37] Currently withdrawn from cocoa in Viet Nam. Dakman will be using their buying station.
[38] This was the case recently in Ba Ria Vung Tau. The Viet Nam Cocoa Coordination Committee met with some of the traders following this practice and recommended to stop buying unfermented beans at same price as fermented beans since this would encourage bad habits of farmers early on in the development of the industry which will be difficult to correct later.

489. The price of beans differs considerably across companies. Interview with Mr. Tran Hung Son from Ben Tre shows that on July 14, 2008 Cargill bought dried beans at the price of VND44,500/kg; EDF Man bought at VND44,000/kg; Armajaro bought at VND43,800; and Thai Duong bought at VND48,500. Small companies as Thai Duong, Xuan Quynh, and Thai Binh are ready to pay higher price but they buy with smaller quantity. Xuan Quynh has a factory in Go Vap to grill beans.

490. Companies communicate their buying stations the daily price to be paid to local collectors or farmers. Price of beans is published daily in the buying stations and disseminated through local TV or radio. Based on this price the coop and the local collectors set the buying price of pods at the level that ensures a margin for their satellites.

491. Price fluctuations affect the fermenters the most since it takes at least 20 days for them to collect the pods, and ferment, dry, and sell beans. If the price is decreasing daily they can not sell beans quickly to cut loss.

492. **Margins**. On July 22, 2008 export companies bought dry beans at VND 39,600/kg in Ben Tre and Cho gao cocoa coop bought dry beans from collectors/fermenters at VND 39,000/kg, making a margin of VND 600/kg. In addition to this margin, the coop could obtain a premium for good quality beans (ie with fermentation ratio of 95% and more) and big size (one gram per bean or more), resulting in an overall margin varying between 4 and 6% of buying price. The premium is shared equally between coop and local collectors. These types of margins are fairly common among competitive commodity marketing systems in Viet Nam, at least for storable (non-perishable) commodities.

E PROVINCIAL PLANS

E.1 Introduction

493. The Study Team had prepared and sent a questionnaire to the DARDs of the 15 provinces in Viet Nam where there is some cocoa production. 14 provinces replied to the questionnaires and the following sections indicate the summary of their responses. Additional data are used to complement the information obtained from the provinces.

494. Cocoa has been introduced in Vietnam since 1950. Since then several attempts to replant the crops have been made, however only recently cocoa has become a commercial crop in some provinces of the MRD, CH and SE. Ben Tre, Dak Lak, Binh Phuoc were among the first provinces that replanted cocoa in the early 2000 and continued until now.

Table 182 Starting Year of Cocoa

#	Province	Year	Year since when cocoa has continued up to present
1	Ben Tre	1999 (1960)	(2002)
2	Tien Giang	1968	2004 (2003)
3	An Giang	1998	2005
4	Vinh Long	(1988)	2006
5	Can Tho	(1994)	
6	Dong Nai	(1980)	2001
7	Ba Ria Vung Tau	2002	(2002)
8	Binh Phuoc	2002 (2000)	(2002)
9	Dak Lak	1950	2000
10	Dak Nong	2004 (2000)	(2000)
11	Lam Dong	1968	2005 (2004)
12	Binh Dinh	1989	1997
13	Binh Thuan	1993	2007
14	Phu Yen	2007 (2003)	2007
15	Quang Ngai	1996	

Source: ACI PRO survey, July 2008.
Note: Data without parentheses are from the provinces. Data in parentheses are from the Study Team, based on personal communications.

E.2 Production

495. Current area under cocoa is estimated by the provinces at 8,584 ha of which 1,116 ha is monoculture. The rest is intercropped with coconut, cashew or fruit trees. The provinces estimate that about 25% of total cultivated area is productive. The majority of cocoa trees are between 2-4 years old, and yields are averaging at 516 kg of dry bean per ha.

496. The data provided by the provinces, particularly as related to beans production, are considerably overestimated. Production in 2007 was closer to 300 tonnes, based on trade statistics. The two major buyers in that year, Cargill and EDF Man, bought 240 tonnes.

Table 183 Areas under cocoa and production by end of 2007 estimated by Provinces

#	Province	Area (Ha)	Productive area (ha)	Production (tonnes dry beans)
1	Ben Tre	3,025	1,020	996
2	Tien Giang	1,231	498	7.2
3	An Giang	50	50	2.3
4	Vinh Long	300	na	na
5	Can Tho			
6	Dong Nai	170	na	na
7	Ba Ria Vung Tau	957	257	45
8	Binh Phuoc	1,200	na	na
9	Dak Lak	1,112	267	68.3
10	Dak Nong	342	na	na
11	Lam Dong	118	5	3
12	Binh Dinh	0	-	-
13	Binh Thuan	50	-	-
14	Phu Yen	4	-	-
15	Quang Ngai	25	25	17.5
	Total	8,583.6	2,122	1,139.3

Source: ACI PRO survey, July 2008; Data for Dong Nai is taken from Cocoa Need Assessment Survey, 2007. Data on production in Tien Giang is from Cho Gao coop, 2008.

497. In the provinces of MRD cocoa concentrates in the districts with coconut whereas in CH it concentrates in the places with old aged coffee and in SE it is intercropped mainly with cashew, pepper and durian where water is available.

Table 184 Districts with cocoa in main producing provinces

Region	Province	District of main cocoa production
MRD	Ben Tre	Chau Thanh, Giong Trom, Mo Cay: concentrated coconut
	Tien Giang	Cho Gao, Go Cong Tay: concentrated coconut
SE	Ba Ria Vung Tau	Chau Duc, Tan Thanh: pepper, coffee, mixed gardens
	Binh Phuoc	Bu Dang, Phuoc Long, Loc Ninh, TX Dong Xoai
	Dong Nai	Trang Bom, Cam My, Long Khanh, Xuan Loc, Dinh Quan, Tan Phu
	Lam Dong	Da Hoai, Da Te, Cat Tien
CH	Dak Lak	Krong Ana, Krong Pak, Krong Buk, Ea Kar, M'Drak, Lak – coffee
	Dak Nong	Dak Min, Krongno, Daksong, Dakrlap

Source: ACI PRO survey, July 2008

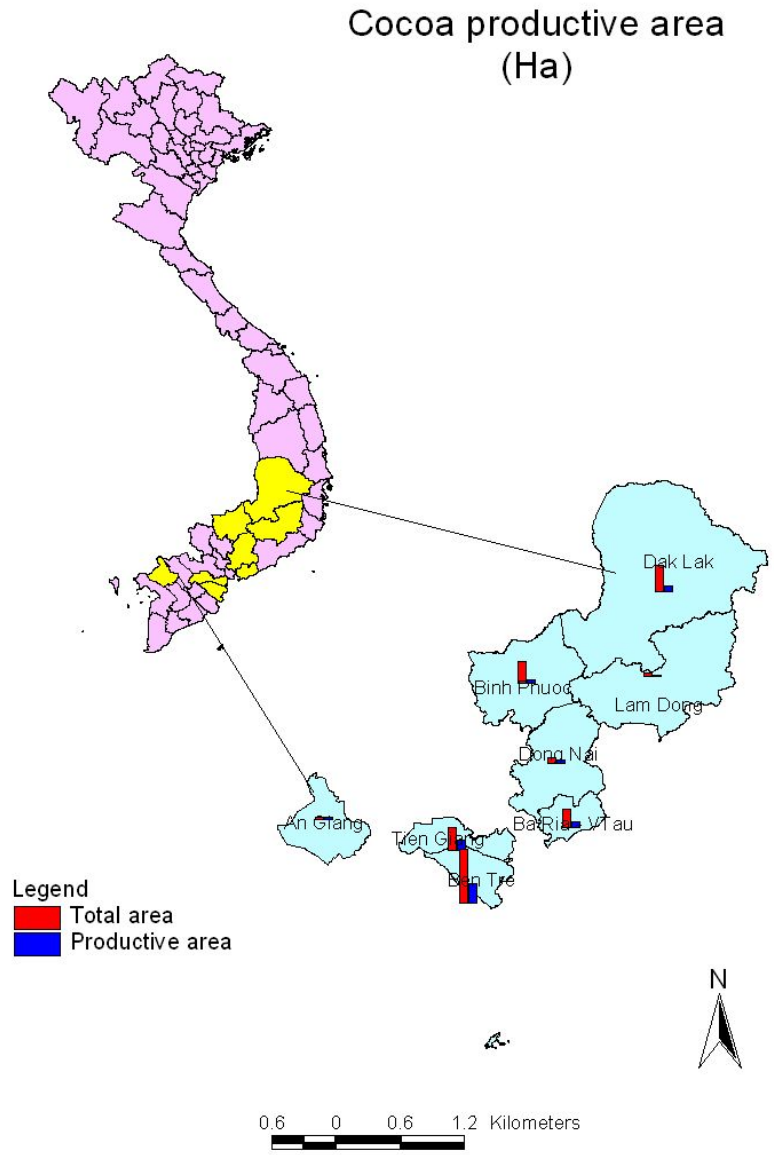


Figure 32 Total cocoa cultivated area and productive area

E.3 Agroecological Potential

498. Out of 14 provinces responding to the questionnaires, 5 do not assess agroecological potential for cocoa production. For those who do make such an assessment, more than 325,000 ha of land has been assessed by the provinces to have agroecological potential for cocoa.

499. The way the agroecological assessment has been conducted in most cases is based on qualitative assessment, without the use of science-based methods.

500. Of this area only 7.4% is planned to be planted with cocoa.

Table 185 Assessment of agroecological potential by the Provinces

Province	Assessment of agroecological potential for cocoa (ha)	Comment
Ben Tre	64,219	35,000 ha coconut & 31,219 ha of fruit trees
Tien Giang	22,500	20,000 to 25,000 ha
An Giang	1,800	
Vinh Long	10,000	
Can Tho	5,000	Area under fruit trees & coconut that is possible to intercrop with cocoa is 17-20,000 ha. If use 5% to intercrop with cocoa there would be 1,000 ha. In the cocoa need assessment report it is projected to have 4,000-5,000 ha under cocoa in Can Tho.
Dong Nai	na	na
Ba Ria Vung Tau	na	na
Binh Phuoc	41,000*	Binh Phuoc has 250,000 ha of perennial crops half of which is under cashew. About 50% of the cashew area have access to water during dry season and these areas can be intercropped with cocoa (41,000 ha)
Dak Lak	185,000*	In coffee SFE with good access to water (Krong Ana, SFE No. 10 & SFE No.715)
Dak Nong		
Lam Dong	5,000	
Binh Dinh	1,100	
Binh Thuan		
Phu Yen		
Quang Ngai		
Total	335,619	

Source: ACI PRO survey, July 2008 &
Note: Data with (*) are from *Cocoa Need Assessment, 2007*

501. Though the potential land areas for cocoa production is assessed to be high however several provinces have no plan of cocoa development. Of the provinces with plans 37.5% do not plan longer than 2010.

Table 186 Plan to expand cocoa

#	Province	Potential area	Planned				
			2007	2008	2010	2015	2020
1	Ben Tre	64,219	3,025	4,100	10,000		
2	Tien Giang	22,500		1,300	2,000	3,000	5,000
3	Dong Nai	na					
4	Ba Ria Vung Tau	na	957	1,500	1,500	4,000	5,500
5	Dak Lak	185,000	1,112	1,567	2,000	4,000	6,000
6	Dak Nong		468	2,900	5,000		
7	Binh Phuoc	41,000	1,200		2,000	7,000	
8	Binh Dinh	1,100					
9	Binh Thuan	na		100	450	2,000	2,000
10	Phu Yen	na		No plan			
11	Quang Ngai	na		No plan			
12	An Giang	1,800			1,800		
13	Vinh Long	10,000					
14	Lam Dong	5,000					
15	Can Tho	5,000		No plan			
	Total	**335,619**			**24,750**		

Source: ACI PRO survey, July 2008 & Cocoa Need Assessment, 2007

502. Of the respondents only 21.4% (Ben Tre, Dak Lak and Tien Giang) think that there is scope for production of organic cocoa in the provinces. An Giang is the only province that sees no opportunity for organic cocoa in the province. Others did not respond to the question. The corresponding figures for scope for production of Fair Trade cocoa and Rain Forest certification related to cocoa are 14.3 and 7.1% respectively. Dak Lak is the only case where Rain Forest Certification Related to Cocoa is seen as an opportunity. Several provinces have no responses on Fair Trade cocoa and Rain Forest certification related to cocoa. This may be because they might not have a clear idea about these concepts.

E.4 Projects

503. Recently there are several projects funded by international organizations and the Government. The government extension centers and private companies provide support for cocoa development in Vietnam through various services to farmers including: technical assistance (training courses, establishment of demonstration models, study tours, technical advice, etc.); distribution of planting materials such as seedlings, fertilizers; and distribution of reading materials.

504. Since 2004 SA has organized 11 courses on TOT for 5 provinces Ben Tre, Tien Giang, Ba Ria – Vung Tau, Binh Phuoc and Dak Lak. Each TOT course lasted 2 weeks.

505. In Ben Tre only, SA has organized 4 courses of TOT of 10 days each; 137 courses for 5,400 farmers on technique of cultivation totaled at VND44 million; 411 courses on pest management for 16,400 participants; VND132.8 million; 137 courses on fermentation & drying; 5,400 beneficiaries, VND44 million; 2 courses on marketing for 100 beneficiaries, VND12 million; 06 courses on nursery.

506. Topics offered to Training Facilitators (TF) during TOT and In Service Training in Success Alliance project include the following:

1. Guideline For Organizing Community Meeting
2. Transect analysis
3. Shade Establishment And Management For New Cocoa Plantings:
4. Managing Shade Trees And Intercrops For Cocoa Plantings
5. Planting And Maintenance For Cocoa Seedlings
6. Agro Ecosystems Analysis For Young Cocoa Trees
7. Pests Of Cocoa and their Management
8. Diseases Of Cocoa and their Management
9. Agro Ecosystems Analysis: Crop Management
10. Pruning And Shaping For Clonal Cocoa Plants
11. Pruning And Shaping For Cocoa Seedlings
12. Seed Selection For Rootstocks And Seedling Production
13. Selecting Clonal Materials
14. Grafting Clonal Materials
15. Agro Ecosystems Analysis: Cocoa Nursery
16. Harvesting, Fermenting And Drying Cocoa Beans
17. Cut Bean Test For Cocoa Beans
18. Mould Levels And Other Defects In Fermented Beans
19. Grading And Quality Management Of Cocoa Beans
20. Keeping Accounts For Cocoa Farmers

507. NLU offered these topics to TF during TOT and In-Service Trainings (IST). Each batch of TF has 1 TOT and followed with IST in every 3 months in 3 years. Every month, the TFs offer 1 topic in 1 day, to farmer members (40 person/cocoa club) in their cocoa clubs.

508. SA has distributed about 3.4 million seedlings to farmers. These seedlings have been provided to the farmers as credit in kind. The farmers have to return the cost after 30 months either in pods, in beans or in cash when there is a harvest. The farmers do not have to pay for interest rate. This money is then used by the province to expand area under cocoa. Unlike SA the projects funded by the government through extension centers or in case of Ben Tre through DARD, the farmers are to pay from 40%-60% of the cost of seedlings or fertilizers. The payment is made right after receipt of planting materials.

Table 187 Training received by the Provinces

Province	Training	N0. courses	Budget (Million VND)	Source of Funding
Ben Tre	Training of trainers	4		SA
	Training of farmers in pest and diseases management	137	44	SA
	Training of farmers in fermentation and drying	411	132.8	SA
	Training of enterprises in nursery	137	44	SA
	Training of farmers in fermentation and drying	100	12	SA
	Training of farmers in marketing	2		SA
Tien Giang	Training of trainers	15		SA
Baria Vung Tau	Training of trainers In service training of training facilitators	20		Provincial budget
Dak Lak	Training of trainers	13		SA
	Training of farmers in cultivation methods	984		SA, NCAE
	Training of farmers in pest and diseases management	246		SA
Vinh Long	Training of farmers in cultivation methods	10	10	Provincial budget
	Training of farmers in pest and diseases management	2	2	

Source: ACI PRO survey, July 2008. These data should be checked by ACDI/VOCA

509. The 10,000 ha of cocoa for export in Ben Tre is funded by Ben Tre province and implemented by DARD. This project has a total budget of VND101.4 billion of which VND32 billion is from provincial budget; 40.6 billion is covered by the farmers and the rest is loans. The project started in 2006 and will finish in 2010 aiming to reach 10,000 ha by 2010 and benefit 11,400 smallholder households.

510. Extension centers in different provinces also introduce cocoa in the provinces using state budget. Each province spends part of the extension budget (VND100-200 million) on cocoa promotion. The support is also in kind (40-60% subsidy of seedling and fertilizer cost) payable after receiving materials. Since the budget is limited only limited number of farmers benefit from these schemes.

511. Other agencies that provide service for the farmers include extension centers and stations; plant protection department at provincial and district levels; Department of Science and Technology, NLU, JICA, Trong Duc, Nguyen Loc, Thao Ly companies; Cargill, EDF Man, Armajaro.

512. Being asked whether there is enough capacity to provide the farmers 6 out of 14 provinces responded positively. However almost all the provinces expressed their desire to strengthen their capacity in specific subjects.

513. Being asked whether there are any environmental surveys taken before implementing any cocoa project only 5 out of 14 provinces responded and of the responses only 2 are positive.

514. Of the responses to the question on whether there are any environmental issues related to the expansion of cocoa in the province 75% indicated that there are no environmental issues. Ben Tre is the only province that expressed their concerns about environmental issues associated with cocoa production, such as waste containers and bags of pesticides & fertilizers and diseases.

Table 188 Distribution of cocoa seedlings

Province	Total number of seedlings distributed	Percentage of the distributed seedlings survived (%)	Average percentage of the cost the farmer had to pay for distribution (%)	Total budget for distribution of seedlings. (VND million)	Source of the budget	Number of farmers who have benefitted from the distribution of seedlings
Ben Tre	1,200,000	80	0	3893	SA	5805
		80	60	2080	Provincial budget	4120
Tien Giang	699,653	73	0	3000	SA	4195
Vinh Long	240,000	70	70	400	Provincial budget	1500
An Giang	6,770	95	0	40	na	na

Source: ACI PRO survey, July 2008

E.5 Constraints

515. The most common constraints indicated by respondents are:

1. Policy and capacity of the government agencies; technique of fermentation; market/price of output; and capital (each mentioned by 60% of the respondents)
2. Land and water (46%)
3. Diseases and pests (30.8%)
4. Wind (15.4%)

516. Soil is not mentioned as a constraint in any of the provinces. The three major constraints for different province are different.

Table 189 Three major set of constraints for development of cocoa sector in order of importance

Province	Three major constraints		
	First	Second	Third
Ben Tre	Too high input price. Lack of budget for capacity building for management & technical staffs. Lack of budget on research, planning; lack of technicians; lack of budget to subsidize seedling for farmers	Not yet suitable fermentation protocol to reduce acidity	Lack of drying facility, equipment for rainy season
Tien Giang	Lack of human resources	Limited knowledge of technique on cocoa cultivation	Lack of buying stations/points
Baria Vung Tau	Lack of plan/policy on cocoa development	Smallholder farmers, lack of experience; high competition by other crops (pepper, coffee)	Lack of marketing promotion
Dak Lak	Low efficiency as compared to other crops	Lack of capital to invest	Not much research and studies on cocoa; lack of convincing models
Dak Nong	na	na	na
Vinh Long	Lack of planning	Lack of nurseries in the province	Lack of labor in rural areas
An Giang	Unstable market for output. Lack of collection and fermentation points	Local managers face shortage of information on cocoa sector	Lack of information on cocoa sector by farmers
Binh Dinh	Market and market information	Lack of capital to invest	Unstable price
Lam Dong	Lack of qualified system of seedlings supply	Investment on irrigation	Lack of buying stations/points in the areas
Quang Ngai	Unstable market; price does not cover expenses. Lack of buying and fermentation stations/points	Poor farmers; lack of capital; poor soil; limitation of land	Lack of human resources, lack of technicians, lack of capital and good quality clones
Binh Thuan	Lack of plans for cocoa production	Lack of experience due to newly introduced crop	Small and fragmented areas under cocoa
Phu Yen	Not yet identify clones suitable to the local conditions	Private sector not yet involves in production and buying output	No scientific basic and experience to orient cocoa development
Can Tho	No policy on cocoa development by 2020.	Lack of market for output. No demonstrations on production, fermentation	Lack of human resource

Source: ACI PRO survey, July 2008

F PESTS AND DISEASES

517. The number of insect species that have been reported as feeding on cocoa exceeds 1500 (see a Review of main pests and diseases in section A.13). Introduction of cocoa to an area where it had not previously been planted often leads to some local pests attacking the introduced crop, although they had not previously been reported on cocoa. Some of these pests adapt to cause significant damage. Most of the pests reported do not create any significant problems but there are sufficient major pests to cause significant crop loss.

F.1 Main Cocoa Pests in Viet Nam

518. The main cocoa pests in Viet Nam are described as follows:

1. **Mirids**. *Helopeltis spp*. is the main pest in cocoa farm of Vietnam. However, the incidence is much higher in the Central Highlands and Southeast as compared with other regions. In the Mekong River Delta, the rate of incidence varies from farm to farm depending on the availability of cocoa black ant, the natural enemy of *Helopeltis.* Direct losses from this insect are not clear; however it causes good condition for the infection of black pod disease.
   Pest management:
   - Pruning properly
   - Establishing weaver ant or black ant colonies in cocoa farms. This is the most recommended practice to control Helopeltis.
   - Spraying Fenobucarb or Dimethoate at young shoot and pods

2. **Chafer beetle**. It is important in the first year when the trees have few leaves which are very essential for photosynthesis. The incidence is more severe where there is less shade trees and wind break.
   Pest management:
   - Using fertilizer bag to cover the tree
   - Establishing proper temporary shade and wind break
   - Applying chemical under the plant residue piles in the farm.
   - Spraying Cypermethrin, Decamethrin on the leaves at sun set.

3. **Weevil borers**. So far, only cocoa in Ba Ria Vung Tau has been affected. Young leaves and shouts are heavily attacked, especially during rainy season. Hibiscus which is abundant in this area is a favorable host of this insect.
   Pest management:
   - Regularly visiting the farm for early identification.
   - Controlling hibiscus.
   - Spraying both hibiscus and cocoa with cypermethrin.

4. **Cocoa husk borer**. The symptom appears in some cocoa farms but not severe. Just removing the infected pod, no specific measure to control this pest is available.

5. **Rat and squirrel**. It becomes more important when cocoa volume increase. In severe case in Binh Phuoc, 50% is lost.

Pest Management:

- Trap and bait are used but not so effective.

F.2 Main Cocoa Diseases in Viet Nam

519. The main cocoa diseases in Viet Nam are described as follows:

1. **Black Pod, Stem Cancer**. This is main disease in Vietnam, especially where cocoa are intercropped at high density such as Ba Ria-Vung Tau. In the Highland, the high incidence happens during rainy season. The loss has been reported up to 50% at BRVT and 80% in some cocoa farms in Dak Lak and Dak Nong in 2007. In Ben Tre, high incidences of stem cancer are on farms that do not drain well the soil or mulching inappropriately (too thick and too near the base of the stem)

   Disease management:
   - Reduce canopy humidity through
     - improving soil drainage
     - improving canopy aeration by spacing, pruning and shade management
   - Sanitation and regular, frequent harvesting
   - Leaf litter mulch to prevent soil splash
   - Destroy the tent building of ant on the tree.
   - Stimulate antagonistic soil microbes and appropriate fertilizer application
   - Bury infected pods in trenches. Anaerobic fermentation will kill Phytophthora within 10 weeks, improve soil health and provide nutrients for cocoa trees
     - Add chicken/quail manure (or urea), green manure, pod cases, pod mummies, chopped cocoa prunings and EM4
     - Exclude air by tramping
     - Cover with soil
   - Treat cankers with cuprous oxide or Fosetyl-Al fungicides
   - Phosphonate potassium trunk injections

2. **Vascular Streak Dieback**. The incidence is still low in Vietnam. VSD has been found at Ben Tre, Ba Ria-Vung Tau and Dong Nai. No report of this disease in other provinces

   Disease management
   - Using resistant variety: Planting higher portion of TD6 in the cocoa farm. Not to use only TD6 since its quality is low (low fat content)
   - Regularly visiting cocoa farm to detect the symptom at early stage.
   - Field sanitation: Removing on infected branches.
   - Pruning to reduce relative humidity under canopy
   - Uproot infected plant if less than one year old.
   - Cut infected branches 30 cm from the infected point

3. **Pink disease**. The incidence is high when cocoa is near rubber plantation or intercropped with cashew. This is the main disease in Binh Phuoc and some part of Dak Lak.
   Disease management
   - Visiting regularly the farm

- Field sanitation: removing and burry all infected branches
- Pruning cocoa and shade tree
- Spraying cuprous oxide fungicide

4. **Algae rust**. When cocoa branches are exposed to direct sunlight they often suffer sun scorch. This condition facilitates the attack of different types of fungus can cause the death of the whole branches. Algae develop on the death tissues at sun scorch and giving the rust color. The disease is very severe in the Highland and SE areas, especially on those farms lacking shade. In Mekong Delta, the disease is less due to availability of shade in all of cocoa farms.
   Disease management
   - Visiting regularly the farm
   - Establishing proper shade
   - Not to prune heavy at a time
   - Keeping leaves to protect branches against direct sunlight
   - Maintaining sufficient water and nutrition
   - Establishing windbreak

520. Table 190 indicates the major pests affecting cocoa and the extent they are relevant in Viet Nam, the risk assessment and the risk management.

Table 190 Major Pests affecting Cocoa and Viet Nam

Pest	Effects	Extent in Viet Nam (low, medium, high)	Risk Assessment in Viet Nam (low, medium, high)	Risk Management
Mirids or capsids	Lesions caused by sap-sucking bugs resulting in wilting or death of stems, entry of fungi, losses of pods	Main pest in Vietnam.	It is prevalent in Vietnam. Low incidence in Mekong Delta and high in the Highland and SE areas.	Controlled by cyclodience organochlorine, benzene hexachloride (BHC) or carbamate. Biological control: Black ant
Shield bugs	Inhibit development of beans and make pods abort	Not yet observed in Vietnam		Controlled by lindane, thiodan, unden or basudine.
Leaf Hopper	Causing distortion of bud and premature fall of leaves, pod wilt	Observed in Vietnam	It is prevalent in Vietnam. The risk is minor.	Controlled by fenitrothion or formothion
Psyllids	Causing bud death, flower and fruit atrophy	Observed in Vietnam	It is prevalent in Vietnam. The risk is minor.	Controlled by cyclodience organochlorine, benzene hexachloride (BHC) or carbamate.
Aphids	Causing leaves to crinkle and fall and flowers to wilt	Observed in VN	It is prevalent in Vietnam. The risk is high during establishment stage.	Controlled by menazon
Thrips	Causing leaves become silvered and dry	Observed in VN	It is minor pest in Vietnam.	Controlled by BHC, fenitrothion, diazinon

Pest	**Effects**	**Extent in Viet Nam (low, medium, high)**	**Risk Assessment in Viet Nam (low, medium, high)**	**Risk Management**
Mealybugs	Causing pods damaged and transferred cocoa swollen-shoot virus	Observed in VN	It is prevalent in Vietnam. The risk is minor.	
Ring Bark Borers	Causing seedling died, branches broken	Observed in VN	It is minor pest in Vietnam.	Controlled by removal of affected branches.
Stem Borers	Causing stem damaged and died	Observed in VN	It is minor pest in Vietnam.	Controlled by Organochlorine chemical
Cocoa Pod Borer	Beans is undeveloped and useless	Not yet observed in VN	It could be very serious in the future.	Quarantine should be strict. Controlled by dieldrin and aldrin. Remove all pods from a plantation at the end of mian crop. Releasing Trichogrammoidea as egg parasite,
Bollworm	Damaging bud and leaves	Not yet observed VN	It is not yet prevalent in Vietnam	Controlled by systemic insecticides
Leaf-cutting ants	Eating leaves	Not yet observed VN	It is not yet prevalent in Vietnam	Destroying nest, fumigating with methyl bromide. Using bate
Chafer Beetles	Causing damage on young leaves, flowers and also on roots	Observed in VN	It is major pest in the first year after planting. High incidence has been reported in the Highland and SE areas. Low in the Mekong Delta	Controlled by pouring BHC, derivatives into the holes towards the top roots, spreading granular insecticides around the collar.
Cocoa Beetle	Larvae bore the chamber in the cambium and bark	Observed in VN	It is major pest.	Controlled by systemic insecticides. Using alternative host plant, *Pachira insignis*, as traps
Weevil Borers	Causing damage on leaves and pods	Observed in BR-VT	It is major pest in Ba Ria Vung Tau.	Controlled by Cypermethrin
Cocoa Husk Borer		Observed in VN	It is minor pest in Vietnam.	Controlled by dieldrin and aldrin
Nematodes	Causing stunting of young plants, and die	Not yet observed in provinces	It is not yet prevalent in Vietnam	Sterilize the nursery and plantation before planting. Systemic insecticides
Termites	Cutting stem at root collar or 2-3 cm below soil surface.	Observed in VN, caused considerably loss after planting	High incidence in SE areas and Highland	Reducing organic matter in potting medium. Using chemical Imidacloprid or Chlorpyrifos
Vertebrates	Pods damaged,	Observed VN	It becomes more	Trap and bait are used

Pest	Effects	Extent in Viet Nam (low, medium, high)	Risk Assessment in Viet Nam (low, medium, high)	Risk Management
	lost of production		serious when production increases. It could be serious in the future	but not so effective.

Source: Study Team.

Table 191 Major Diseases affecting Cocoa and Viet Nam

Diseases	Effects	Extent in Viet Nam (low, medium, high)	Risk Assessment in Viet Nam (low, medium, high)	Risk Management
Cocoa Necrosis Virus	Shoot wilt and died back	Not yet observed in VN	It is not yet prevalent in Vietnam	
Cocoa Mottle-leaf Virus	Producing mottle on flush leaves	Not yet observed in VN		
Black Pod Disease	Causing damage on flower cushions, shoos, leaves, seedlings and roots.	Observed in VN	High incidence in all cocoa farms. The main and serious disease in future	Controlled by IPM concept. Using metalaxyl, copper oxychloride
Cushion Gall Disease	Damaged on flower cushions	Not yet observed in VN	It is not yet prevalent in Vietnam	Remove all gall-bearing trees. Using systemic fungicide
Mealy Pod Disease	Causing black pod	Not yet observed in VN		Controlled by IPM concept. Using copper fungicides
Ceratostomella Wilt	Whole or part of the tree wilts and part affected will die	Not yet observed in VN	It is not yet prevalent in Vietnam	Controlled by chemical
Vascular Streak Dieback	Kill the tree	Observed in VN	It is prevalent in Vietnam. The risk is mild.	Using resistant materials, pruning diseased branches
Sudden-death Disease	Leaves wilt and fall, the tree dies	Not yet observed in VN	It is not yet prevalent in Vietnam	Selection of resistant materials. Pruning the diseased branches
Pink Disease	Causing defoliation and death of effected branches	Observed in VN	It could be serious in the system cocoa-cashew	Controlled by copper fungicides. Pruning the effected materials
Thread Blights	Leaves die, canopy covered by fungal	Not yet observed in VN	It is not yet prevalent in Vietnam	Pruning dead materials. Using copper fungicide
Brown Root Disease	Leaved wilt, trees die	Not yet observed in provinces	It is not yet prevalent in Vietnam	

Source: Study Team.

F.3 Review of Main Cocoa Pests

1. **Mirids or Capsids**. These sap-sucking bugs cause severe damage in many countries. Their eggs are buried in the epidermal layer of chupons, jorquette branches, pods and pod stalks and hatch in up to 17 days. Five successive nymphal stages follow before the winged adult appears. Where the insects have fed by sucking sap lesions are formed which turn black. Lesions in unhardened stems cause wilting and ultimately death. They also allow injurious fungi to enter. The extent of losses of pods due to myrids feeding varies from one country to another; losses from stem damage are serious everywhere.

2. **Shield Bugs**. *Bathycoelia thalassina* is a large green bug that attacks cocoa between Zaire and Côte d'Ivoire. While their eggs are laid mainly on leaves, less often on stems, they feed mainly on pods, which inhibits development of beans and makes pods abort. Resistance to organochlorine pesticides has reduced their effectiveness in controlling shield bugs. Control can be achieved by following an application of lindane of an application of thiodan, inden or basudine 28 days later.

3. **Leaf Hoppers**. *Empoasca devastans* in Sri Lanka, Affroccidens spp. Ghana and Chinaia rubescens in Costa Rica cause leaf-hopper burn: distortion and premature fall of leaves. In South and Central America, Horiola picta attacks cushions, pods and stems and may be cause pods to wilt. These species are more active in unshaded cocoa. Fenitrothion or formothion will control them.

4. **Psyllids**. *Tyora (or Mesahomatoma) tessmanni* is important in Africa from the Congo to Sierra Leone. These small insects lay eggs in vegetative buds, young leaves, flowers and young fruit and form fluffy white colonies on young stems and flower cushions. Buds may die and flowers and fruit atrophy (Kaufmann, 1975). These insects may take part in pollinating cocoa.

5. **Aphids**. *Toxoptera aurantii* is the most important species, causing leaves to crinkle and fall and flowers to wilt. Scale insects within the genus *Asterolecanum* are known throughout the tropics. They are minor pests on cocoa; their main importance is that they produce stem swellings, which can be confused with swellings caused by cocoa swollen-shoot virus. *Asterolecanum spp*. swellings can be recognized by dimpling, known as the 'pit-and-gall' syndrome. *Stictococcus spp*. infest pods heavily and damage them. They are confined to Africa. Over 40 species of mealybug, within the superfamily *Coccoidea*, infest cocoa. Species within the genus *Pseudococcidae* are the only carriers of the cocoa swollen-shoot virus and are therefore of great importance. *Planococcus citri* is found in all cocoa areas. *P.dilacimus* is found from Sri Lanka to Papua New Guinea. *P. njalensis* is the major carrier of swollen-shoot virus and is distributed throughout West Africa, where *Planococcus hargreavesii* and *Planococcus kenyae* are also found. Ferrisiana (Ferrisia) virgata is of minor importance throughout the tropics. Adult females and eggs of some species are covered in powdered white wax. Scale insects and mealybugs are usually attended by ants of a variety of species, which often construct tents over these insects.

Control is difficult because of the covering of wax and the water-repellent skin. Biological control has had no effect so far. Control of ants by insecticides reduced numbers significantly, with some reduction of disease, but allowed other pest insects to multiply. Systemic pesticides reduced the incidence of disease for a short period only; this was not economic. Removal of alternative virus hosts, particularly *Cola chlamydantha*, *Cola gigantea*, *Ceiba pentandra* (kapok), *Bombax buonopozense* and *Sterculia tragacantha*, helps to minimize the incidence of diseases. For a fuller discussion, with references, see Willson, K.C. 1999, Coffee, Cocoa and Tea. CABI Publishing

6. **Thrips**. The species most frequently found on cocoa is *Selenothrips rubrocinctus*, the cocoa or red-banded thrips. This is a small insect, pale yellow with a red band when young and black when mature. Leaves become silvered following sap-sucking. Eggs are laid on the underside of the leaves. The nymphs drop fluid on the leaves, which forms brown spots. These spots on dry or silvered leaves are characteristic of thrips.

7. **Ring Bark Borers**. *Endoclyta (or Phassus) hosei* and *Phassus sericeus (or damur)* destroy the bark in a ring around the stem. The ring is covered by woven silk and bark; the larvae leave by a tunnel through the stem. Attacks are usually on trees between 6 months and 3 years old. Control is helped by removal of *Trema cannabina*, which is the main host plant. This grows profusely after land clearance. The main control is by injecting dieldrin emulsion, where permitted, into holes and sealing with earth. This must be done regularly, following an inspection of trees, at monthly intervals.

8. **Stem Borers**. *Zeuzera coffeae* is a pest in Sri Lanka, Malaysia, Java and Papua New Guinea. *Zeuzera roricyanea* is present in Sabah. Larvae tunnel along slender stems for up to 30cm and then make a transverse tunnel before pupating to become the adult leopard moth. Young seedlings can be killed; affected branches on larger trees often break off. Control is mainly by removal of affected branches. Clearance of undergrowth and vegetation between forest and plantation reduces the risk of infestation. Systemic insecticides are sometimes effective

9. **Cocoa Moth (Cocoa Pod Borer).** *Conopomorphs (Acrocercops) crameralla* is a small moth which does much damage to pods in Malaysia, Indonesia and the Philippines. It also occurs in Papua New Guinea. This is the most destructive pest in this region. Eggs are laid in the epidermis of pods, usually in furrows. The larvae go through the husk and bore around the beans for 15-18 days before leaving to form a cocoon. Damage cannot be seen until the pod is opened and found to be full of frass; the beans are useless. Alternative host species must be kept away from cocoa, i.e. *Nephelium* spp. (rambutan, litchi, pulasan), *Cola spp*. and *Cynometra cauliflora*. The main control system is to remove all pods from a plantation at the end of a main crop period and to destroy them. Protection of pods by sealing in polythene bags is effective. A variety of chemical insecticides have been found to reduce pod-borer infestations significantly.

10. **Bollworm**. The spiny bollworm of cotton, *Earias biplaga* attack cocoa from Côte d'Ivoire to the Congo. It mainly attacks unshaded plants up to 3 years old. It is therefore a greater problem on cocoa planted on clear-felled land, particularly when the early shade is inadequate. Early removal of temporary shade has been followed by

severe infestations. Young larvae feed on apical buds and older ones on leaves. Continuous disbudding can therefore occur, inhibiting the formation of tress with the desired shape and a good canopy.

11. **Leaf-cutting ants**. *Atta cephalotes* is the most important species . These ants occur very frequently, up to 150 nests ha^{-1}. Control is therefore a major problem and expense, and is achieved by injecting BHC dust into the nests.

12. **Chafer Beetles**. *Apogonia, Anomala* and *Chactodoretus* species feed mainly on roots but also damage soft leaves and flowers. *Camenta obesa* feeds on the main roots of cocoa. Young trees (up to 2 years old) can be killed by one or two larvae. They can be controlled by pouring coaltar derivatives or BHC into holes directed towards the top roots or by granular systemic insecticide, e.g. phorate, on the ground around the collar.

13. **Cocoa Beetle.** Eggs are laid in holes in the bark. The larvae bore a chamber in the cambium and bark. From the chamber a tunnel is bored in a spiral, which often rings the stem so that it dies. A pupal chamber is then bored in the heartwood, weakening the stem. A gummy, gelatinous exudate appears around holes through the bark made by larvae. Trees from 6 months to 5 years are attacked. The intensity of attack increases as the amount of shade is reduced.

14. **Weevil borers**. At least six species of the genus *Pantorhytes* attack on cocoa. Adults feed on young leaves, the veins of old leaves, on the bark of shoots up to six months old and the husk o pods where they leave oval scars.

15. **Cocoa Husk Borer**. The caterpillar of *Cryptophlebia encarpa* feeds on the cocoa husk, this stage lasting 13 – 15 days. Pupation occurs in the tunnel made by the caterpillar. An untidy cocoon covered in frass material is made prior to pupation. Although the insect attacks only the husk, in cases where large numbers of caterpillars are found in the husk, they will bore through the husk and cause heavy losses in yield of cocoa beans, In addition, young fruits will drop if attacked. Little is known of the ecology of this insect

16. **Nematodes**. *Meloidogyne spp.* are widespread in cocoa. They cause stunting of young plants, with yellowing and browning of leaves, which fall before the plant dies. Leaves on trees in the field dry up in a similar manner and stems die back. New stems may grow from the roots in the growing season but the whole plant will die eventually. The main weapon against these pests is to keep nurseries and fields clear of them. Nursery soil should be sterilized before use.

17. **Termites**. These do not normally attack healthy trees. Occasional attacks following damage or drought stress can cause severe damage. They can be troublesome in nurseries; incorporation of an insecticide in potting soil will protect the young plants.

18. **Vertebrates**. A wide range of small and large mammals are attracted primarily by cocoa pods. Some birds also attack pods. Clearance of a strip of land between the cocoa and forest can minimize attacks. Smaller animals can be attracted and killed by poisoned baits. Some loss is inevitable. Warren and Emamome (1993) reported attempts to control the neotropical red squirrel, which prefers to attack ripe pods.

F.4 Review of Main Cocoa Diseases

1. **Cocoa Necrosis Virus**. This has been found in Nigeria and Ghana. It is no transmitted by mealybugs. Distinctive leaf symptoms appear, consisting of translucent distorted patches along veins. Shoots wilt and die back but usually recover. This virus has killed seedlings.

2. **Cocoa Mottle-leaf Virus**. Also found in Nigeria and Ghana, this disease produces a red mottle on flush leaves. Translucent veins and bands develop on leaves.

3. **Black Pod Disease**. This is caused by the fungi *Phytophthora palmivora, P. megakarya, P. capsici* and related species, which are present in all growing areas, although one of the three is more active than the other two in any specific situation. The incidence of the diseases varies greatly from one region to another. *P. megakarya* is present in some African countries, not in Asia, causes a particularly severe form of the disease.
   The fungus infects flower cushions, shoots, leaves, seedlings and roots. On some varieties, cankers are also farmed. Root infection is an important part of the annual cycle of the fungus. Ground cover preventing spores reaching the soil (cover crop, mulch) could help to disrupt the normal cycle of the disease. The disease spreads more quickly in conditions of high humidity. Careful pruning and reduction of shade will minimize the spread of the disease.

4. **Cushion Gall Disease**. This disease is rarely of great severity. It is caused by the fungus *Fusarium rigidiuscula.* Galls of varying types are formed on the infected flower cushions. Trees do not suffer greatly but their yield is reduced, probably because infected cushions cannot produce pods. Control methods consisted at one time of removal of gall-bearing trees. A systemic fungicide is now recommended. Seed from gall-bearing trees should not be used for propagation.

5. **Mealy Pod Disease**. Caused by a fungus allied to *P.palmivora*, this disease does not cause great loss. Entry of the fungus to pods may be restricted to wounds. Infected pods look very similar to those with black rot. Frequent and regular harvesting, along with minimizing wounds to pods (often mainly caused by animals), should prevent heavy losses.

6. **Ceratostomella Wilt**. The fungus *Ceratocystic fimbriata* enters the trees though damage caused by implements or through holes bored by beetles.
   Whole or part of the trees wilts and the part affected will die rapidly. Mature leaves droop from their normal horizontal position. These leaves remain in position on the dead stem. Insect tunnels are always found in wilted stems. The wood surrounding the wound is always discoloured.

7. **Vascular Streak Dieback**. The fungus *Oncobasidium theobromae* was identified as causing a major problem in many countries in Asia. Attacks are most severe in high rainfall areas. Amelonado cocoa is more susceptible than Amazon types. The disease spreads as spores arising from diseased branches. Thise are released at night under

particular climatic conditions and moved by wind. Sunlight kills spores. Dispersal is limited by high humidity and lack of wind.

8. **Sudden-death Disease**. This disease, known also as *Verticillium* wilt, is caused by the fungus *Verticillium dahliae*. It occurs in all countries. Leaves wilt suddenly, drooping without loss of color. They dry off from tips and margins and start to roll up from the margins. Fine branches break off and leaves fall, leaving a bare stem. Trees can die within a week. Internally, petioles, stems and roots discolor, light brown becoming darker, usually in streaks. The disease is much less severe in cocoa under shade than in unshaded conditions. No chemical control has yet been found. Selection of resistant material may minimize the effects in the long terms. Pruning of diseased branches restricts the spread of the disease.

9. **Pink disease.** This is caused by the fungus *Corticium salmonicolor*, a fungus that affects many dicotyledonous crops. This disease does not cause much loss in most areas, but it is of greater importance in some Asian countries. Sporulation occurs at night and is most active in high humidity. Spores are distributed by wind and need moisture for germination. At a low level of shade, cocoa stems will be kept drier, so that conditions for germination of spores will be less favorable. On the other hand, there will be freer movement of air, so that spores will disperse over a larger area.

10. **Thread Blights**. *Marasmius scandens* produces white thread blight and *Marasmius equicruinus* horsehair blight. The first kills leaves, which become covered by white mycelial strands. The second produces black fungal threads throughout the canopy. These prevent leaf fall and inhibit the growth of new leaves. Removal of dead material minimizes further damage. Pruning to reduce humidity in the canopy and removal of infected wood can also help.

11. **Brown Root Diseases.** The fungus *Phellinus noxius* is widespread in West Africa and the Far East. Although usually of minor importance, it causes significant damage in Papua New Guinea. Leaves wilt rapidly on the diseased tree, followed quickly by death of the tree. Mycelia on the roots are golden before tree death but turn brown and hold a crust of soil around the roots. Roots and mycelia eventually turn black.

12. **White Root Disease**. This is caused by the fungus *Rigidoporus lignosus* which produces white color on the roots, which age to orange-red. Fruiting bodies form on the collar and have an orange- yellow upper surface and orange, red or brown lower surface.

13. **Collar Crack**. The casual fungus *Armillaria mellea* flourishes in wet conditions and is distributed throughout the world. Fruiting bodies, light brown, changing to yellow and then black, appear at the base of the tree. Mycelia invade the tree, causing the wood to split and making the collar crack for up to 2 m in length. The tree often falls over before it wilts.

G COSTS OF PRODUCTION AND REVENUES

G.1 Intercropping Model Cocoa-Coconut (600 trees cocoa and 100 trees coconut per ha)

Average Quantity and Average Value of Material Cost for Cocoa Production

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Material Cost Items Used						Average Value of Material Cost Items Used (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seedlings	Cay	5000	600						3.00					
NPK 16-16-26	Kg	20000				540	900	900				10.80	18.00	18.00
NPK 16-16-8	Kg	15000	120	240	360				1.80	3.60	5.40			
Foliar fertilizer	Kg	15000	10	10	15	15	15	15	0.15	0.15	0.23	0.23	0.23	0.23
Manure	Kg	500	6000	3000	3000	3000	3000	3000	3.00	1.50	1.50	1.50	1.50	1.50
Lime	Kg	1000	300	120	120	120	120	120	0.30	0.12	0.12	0.12	0.12	0.12
Pesticide	Lumpsum										0.15	0.50	0.60	0.60
Fungicide	Lumpsum											1.50	2.00	2.50
Irrigation	Kw	600	150	150	180	240	240	240	0.09	0.09	0.11	0.14	0.14	0.14
Total/ Overall									8.34	5.46	7.50	14.79	22.59	23.09

Average Quantity and Average Value of Labour Cost for Cocoa Production

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Labour Cost Items Used						Average Value of Labour Cost Items Used (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Hole digging	Person Day	55000	33						1.80					
Planting	Person Day	55000	15						0.83					
Watering	Person Day	40000	52	52	26	26	26	26	2.08	2.08	1.04	1.04	1.04	1.04
Pruning	Person Day	40000		2	3	3	3	3		0.08	0.12	0.12	0.12	0.12
Spraying pesticides	Person Day	60000	3	4	6	6	6	6	0.18	0.24	0.36	0.36	0.36	0.36
Applying fertilizer	Person Day	40000	3	3	3	3	3	3	0.12	0.12	0.12	0.12	0.12	0.12
Weeding	Person Day	40000	15	12	5				0.60	0.48	0.20			
Harvesting	Person Day	40000			7.20	14.40	16.50	18.90			0.29	0.58	0.66	0.76
Fermentation and drying	Person Day	55000			9	18	23	27			0.50	0.99	1.24	1.49
Total/ Overall			121	73	59	70	77	84	5.61	3.00	2.62	3.21	3.54	3.88

Average Quantity and Average Value of Material Cost for Coconut

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Material Cost Items Used						Average Value of Material Cost Items Used (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Potassium	Kg	15000	150	150	150	150	150	150	2.3	2.3	2.3	2.3	2.3	2.3
Urea	Kg	10000	80	80	80	80	80	80	0.8	0.8	0.8	0.8	0.8	0.8
Phosphate	Kg	5000	100	100	100	100	100	100	0.5	0.5	0.5	0.5	0.5	0.5
Total/ Overall									3.6	3.6	3.6	3.6	3.6	3.6

Average Quantity and Average Value of Labour Cost for Coconut

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Labour Cost Items Used						Average Value of Labour Cost Items Used (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Applying fertilizer	Person Day	50000	2	2	2	2	2	2	0.10	0.10	0.10	0.10	0.10	0.10
Harvesting	Person Day	50000	60	60	60	60	60	60	3.00	3.00	3.00	3.00	3.00	3.00
12. Total/ Overall			62	62	62	62	62	62	3.10	3.10	3.10	3.10	3.10	3.10

Average Quantity and Average Value of Infrastructure and Equipment Cost for Cocoa Production

Cost Items	Average Value of Infrastructure/ Equipment Cost Used (VND in Million)					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fermentation Boxes			1.5			
Equipment	3.0			3.0		
Spraying equipment	0.5					
Pump	2.5					
Drying equipment			1.0			
Total	6.0		2.5	3.0		

Average Quantity and Average Value of Expected Production of Cocoa and Coconut

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Expected Products						Average Value of Expected Products (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Cocoa beans	Kg	40000			600	1200	1500	1800			24.0	48.0	60.0	72.0
Coconut	Nuts	3000	8000	8000	8000	8000	8000	8000	24.0	24.0	24.0	24.0	24.0	24.0
Total/ Overall									24.0	24.0	48.0	72.0	84.0	96.0

G.2 Monoculture Model (1100 trees cocoa and 140 trees of Leucina Laeuca permanent shade)

Average Quantity and Average Value of Material Cost for Cocoa Monoculture

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Material Cost Items Used						Average Value of Material Cost Items Used (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Cocoa														
Seedlings	Cay	6000	1100						6.6					
NPK 16-16-26	Kg	20000				990	1650	1650				19.8	33.0	33.0
NPK 16-16-8	Kg	15000	220	440	660				3.3	6.6	9.9			
Foliar fertilizer	Kg	15000	10	10	15	15	15	15	0.2	0.2	0.2	0.2	0.2	0.2
Manure	Kg	500	11000	5500	5500	5500	5500	5500	5.5	2.8	2.8	2.8	2.8	2.8
Lime	Kg	1000	550	330	330	330	330	330	0.6	0.3	0.3	0.3	0.3	0.3
Pesticide	Litre	300000	0.50	0.50	1	1.50	2	2	0.2	0.2	0.3	0.5	0.6	0.6
Fungicide	Litre	300000	1.00	1.50	1.50	4	6	8	0.3	0.5	0.5	1.2	1.8	2.4
Herbicide	Litre	90000	10	10	10	5	3		0.9	0.9	0.9	0.5	0.3	
Irrigation	Kw	15000	30	40	60	80	80	80	0.5	0.6	0.9	1.2	1.2	1.2
Shading														
Seed crotalaria (temp shading)	Kg	60000	10						0.6					
Leucina Laeuca (permanent shading)	Seedlings	3000	140						0.4					
Rock phosphate	kg	5000	200						1.0					
Inorganic phosphate	Kg	10000	50						0.5					
Total/ Overall									20.4	11.9	15.8	26.4	40.2	40.5

Average Quantity and Average Value of Labour Cost for Cocoa Monoculture

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Labour Cost Items Used						Average Value of Labour Cost Items Used (VND in					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Cocoa														
Hole digging	Person Day	55000	60.00						3.3					
Planting and hole treatment	Person Day	55000	30.00						1.7					
Watering	Person Day	60000	8.00	8.00	8.00	12.00	12.00	12.00	0.5	0.5	0.5	0.7	0.7	0.7
Pruning	Person Day	60000		2.00	3.00	6.00	10.00	10.00		0.1	0.2	0.4	0.6	0.6
Sparying pesticide	Person Day	60000	3.00	3.00	6.00	9.00	12.00	12.00	0.2	0.2	0.4	0.5	0.7	0.7
Applying fertilizer	Person Day	60000	3.00	3.00	3.00	3.00	3.00	3.00	0.2	0.2	0.2	0.2	0.2	0.2
Weeding and applying herbicide	Person Day	60000	15.00	12.00	5.00	3.00	2.00		0.9	0.7	0.3	0.2	0.1	
Harvesting	Person Day	60000			8.45	19.01	21.30	27.72			0.5	1.1	1.3	1.7
Fermentation and drying	Person Day	60000			12.57	28.29	34.57	47.14			0.8	1.7	2.1	2.8
Shading														
Applying fertilizer	Person Day	60000	6.00						0.4					
Hole digging and planting	Person Day	60000	10.00						0.6					
Thinning shade trees	Person Day	60000	1.00	2.00	3.00	4.00	5.00	6.00	0.1	0.1	0.2	0.2	0.3	0.4
Total/ Overall			136.00	30.00	49.02	84.29	99.87	117.86	7.7	1.8	2.9	5.1	6.0	7.1

Average Quantity and Average Value of Infrastructure and Equipment Cos

Cost Items	Average Value of Infrastructure/ Equipment Cost Used					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fermentation Boxes			1.5			
Small equipment	3.0			3.0		
Spraying equipment (machine)	5.0					
Pump	2.5					
Drying equipment			1.0			
Total/Overall	10.5		2.5	3.0		

Average Quantity and Average Value of Expected Production of Cocoa

Cost Items	Unit	Unit Price (VND/ Unit)	Average Quantity of Expected Products						Average Value of Expected Products (VND in Million)					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Cocoa beans	Kg	40000			880	1980	2420	3300			35.2	79.2	96.8	132.0
Total/ Overall											35.2	79.2	96.8	132.0

H ALTERNATIVE CROPS

H.1 Basic Information on Alternative Crops

521. The analysis of profitability in other crops is motivated by the need of understanding what options to cocoa are available to farmers. Even though almost 20,000 farmers have already started to grow cocoa on about 10,000 ha and they seem to be encouraged by high prices and promotional activities carried out by projects, the fundamental economic feasibility of cocoa needs to be posed in relation to alternative economic opportunities that are offered.

522. The cocoa farmer practices survey has highlighted a number of alternative crops that farmers consider competitive to cocoa. The main competing crops include:

a. Export crops such as coffee, rubber, cashews, and pepper
b. Fruits such as durian, longan, pomelo, mango, and coconut

523. For each of these crops, the Study Team, with the help of the DARDs in different provinces, has identified representative farmers that are specialized in the production of the alternative crops. The purpose is to evaluate the profitability of alternative crops relatively to cocoa. The sample of crops is shown in **Table 192**.

Table 192 Alternative Crops Analyzed by the Study Team

Province	Sample	Coffee	Rubber	Pepper	Cashews	Mango	Pomelo	Coconut	Durian	Longan
Ben Tre	3							1	1	1
Dak Lak	1	1								
Binh Phuoc	2		1		1					
Ba Ria Vung Tau	1			1						
Total	9	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Source: ACI Field Survey, July 2008

524. Cultivated land by farmers engaged in these crops varies from as little as 0.3 ha (longan) to 5 ha (cashews). All the farmers interviewed are smallholders with a maximum total cultivated land of 5 hectares.

Table 193 Information on cultivated land

Province	Crop	Total Cultivated Land (ha)	Own Cultivated Land (ha)	Rented Cultivated Land (ha)	Main Crop Cultivated Area (ha)	Other Crops Cultivated Area(ha)
Dak Lak	Coffee	1.6	0.84	0.76	0.8	0.8
Binh Phuoc	Rubber	3	3	0	1	2
Binh Phuoc	Cashews	5	5	0	5	0
Ba Ria Vung Tau	Pepper	1.2	1.2	0	0.7	0.5
Ben Tre	Durian	1.5	1.5	0	1	0.5
Tien Giang	Pomelo	0.7	0.7	0	0.4	0.3
Ben Tre	Longan	1.5	1.5	0	0.3	1.2
Tien Giang	Mango	0.5	0.5	0	0.45	0.05
Ben Tre	Coconut	1.2	1.2	0	1.2	0

Source: ACI Field Survey, July 2008

525. Data on production and unit prices of sales are reported in Table 194.

Table 194 Information on production and prices of alternative crops for the most recent year 2007/2008

Province	Crop	Unit of Production	Total Production	Productivity (unit/ha)	Unit price of sales (VND/Unit)	Value of sales (VND Million)
Dak Lak	Coffee	Tonnes	2	2.5	36900	74
Binh Phuoc	Rubber	Tonnes	9.75	9.8	15000	146
Binh Phuoc	Cashews	Tonnes	9	1.8	14000	126
Ba Ria Vung Tau	Pepper	Tonnes	1.5	2.1	46000	69
Ben Tre	Durian	Tonnes	20	20.0	12000	240
Tien Giang	Pomelo	Tonnes	5	12.5	5999	30
Ben Tre	Longan	Tonnes	2.9	9.7	4500	13
Tien Giang	Mango	Tonnes	7	46.7	30000	210
Ben Tre	Coconut	Number	7900	15.6	3500	28

Source: ACI Field Survey, July 2008

526. All the respondents have some degree of familiarity with cocoa and have pointed out the relative advantages and disadvantages. Among the various reasons for not considering cultivation of cocoa in the future, they indicate the following:

a. The province has a plan to promote the alternative crop
b. The farmers do not have sufficiently knowledge about cultivation techniques for cocoa
c. The farmers do not have land available
d. The farmers are not yet convinced that the benefits will be higher
e. The farmers do not know about demonstration models available for cocoa in their locality
f. The farmers do not have sufficient capital for investing in cocoa

g. The farmers do not have sufficient water
h. The farmers do not have suitably flat or moderately sloped land
i. The farmers are used to a certain crop and they do not want to change to a new crop

H.2 Analysis of Profitability of Alternative Crops

527. The only common feature indicated by the analysis of profitability of alternative crops (Table 195)could be summarized by saying that in all cases, the IRR are comfortably high ranging between 31% (for rubber, cashews, and longan) to more than 100% (in the case of mango hoa loc).

528. Once other indicators are considered, there is a considerably variation among various crops:

a. In terms of NPV (calculated over a 10-year period at a discount rate of 12% in real terms), some crops show modest net present value (eg cashews, longan, and coconut), while others prove to be exceptionally good investments with net present value in excess of 100 VND million per ha (eg rubber, pepper, durian, and the outperforming mango hoa loc).
b. In terms of breakeven point, most crops, with the exception of mango hoa loc take 4 to 7 years to recover the initial investment.
c. In terms of initial investment over the first 6 years of production, some crops require considerable investment (eg coffee, rubber, pepper, durian, pomelo, and mango), whereas other crops require a modest investment (eg cashews, coconut, and longan).
d. In terms of labor requirements, some crops need a lot of labor (eg coffee, rubber, pepper, durian, pomelo, longan), whereas others have more modest labor requirements (eg coconut and cashews).

Table 195 Profitability Analysis of Alternative Crops

	IRR (%)	10-year NPV @12% (VND million)	Breakeven point (year)	Total investment first 6 years (VND million)	Labor/ha at full production (person days/ha)
Coffee	38%	100.2	5	188.1	258
Rubber	31%	140.8	6	244.5	391
Cashew	31%	17.9	7	41.9	64
Pepper	85%	219.9	4	109.7	129
Durian	58%	280.5	7	137.7	255
Pomelo	34%	79.8	6	134.0	170
Longan	31%	30.4	4	70.0	175
Mango (hoa loc)	127%	430.5	3	101.4	132
Coconut	41%	26.7	6	15.9	53

Source: Analysis by the Study Team based on data from the ACI Field Survey, July 2008

529. Details about cash flow for each crop are provided in Table 197 to Table 205. In terms of revenue, costs, and margins for the steady state (in this case we take year 10), the results are reported in Table 195. Considerable cash is generated by crops such as rubber, durian, and mango, whereas more modest gains are made from cashew, longan, and coconut.

Table 196 Revenue, Cost, and Margin at year 10 for alternative crops

Crop	Revenue (VND mil)	Cost (VND mil)	Margin (VND mil)
Coffee	92.3	51.0	41.3
Rubber	157.5	38.5	119.0
Cashew	28.0	11.2	16.8
Pepper	95.0	18.8	76.2
Durian	240.0	36.0	204.0
Pomelo	72.0	29.1	42.9
Longan	40.0	15.9	24.1
Mango	240.0	27.0	213.0
Coconut	24.0	3.6	20.4

H.3 Market Analysis of Alternative Crops

530. For alternative crops including export crops (coffee, rubber, cashew, and pepper), Viet Nam is a major exporter for crops such as coffee, cashew, and pepper. While world prices for coffee are on a positive trend, cashew and pepper prices seem to be stagnant or declining. In the case of rubber, demand is strong and prices are also on a positive trend.

531. For fruit crops (longan, durian, mango, and pomelo), exports are only a negligible part of total production. Prices are highly unstable, given the perishable nature of the crops and the absence of well organized cold chains. Even though some of these crops are highly profitable (eg mango hoa loc), market risk is very high. The entry into profitable export markets is limited by food safety considerations. Recently some farmers in Viet Nam are seeking certification for durian and this might increase access to high-value markets.

Table 197 Cash Flow Analysis for Coffee

Coffee	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	7.4	73.8	92.3	92.3	92.3	92.3	92.3	92.3
Material and Labor Costs	37.8	15.3	18.5	44.6	32.0	33.7	50.9	34.5	34.5	50.9
Infrastructure and equipment costs	0.7	0.2	5.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total costs	38.4	15.5	23.6	44.7	32.1	33.8	51.0	34.6	34.6	51.0
Gross margins	-38.4	-15.5	-16.3	29.1	60.2	58.4	41.3	57.7	57.7	41.3
Cumulative sum of gross margins	-38.4	-53.9	-70.1	-41.0	19.2	77.6	118.9	176.6	234.3	275.6
Labor (person days/ha)	196.0	120.0	153.5	236.7	258.4	258.4	258.4	258.4	258.4	258.4

Table 198 Cash Flow Analysis for Rubber

Rubber	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	0.0	45.0	90.0	123.8	135.0	146.3	157.5	157.5
Material and Labor Costs	48.7	36.2	36.2	39.7	35.4	35.4	35.4	35.4	35.4	35.4
Infrastructure and equipment costs	1.8	0.0	0.0	3.1	4.9	3.1	3.1	3.1	4.9	3.1
Total costs	50.5	36.2	36.2	42.8	40.3	38.5	38.5	38.5	40.3	38.5
Gross margins	-50.5	-36.2	-36.2	2.2	49.7	85.3	96.5	107.8	117.2	119.0
Cumulative sum of gross margins	-50.5	-86.7	-123.0	-120.7	-71.0	14.2	110.8	218.5	335.7	454.7
Labor (person days/ha)	163.8	144.4	144.4	396.9	390.6	390.6	390.6	390.6	390.6	390.6

Table 199 Cash Flow Analysis for Cashews

Cashews	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	0.0	2.8	8.4	23.8	28.0	28.0	28.0	28.0
Material and Labor Costs	3.4	3.4	5.9	5.8	8.4	10.5	11.2	11.2	11.2	11.2
Infrastructure and equipment costs	0.5	0.0	0.0	0.0	4.0	0.0	0.3	0.0	0.0	0.0
Total costs	3.9	3.4	5.9	5.8	12.4	10.5	11.5	11.2	11.2	11.2
Gross margins	-3.9	-3.4	-5.9	-3.0	-4.0	13.3	16.5	16.8	16.8	16.8
Cumulative sum of gross margins	-3.9	-7.3	-13.2	-16.2	-20.2	-6.9	9.6	26.4	43.2	60.0
Labor (person days/ha)	40.0	33.0	43.0	25.0	58.0	61.0	64.0	64.0	64.0	64.0

Table 200 Cash Flow Analysis for Pepper

Pepper	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	38.0	76.0	95.0	95.0	95.0	95.0	95.0	95.0
Material and Labor Costs	16.2	18.6	16.1	18.8	18.1	18.8	18.1	18.8	18.1	18.8
Infrastructure and equipment costs	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total costs	19.2	18.6	16.1	18.8	18.1	18.8	18.1	18.8	18.1	18.8
Gross margins	-19.2	-18.6	21.9	57.2	76.9	76.2	76.9	76.2	76.9	76.2
Cumulative sum of gross margins	-19.2	-37.8	-16.0	41.2	118.1	194.3	271.2	347.3	424.2	500.4
Labor (person days/ha)	86.0	92.0	126.0	129.0	129.0	129.0	129.0	129.0	129.0	129.0

Table 201 Cash Flow Analysis for Durian

Durian	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	0.0	0.0	96.0	120.0	144.0	216.0	216.0	240.0
Material and Labor Costs	17.9	12.4	16.3	25.6	31.1	31.7	32.7	34.2	34.1	36.0
Infrastructure and equipment costs	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total costs	20.7	12.4	16.3	25.6	31.1	31.7	32.7	34.2	34.1	36.0
Gross margins	-20.7	-12.4	-16.3	-25.6	64.9	88.3	111.3	181.8	181.9	204.0
Cumulative sum of gross margins	-20.7	-33.1	-49.3	-74.9	-10.0	78.3	189.7	371.5	553.4	757.4
Labor (person days/ha)	140.0	77.0	87.0	113.0	193.0	205.0	215.0	245.0	245.0	255.0

Table 202 Cash Flow Analysis for Pomelo

Pomelo	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	18.0	21.6	72.0	72.0	72.0	72.0	72.0	72.0
Material and Labor Costs	32.8	14.0	15.0	20.1	21.6	21.8	23.9	25.5	26.2	27.4
Infrastructure and equipment costs	8.5	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	1.7
Total costs	41.3	14.0	15.0	20.1	21.8	21.8	23.9	25.5	26.4	29.1
Gross margins	-41.3	-14.0	3.0	1.5	50.2	50.2	48.1	46.5	45.6	42.9
Cumulative sum of gross margins	-41.3	-55.3	-52.3	-50.8	-0.6	49.6	97.7	144.2	189.8	232.7
Labor (person days/ha)	393.0	144.0	144.0	144.0	158.0	168.0	168.0	170.0	170.0	170.0

Table 203 Cash Flow Analysis for Longan

Longan	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	0.0	22.4	36.0	36.0	40.0	40.0	40.0	40.0
Material and Labor Costs	9.4	6.0	7.6	14.9	15.9	15.9	15.9	15.9	15.9	15.9
Infrastructure and equipment costs	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total costs	9.8	6.0	7.6	14.9	15.9	15.9	15.9	15.9	15.9	15.9
Gross margins	-9.8	-6.0	-7.6	7.5	20.1	20.1	24.1	24.1	24.1	24.1
Cumulative sum of gross margins	-9.8	-15.8	-23.4	-15.9	4.3	24.4	48.5	72.7	96.8	120.9
Labor (person days/ha)	130.0	90.0	90.0	155.0	175.0	175.0	175.0	175.0	175.0	175.0

Table 204 Cash Flow Analysis for Mango Hoa Loc

Mango Hoa Loc	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	36.0	72.0	120.0	180.0	180.0	192.0	192.0	240.0
Material and Labor Costs	6.1	4.1	6.7	22.8	23.5	25.1	25.7	26.2	26.6	27.0
Infrastructure and equipment costs	8.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total costs	14.1	9.1	6.7	22.8	23.5	25.1	25.7	26.2	26.6	27.0
Gross margins	-14.1	-9.1	29.3	49.2	96.5	154.9	154.3	165.8	165.4	213.0
Cumulative sum of gross margins	-14.1	-23.2	6.1	55.3	151.8	306.6	460.9	626.7	792.1	1005.2
Labor (person days/ha)	30.0	18.0	48.0	54.0	65.0	97.0	109.0	117.0	125.0	132.0

Table 205 Cash Flow Analysis for Coconut

Coconut	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected Revenue	0.0	0.0	0.0	0.0	0.0	19.4	19.8	21.0	22.5	24.0
Material and Labor Costs	3.8	1.1	1.7	1.7	2.5	3.0	3.0	3.2	3.5	3.6
Infrastructure and equipment costs	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total costs	5.8	1.1	1.7	1.7	2.5	3.0	3.0	3.2	3.5	3.6
Gross margins	-5.8	-1.1	-1.7	-1.7	-2.5	16.4	16.8	17.8	19.0	20.4
Cumulative sum of gross margins	-5.8	-7.0	-8.7	-10.3	-12.9	3.6	20.4	38.1	57.2	77.6
Labor (person days/ha)	22.0	17.0	13.5	13.5	14.5	53.0	53.0	53.0	53.0	53.0

I COCOA AGROFORESTRY SYSTEMS IN VIET NAM

I.1 Background on cocoa agro-forestry from review of literature

532. Agro-forestry is an agricultural approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock. It combines agriculture and forestry technologies to create more integrated, diverse, productive, profitable, healthy and sustainable land-use systems[39]. Farmers have practiced agro-forestry for years.

533. There is a wide range of proven impacts that agro-forestry can bring such as reducing poverty through increased production of agro-forestry products for home consumption and sale; contributing to food security by restoring farm soil fertility for food crops and production of fruits, nuts and edible oils; reducing deforestation and pressure on woodlands by providing fuel-wood grown on farms; increasing diversity of on-farm tree crops and tree cover to buffer farmers against the effects of global climate change, etc.[40]

534. In the world diverse cocoa agro-forests are grouped based on the following characteristics:

- multi-strata vegetation including primary and secondary forest species
- upwards of 50 tree species forming a closed canopy between 20 and 40 m high
- complex vegetation structure
- large leaf biomass
- high floristic diversity (Ruf and Zadi 1998, Beer et al. 1998, Siebert 2002)

535. In agro-forestry model, cocoa is intercropped with forest remnant species and a relatively high number of native timber trees. This cultivation model most closely resembles the ecological functioning of a secondary forest, particularly important in areas of widespread deforestation (Asare 2006-1). Although not a replacement for primary forest, diverse cocoa agro-forests are thought to be more environmentally preferable to other cocoa cultivation models as well as other agricultural activities in tropical forest regions (Asare 2006-1, Parrish et al. 1998).

536. Diverse cocoa agro-forests provide a diverse suite of services to the farmer – a mix of short and long-term harvestable crops - while maintaining critical ecological functions. The benefit to cocoa cultivation of shade or “neighbor” (Boa et al. 2000, Asare 2006-2) trees include shade to cocoa, soil fertility maintenance through nutrient recycling, protection against drought, fire damage, and insect and disease attacks.

[39] USDA National Agroforestry Center (NAC)
[40] http://www.worldagroforestry.org/treesandmarkets/inaforesta/agro_info.htm

Source: Somarriba (2006)

Figure 33 Agroforestry Systems in Central America

537. The environmental benefits include biodiversity conservation, habitat links with forest patches, temperature and rainfall regulation and carbon sequestration. The benefits to the farmer in addition to cocoa sales are gained through sales and home use of non-cocoa products such as timber, fruit, food crops, medicinal plants, and non-wood forest products (Asare 2005). Diverse shaded systems are found more often among small-scale, low resource farmers on sub-optimal sites (Beer et al. 1997).

I.2 Agro-forestry cocoa systems in Vietnam

538. Thousands hectares of degraded forest lands in Southern Annamites (Southern of Truong Son mountain chain) of Vietnam have been in the process of being allocated to poor farmers by local governments for (i) forest protection and enrichment; (ii) forest reforestation; and (iii) agricultural production (transferring land use purpose).

539. For the first purpose, the farmers normally receive a modest financial support from the government, which is a flat fee of 50,000 VND/ha/year/household under the Decision No. 661/QD-TTg dated 29 July 1998 on objective, responsibility, policy and organization for implementation of the project on 5 million ha reforestation, followed by the Decision No. 100/2007/QD-TTg. They are not allowed to carry out any activities on the allocated lands, but protect and enrich the forests. However this fee does not financially enable them to plant additional trees in the forest. The farmers' livelihoods are based on agricultural activities (i.e. cashew and rice cultivation) or collection of non timber forest products (NTFP). This degree

has been implemented on a nation-wide scale and also based on specific forestry situation of each province.

540. For the second purpose, poor farmers are supported with seedlings via a number of governmental programs for reforestation.

541. For the third purpose, transferring land use purpose implies land clearance; a traditionally used method is slash and burn, which brings negative impacts to the environment such as deforestation, soil erosion and degradation, etc.

542. This method is also widely applied for clearing forest land for agricultural production. This also leads to devastate natural species dependent on forest environment as well as their habitats.

Picture 1 Slash and burn practice and low yield cashew garden (Da The, Lam Dong)

543. Most of allocated degraded forest lands are sloping or far from water source. So far, cashews seems to be the most suitable tree for this type of land as it can tolerate drought and grow on hillside with a slope of even higher than 60 degrees. However, income gained from cashew production is not high due to low production yield. This is caused by applying backward cultivation practices and low investment. Mostly, farmers let cashew trees grow naturally tending to them only during the pollination period. Another reason of low production is seedling. In provinces such as Binh Phuoc and Lam Dong, thousands hectares of cashew gardens were planted with true seedlings of unidentified seeds which gave an average production of 0.7 tons/ha annually only. Many of them are reaching the end of production cycle and need to be replaced. Consequently, livelihoods of the poor farmers cannot be improved.

544. Therefore, the local governments are looking for a new high-economic valued crop that can be planted on these lands and could help to keep forest canopy and significantly improve livelihoods for the poor farmers. Agro-forestry cocoa can be a good option to address these issues.

545. In Vietnam, only a few cocoa agro-forestry systems were recently established for demonstration purpose. For most farmers, cocoa agro-forest is still a very new concept. Only very few of them want to intercrop cocoa with timber trees for economic purpose**.** During the field work in the present Study conducted between 14-23 July 2008 the following sites were visited:

5. Sustainable Cocoa Agro-forestry System in Binh Phuoc province;
6. Community – Sustainable Agro-forestry System in Lam Dong province;
7. Household forest area managed by Community Conservation Unit in Lam Dong province; and
8. Private enterprise Cocoa Agro-forestry system in Dong Nai province.

546. More detailed information will be provided in the following sections.

I.3 Sustainable Cocoa Agro-forestry System (SCAS) in Nghia Trung commune, Bu Dang district, Binh Phuoc province

547. SCAS is a project funded by Mars Incorporated and established in the area of 7 ha belonged to the Forest Science Sub-Institute of the South Vietnam's (FSSIV) management. It stated from June 2005 and cocoa was planted in November of the same year.

Picture 2 Nghia Trung SCAS site

548. The area used to be 100% of *Pseudoxytenanthera albo-ciliata sp* forest with only a few of *Dipterocarpus alatus*. Except for the forest trees left on the top of the hill for keeping rainy water, the whole area was totally cleared to set up a system consisting of 4 reservoirs, water sluice-ways, water dripping system, and a cocoa plot.

549. Cocoa is intercropped (by contour) with forest (*Leuceana glauca*, *Crotalaria sp, Aquilaria crassna*) and fruit (banana) trees in the area of 6 ha by different density (0, 25, 50, 75, and 100%) for experimental purpose. These trees however fail to provide shading for cocoa during the basic construction period as being established at the same time with cocoa.

550. The area suffers from drought and strong sun during dry season. Annual rainfall is less than in neighboring areas as expected. Soil type is basal characterized by grain composition, unable to keep water and lacks of proper humidity for cocoa. Although the irrigation system was perfectly designed, it could not be used yet as there is not enough rain water running to the reservoirs for functioning the dripping system. Currently water is pumped from streamline nearly to water tanks located on the site.

551. Besides, due to land clearance method of using digging machine to take off all roots of old trees on the land, after the first rainy seasons, sod was washed out. This caused lack of

nutrition for soil although it was applied with organic fertilizers. The lower soil layer is too hard for cocoa to root. Moreover, as being planted in newly cleared forest, cocoa was seriously attacked by termite, leading to using more pesticide for the site.

Picture 3 Bed and surroundings of the reservoirs were concreted but water is not enough for running the dripping system

552. The aforesaid disadvantages negatively impact growth of cocoa, especially lack of water and shading is the main reason leading to very low survival rate of cocoa trees. For several times, the site was planted with additional seedlings. Young trees currently are shaded by black plastic net. This situation could change in few years from now when the irrigation system would be functioned and the intercropped trees would provide shading for cocoa and help to improve soil quality. The model could also help with reforestation by replacing non economic valued bamboo forest by timber forest and cocoa

553. As mentioned above, this is supposed to be a perfectly designed agro-forestry model. If successful, it could be applicable to similar sites. As the big investment was paid for infrastructure, this model might not be financial feasible for farmers from small households. Key factors that directly impact the growing conditions of cocoa such as shading, water, soil humidity and type, etc. should be well considered in the site design and establishment.

I.4 Community – Sustainable Agro-forestry System in Phuoc Loc commune, Da Huoai district, Lam Dong province (C-SCAS)

554. In 2007 C-SCAS was established by partnership between WWF Vietnam, ACDI/VOCA, Touton, and FSSIV in collaboration with Da Huoai Agricultural and Rural Extension Office. It is a 40 hectare pilot site in Phuoc Loc with participation from 30 poor households of ethnic minorities. Livelihoods of the farmers are based on cashew production and collecting NTFP. This is aimed at (i) minimizing impacts of cocoa production towards biodiversity conservation, both at the site and landscape levels, (ii) improving the quality of degraded forest land, and (iii) improving the livelihoods of ethnic minority community who are participating in the project.

Picture 4 Panorama of C-SCAS site in Phuoc Loc

555. This is the first time that cocoa has been planted under existing forest canopy in Vietnam. If successful, the model will be replicated elsewhere in Lam Dong as well as other southern provinces where the process of allocating degraded forest land to poor farmers is taking place. In Lam Dong province, the newly approved provincial master plan for cocoa production indicates that in Da Huoai and Da Te'h districts alone, 320 ha of land are suitable for cocoa agro-forests as similar to Phuoc Loc site.

T

Picture 5 Cocoa site – before and after land clearance

556. The site used to be a degraded production forest collected from Da Huoai State Forest Enterprise to allocate to the poor ethnic minorities. Two main forest trees are *Dipterocarpus alatus* and *Hopea odorata* with an average density of 74 trees/ha and regenerated forest trees - 376 trees/ha. Biodiversity and environment survey and monitoring are taken place before and during the project implementation to evaluate the impacts of cocoa production on environment and biodiversity as well as put forwards immediate recommendations for its sustainability.

557. At the first survey, 94 vertebrate animals and 133 flora species were recorded. A number of them are listed as endangered species in the global and domestic scales or legally named in the list of prohibited species for exploitation and utilization for commercial purposes. The survey was followed by periodical monitoring works carried out by biodiversity consultants. It was observed that there is a positive impact of cocoa on soil composition thanks to increase of humus concentration, N, P_2O_5, K_2O and C/N. Main reasons are all of the leaves and branches of shrubs and ground cover vegetation cleared are allowed to decompose and the soil is complemented with humus and minerals. Also, inorganic substances were fertilized before planting cocoa, contributing to an increase of soil nutrition. In addition, the number of birds observed is tripled as cocoa area becomes stabilized and provides a safe and ideal shelter for the birds. It is observed that the flora specie composition has not changed.

558. Cocoa is intercropped with an average density of 600 trees/ha. Cocoa grows well under forest canopy and the survival rate is rather high (91%) after one year. There are small streamlines running inside the site. Besides, an irrigation system was just built to provide water for cocoa trees during dry season. Water is taken naturally via pipeline system from a streamline, which is 1 km far away. Although being planted in a forest environment with shading from 50-85% and high soil humidity, about 2,5% of cocoa could not survive after the first dry season due to drought. Common pest and diseases are found on the plot namely termite, *Endoclita hosei*, and *Corticium Salcomcolor* but those did not bring serious damages.

559. Thirty farmers are gathered in one cocoa club and trained by ToTs according to ACDI/VOCA training program. Every household signed a commitment with the Project Management Board to maintain wood trees on its lot. Thanks to project activities, farmers' awareness of forest protection had been significantly increased. The project also helps to change their perspective of traditional cultivation practices. The farmers were provided freely with production materials (seedlings, fertilizer and pesticides) for the first year.

Picture 6 On field bio-diversity lesson for ethnic farmers

560. Besides, relations amongst individuals and households have been significantly improved via training activities, where the farmers could discuss with each other their common concern – cocoa production. The farmers have shown their commitment to the project and are looking forward to its success.

I.5 Household forest area managed by Community Conservation Unit, Quoc Oai commune, Da Te'h district, Lam Dong province (HFA)

561. HFA was established by Winrock in 2007. This is a part of the Asian Regional Biodiversity Conservation Program implemented by the organization. The project local partners are Da Te'h Forest Protection Agency and Trong Duc Company.

Picture 7 HFA makes almost no change for forest status

562. The area is located in the buffer zone of Cat Tien National Park, one of the areas most rich in biodiversity of the country and home to endangered species such as Javan Rhino and Asian Elephant. This is degraded forest with high slope (above 45 degrees) allocated to poor local farmers with a flat fee of 50,000 VND/ha/year for forest maintenance and protection. Within this year, about 500 ha of this type are planned to be allocated to farmers. In order to support farmers to maintain and enrich the forest, at the same time to improve famers' livelihoods, the project introduced cocoa and other high value forest trees (*Dipterocarpus alatus*) to the sites.

Picture 8 CAFS site of Trong Duc Co. in Quoc Oai commune, Da Te'h

563. Cocoa was planted under forest canopy with an average density of 600 trees/ha on the area of 18 hectares. This number might increase by 30 ha this year. There are more farmers wanting to participate in the project but their land should be investigated as it meets the project requirements, i.e. access to the water source. The farmers were provided production materials (seedlings, fertilizer and pesticide) free for the first year.

564. Land is cleared by contours running from the foot hill to the top and reserves just enough area for cocoa trees to grow. This land clearance method has given minimum impacts towards forest status. Cocoa grows well in the forest environment with relatively high humidity. The farmers said they did not water cocoa during the last dry season. It is observed that cocoa trees at the lower contours do not grow as strong as the ones on the upper contours. It might be caused by the fact that the lower ones are covered by thicker canopy and do not receive enough sunlight for photosynthesis. Cocoa is also attacked by termite but no serious damage was recorded.

565. High slope of the land can make it difficult for the farmers to take care of cocoa trees, especially in the first years of the basic construction period. Furthermore, competition between forest trees' roots and cocoa trees for nutrition is an important factor that should be considered when applying a proper method for land clearance.

566. The farmers are gathered in cocoa clubs and trained by project technicians. Community Conservation Units were formed to guard forests.

567. If successful, this could be a good model to be replicated in degraded forest lands of the same type.

I.6 Cocoa Agro-forestry System in Thanh Son district Dong Nai province (CAFS)

568. Thanh Son district is located totally within the buffer zone of Cat Tien National Park. About 20,000 ha of production forest belong to a number of SFEs. About 22 years ago, the SFEs signed 50-years-contracts with local farmers to plant forest trees, including *Hopea odorata* and *Dipterocarpus alatus*. By the end of contacts, the farmers would get 60% of forest tree value and the State – 40%. The farmers can plan any agricultural crops on the land and get 100% benefit from them. Most of the land is planted with Mandarin, whose production this year seems to be very low due to a local disease outbreak.

Picture 9 Cocoa garden in Thanh Son with high density of forest trees

569. By the end of 2006, Trong Duc Company established the first CAFSs in an area of 20 ha. Cocoa trees grow very well, some of them start giving pods. Cocoa is intercropped by a density of 600 trees/ha. Water is pumping from drilled wells to dripping systems.

570. Many farmers in the area start being interested in cocoa that could bring a higher income to them and generate an additional livelihood; meanwhile forest canopy is still being kept. The farmers reside in the production area that makes it convenient for them to take care of cocoa gardens. They are also gathered in cocoa clubs and technically supported by Trong Duc.

571. Trong Duc (seedling supplier) and its partners (fertilizer and pesticides suppliers) provide production materials to the farmers via cocoa clubs. 50% of material value is paid by farmers when entering the contractual engagement with the companies and the rest will be paid by beans or husks when the trees start giving pods (normally after 3 years). No interest rate would be applied until the end of the contracts. It is expected that about 100 households would participate in this project of Trong Duc.

Picture 10 Cocoa without appropriate shading

572. This system could be replicated in the same type of forest as cocoa is a shade loving trees and can be intercropped with different crops. However, appropriate shading for cocoa is one of key elements deciding its growth. The forest with high density might not providing good condition for cocoa growth.

573. Although it is not clear yet about the status of those forest types after some 25 years in this area, this type of cocoa agro-forests, if successful, would bring high income for the local people, replace old and low – yield mandarin gardens, meanwhile give a better impacts to the environment compared to existing crops.

J ENVIRONMENTAL IMPACT OF COCOA PRODUCTION IN VIET NAM

J.1 General remarks on environmental impacts of cocoa production in the world

574. In the world, main environmental problems associated with cocoa production are habitat conservation, forest degradation, soil degradation and pollution from processing by-products. In addition, cocoa producers use a wide range of pesticides and agrochemicals that have impacts both on farms as well as off farm environment, i.e. downstream through the impacts of effluent contaminants on freshwater and marine organisms[41].

575. Cocoa has an important influence on biodiversity since the main production areas are in tropical rainforest regions. Given the value of these areas for the planet's ecological health, increased cocoa production is likely to have an environmental impact disproportionate to its area.[42] Most of the land that has been historically cleared for cocoa production is in what would be today be called biodiversity hotspots. These include areas in Brazil, Ecuador, Peru, Colombia, Ghana, and Côte d'Ivoire, where only small patches of original forest cover have been spared in the face of advancing cocoa production.

576. The environmental impact of cocoa will also depend on the type of production. Most cocoa is shade grown, but in recent years farmers have used more intensified cocoa cultivation methods, including monoculture plantations. More intensive production will be much more demanding on scarce water resources and bring fewer benefits in terms of biodiversity (or even adverse effects). Plantations will also require more chemical inputs and are more prone to erosion with accompanying pollution of water sources and human health concerns. Such cocoa trees are more prone to poor quality outputs and pest outbreaks.

577. According to Daniels (2006) the environmental impacts between full sun and shade cocoa can be summarized as follows:

[41] "World Agriculture and the Environment", 2003, Jason Clay

[42] "If nothing is done to prevent [expansion into new forests], cocoa cultivation can be expected to cause the deforestation of millions of hectares of tropical forests over the next twenty-five years" (Clay, p. 125). Also see *Commodities and Conservation: The Need for Greater Habitat Protection in the Tropics* (Conservation International, 2005).

Table 206 Environment impacts of full-sun versus shade cocoa

Environmental impacts	Full-sun cocoa	Shade cocoa
Nutrition cycling	Management of nutrition levels is dependent on fertilizers	More efficient and directly affected by shade management. Soil aeration and drainage capacity allowing for slow and consistent nutrition release increase.
Soil fertility and conservation		Soil is better conserved and erosion is less of a threat than in un-shaded systems depending on the amount of shade tree residues allowed to day on the farm to form a mulch layer.
Habitat functions		Diverse canopies provide important habitats, resources and niches for a variety of plants and animals, supporting, in some cases, support higher richness and abundance of migrant and resident bird species.
Hydrology and water quality	Have less hydrologic benefits than of shade cocoa.	Better at controlling sediment loads in local watersheds and water recharge systems
Climate change	Cocoa planted on already degraded land (planted in annual crop cycles or classified as savannah) will show a net gain in carbon and contribute to climate mitigation	Cocoa agro-forest contains 62% the carbon levels of primary forests in Cameroon. Greatest climate effect of shade cocoa is the effect on buffer-zone in providing farmers a profitable cash crop option that maintains shade around protected forests.

J.2 Findings on Environmental Impacts of Cocoa Production in Vietnam

578. Although first being introduced in Vietnam decades ago, the Vietnam's cocoa sector has actually been developed only since 2003-2004. Initially cocoa production penetrated into lands that used to be old and low yielding coffee gardens or by intercropping mostly with perennial trees on existing gardens. Currently two typical cultivation systems are found in Vietnam: intercropping/shade and monoculture/full-sun, where the first occupies 89%. Only a few agro-forestry models have been recently established and are at the experimental stage. The full-sun systems are found mostly in Dak Lak and Dak Nong where cocoa is planted on former coffee gardens with only a few windbreak and shading trees. The intercropping systems are relatively diversified, where cocoa is inter-planted with a wide range of other trees on existing gardens in all surveyed provinces. These trees could be short and long term agricultural, forestry, and industrial trees that provide shading and windbreak for cocoa trees. Different systems would require a different cultivation and management practices that bring different impacts toward environment and biodiversity conservation.

579. In the future, unless full-sun cocoa can be produced on existing or degraded agriculture area, it is likely that cocoa production will continue to expand into existing forests. In this case, expansion should be forbidden in protection and special-use forests. In case of production forests, this expansion should be encouraged in ways that will reduce its impact on biodiversity and ecosystem functions as well as ensure the financial viability of the industry over time. Land use planning and zoning should be undertaken in consideration of what is known about how cocoa can be best produced, over time, with better practices that have already been indentified by growers.

580. The last field survey taken in July 2008 by the Study Team in seven provinces (Tien Giang, Ba Ria-Vung Tau, Ben Tre, Dong Nai, Dak Nong, Dak Lak, Binh Phuoc) has shown a number of environmental impacts of cocoa production in these areas. Survey methodologies include intensive and integrated interviews with cocoa farmers and visiting their gardens.

581. Quantitative environmental impacts of cocoa production in Vietnam are not clearly measured as there have not been yet relevant studies conducted within this regard. All cocoa producing provinces and the surveyed ones in particular have neither environmental survey nor monitoring carried out for cocoa production in their territory. In general cocoa production and expansion plans/projects were developed without any environmental impact assessment (EIA). It is claimed no EIA should be taken since the cocoa areas are scattered by small households and not concentrated in a big area (each household has only 1-2 ha of cocoa). Therefore environmental analysis for the cocoa production in the surveyed area will only be qualitative.

582. Preliminary qualitative environmental impacts of cocoa production on farm level are recognizable as follows

J.2.1 Soil

583. The survey results show that cocoa can grow in different types of soils providing there is sufficient irrigation and shading systems. Four soil types found are alluvium (Tien Giang and Ben Tre), red (Binh Phuoc, Dong Nai, Ba Ria – Vung Tau, Ben Tre, Dak Nong and Dak Lak), black (Ba Ria – Vung Tau and Dak Nong), and sandy (Dak Lak). Out of those, red and alluvium soil types occupy the highest rates – 48,5% and 38.8%, respectively (para 401); while the rate of black soil is the lowest – only 4.9%. 63.1% farmers stated soil quality in their garden gets better thanks to cocoa production (section B.9).

Picture 11 Cocoa on sloping land in Binh Phuoc

584. Most of the cocoa gardens in Vietnam are situated on flat land (80%) and the remaining are on moderate slope (lower than 250). Examples from other cocoa production countries in the world show that cocoa can grow on even higher sloping land. Binh Phuoc could have a big potential of intercropping cocoa on a large area of hill-side and near-water-source cashew gardens. This province has 170,000 ha of cashew gardens; many of them are on the hill-side and steadily become old and unproductive as reaching by the end of production life. It is estimated by the provincial DARD that 7,000 of this land can immediately available for cocoa production. In this case, it is recommended that special techniques for sustainable agriculture cultivation on slopping land, such as SALT model, should be applied.

585. In intercropping system, from the third year onwards, when cocoa has reached the harvesting time, annually there will be a thick layer of fallen cocoa leaves, in addition to the ones from shading trees, on ground. These leaves will decompose and provide soil with considerable volume of humus as well as inorganic mineral substance such as K, Ca, Mg, and P. This helps to increase humidity as well as improve soil quality. Beside, multi-strata of different plants and vegetations in cocoa garden will help to prevent water evaporation, protect soil surface layer, and prevent soil erosion.

586. Moreover, in such a system, soil quality improvement also leads to increase production of intercropping trees and the farmers' income improves accordingly. For examples, in Tien Giang, coconut trees benefit from water and fertilizers applied to cocoa and their yield goes by 25-40%/year[43]. In Binh Phuoc, production of cashew intercropped with cocoa increased by 67% from 1.5 tons/year to 2.5 tons[44] Beside, it was reported that production of coffee[45], durian and pepper also get stable and even higher thanks to intercropping with cocoa.

587. In monoculture system, during the first years of basic construction period, when cocoa trees are still small and their canopy is not large enough, ground soil will be directly affected by rain and wind, leading to soil surface erosion. In case of hill-side particularly, soil can be eroded by gutters, easier becomes dry and degraded due to the fact that soil nutrition will be washed out by rain water. This significantly would give negative impact to cocoa growth (Tran Ngoc Hai et all, 2008)

J.2.2 Water

588. Studies show that cocoa grows best when rainfall is between 1,500 – 2,000 mm per year, but the range can extend somewhat either way under less than ideal conditions. The plant however cannot tolerate dry seasons with more than three months of less than 100 mm of rainfall per month, and cocoa is also sensitive to waterlogged soils. In short, the pattern of rainfall is more important than the total amount[46].

[43] Nguyen Thi Huu Hanh, "Impacts of cocoa production in Tien Giang", Success Alliance project –closing workshop, 2007
[44] Pham Thanh Huyen, "Successful model of cocoa intercropped with cashew in Bu Dang, Binh Phuoc", Success Alliance project – closing workshop, 2007
[45] Normally, coffee yield decreases due to light competition.
[46] Jason Clay, " World Agriculture and the Environment", WWF - 2003

589. Cocoa is not irrigated in most of producing countries such as Papa New Guinea, Malaysia, Indonesia, etc. due to the fact that rainfall is equally distributed all around the year in these countries.

590. Cocoa production provinces in Vietnam have separately rainy and dry seasons. Rainfall in the dry season is normally low and depends on different climate sub-region. During the basic construction stage, cocoa needs to be sufficiently irrigated in dry season, especially for areas that lacks of appropriate shading for cocoa. However, cocoa needs less water during the commercial stage since cocoa blossoms and pods mainly develop in rainy season. If cocoa is irrigated in dry season, production will be high and the tree will bear pods around the year (Pham Hong Duc Phuoc, 2004).

591. In Vietnam, there are some cases where cocoa is not irrigated either. For example, WASI's cocoa garden on a foot-hill in Dak Lak was not irrigated for four years and still gave production. A number of cocoa trees abandoned from the past in many provinces are also left unirrigatged. Cocoa still grows well and produces pods but its productivity is relatively low (pods are small and beans are small and flat with low butter content). This kind of cultivation practice appears not to be suitable and encouraged for cocoa production in Vietnam. For small households, it is essential to utilize the production capacity of this crop in order to bring higher income for the farmers from limited land area. For reaching this target, accessibility to water source is a crucial factor.

592. Beside, if not being sufficiently irrigated during dry season, cocoa will suffer from leaves falling and branches drying. When rain season comes, cocoa will produce more bud woods and flowers at the same time. This will cause nutrition competition between flowers and bud woods leading to flowers falling and low production yield[47].

593. Investment for one hectare of cocoa equals to only one third of that for coffee. Cocoa can grow in land with worse quality and needs less water in comparison to coffee[48]. Therefore suitable land for cocoa can be old and low yielding coffee land that needs to be replaced, assuming that this land is with water accessibility. As currently there are about 50% of coffee gardens in Dak Lak reaching the end of production cycle and some of them cannot be replanted with new coffee due to low land quality, cocoa could be a feasible option to improve these gardens.

[47] Pham Hong Duc Phuoc, "Main technical issues to be attended when expanding cocoa production area", 2007
[48] Phan Hung Cuong, Dak Lak DARD

Picture 12 Water was taken from Dong Nai river to irrigate cocoa garden in Binh Phuoc

594. In surveyed provinces, water used for cocoa gardens are taken from different sources, namely wells, river, cannel, and lakes. Around 17.5% of farmers interviewed stated that they do not have sufficient water for cocoa production in dry season (para 403). In Tien Giang 37.5% of the households claim water insufficiency, followed by Dong Nai (28.6%) and Binh Phuoc (26.3%). As aforesaid, the water insufficiency will lead to lower yield and eventually become a problem for cocoa production sustainability. This issue is urgently needed to be addressed. Furthermore, prior to cocoa cultivation, farmers should be fully aware of how important water and water accessibility are for their production.

595. 98.1% of the farmers reported that their lands are well drained (see para 405) and this is very important for cocoa production as this tree is not tolerant to water-logged and hardly-drained soil.

596. Most farmers stated that there is no change observed in surface and ground water in their gardens. In some cocoa gardens in Ben Tre and Tien Giang, water in cannels and drains is changed due to daily tide. Beside, the farmers have practice of dredging fallen leaves in water to cover trees' feet. Only one case in Ben Tre claimed that water in their garden turns to be black. This might be caused by organic decompose from branches, leaves or manure used for fertilizing cocoa trees. To tackle the issue, drains and cannels in cocoa gardens need to be dredged on a regular basis.

597. In Tien Giang and Ben Tre, it is reported that annually water get salty instructed between January and May and February and April, respectively. It is noticed that edge of leaves get bleached (burnt) and recovered in rainy season. If the affected trees properly watered, the impact would be suspended. However, if soil surface is covered with organic residues such as coconut, cocoa husk or cocoa leaves during the dry season, cocoa can stand without watering. When the rainy season comes, plant will produce new shoots again without any damage.

J.2.3 Air

598. Air and soil temperature in cocoa gardens, especially in the intercropping systems, are normally lower thanks to shade provided by large leaves and dense canopy of cocoa trees.

Large cocoa area also helps to regulate temperature climate. Nevertheless, cocoa production can cause air pollution, especially when post harvesting activities are not well managed

599. 30.1% of the farmers claimed that air environment gets worse (see para 421) due to bad smell from rotten husks left without treatment in their gardens. Such waste can be mosquito and fly breading grounds and can be responsible for the spread of diseases to humans as well.

Picture 13 Cocoa husk with and without eatment

600. This air pollution issue should be immediately solved by relevant parties as it could become an alarming problem and get worse due to cocoa expansion.

J.2.4 By-products of cocoa production

601. By-products in cocoa production include leaves, branches, husk, placenta, mucilage juice and containers of fertilizers and pesticides. It is estimated that for each metric ton of cocoa beans harvested, nearly ten metric tons of waste (husks, pulp, etc.) are created. Proper use and immediate treatment of by-products of cocoa production will not bring negative impacts to the environment, i.e. husk can be mixed with some other materials and used for making compost, leave and branches – to increase humus for soil, leaves – to feed raised animals, etc.

602. **Table 207** shows the number and percentage of households reporting use by products in surveyed provinces. Except for fertilizer and pesticide containers, the rates of farmers "doing nothing" with by-products are relatively high (from 33-86%) It is observed that farmers leave this waste in gardens and used as organic fertilizer or mulch without proper treatment. This practice will favour the propagation of witches'-broom and black pod rot.

Table 207 Number and percentage of households (HH) reporting use of by-products

By –product items	Bury		Burn		Nothing		Other		Total Reporting	
	HH - %		HH - %		HH - %		HH - %		HH - %	
Leaves	14	(13.6)	11	(10.7)	37	(35.9)	43	(41.8)	103	(100.0)
Branches	12	(12.8)	18	(19.2)	32	(34.0)	33	(35.1)	94	(91.3)
Husk	5	(8.3)	4	(6.7)	20	(33.3)	32	(53.3)	60	(58.3)
Placenta	3	(5.7)	3	(5.7)	29	(54.7)	18	(34.0)	53	(51.5)
Mucilage juice	1	(1.9)			45	(86.5)	6	(11.5)	52	(50.5)

Source: Field survey 2008, ACI

603. The cocoa husk comprises about three quarters of the cocoa pod and is high in potassium (K). In its fermented state, it is a useful nutrient supplement for animal feed. Due to its astringent quality, the cocoa husk is generally mixed with other food sources before feeding. Cocoa husks mixed with some other materials are used to make compost for fertilizing the gardens themselves.

604. Containers of pesticide and fertilizer or nylon bags used for seedlings will also cause environment pollution if not being buried or properly treated. 59.3% of the farmers have a good practice in burying and burning these containers (see Table 125). 68% said they use them for other purposes. Many farmers wash and utilize the plastic bags for chemical fertilizer to contain cocoa dry beans. This is absolutely not a good practice as remaining chemicals on the bag can give negative impacts to the quality of dry beans and eventually to people's health.

605. Thick layer of fallen leaves and branches from cocoa left on ground also help to prevent soil erosion. In case this layer and vegetation on the ground totally cleaned, there will be a higher risk of soil erosion due to surface water flow.

J.2.5 Use of fertilizers, pesticides, fungicides and herbicides

606. The survey results show that currently, the farmers use different types of production materials including organic/inorganic/micro-organism fertilizers, and inorganic fertilizers, pesticides and fungicides to control pests and diseases in their gardens. Number of the famers using chemical fertilizers is extremely high, occupying 99%. 81% and 55% of the households reported to use organic and micro-organic fertilizers, respectively (see Table 118). These practices should be further and strongly encouraged.

607. However, high-volume usage of chemical inputs, as a consequence of further expansion of cocoa production area in the future, could cause pollution for soil and water if not well managed. Particularly, usage of herbicide could not only cause pollution for soil but also make lost of species in the cocoa gardens, leading to decrease in biodiversity.

608. Beside the fact that number of cocoa trees on the monoculture system are higher than of intercropping (1,000/1,200 versus 500/600 trees/ha), farmers have to apply more fertilizers

and pesticides in full-sun system. This is explained by the fact that nutrition cycling is more efficient in shaded systems than in no-or low-shade cocoa farms as it is directly affected by the particular share or intercropped tree species and their management (Beer et al. 1998)

J.2.6 Fire flight and prevention

609. Due to big amount of leaves falling on ground during dry season starting from the third year, there is a risk that cocoa garden can be flammable if no fire flight and prevention methods to be applied. Two, out of 103 gardens, caught fire in the past. Information on specific damages was not reported. 15% farmers had received training in this fire fighting (see Table 138) and a number of them have applied these methods such as burying/burning fallen leaves and branches or digging drains in their gardens. This issue should be well attended especially for cocoa agro-forest systems.

J.2.7 Intercropping versus Monoculture

610. In the world, normally in comparison to intercropping, cocoa monocultures boast impressive yield data over the short terms, up to as much as three times the productivity per hectare of that of share cocoa (Chok 1998). However these yields are limited to 1) ideal soil and climactic conditions; 2) a short life cycle vis-à-vis shaded systems (10-20yrs vs. 50-60yrs); and 3) intensively managed plantations which are frequently replanted and pruned requiring inputs and labor (Beer et al. 1998).

611. The intercropping systems are found in 87.4% of surveyed cocoa farms. Cocoa is inter-planted with short and long term agricultural, forestry and industrial trees that also exercise shading and windbreak functions for cocoa trees. Although some full-sun cocoa gardens in Dak Lak have reached the commercial stage (>4 years) but the production (an average of 0.8 ton/ha) is quite lower in comparison to shade cocoa in Mekong Delta provinces. One of the main reasons is that those monoculture gardens were planted with un-known/un-certified hybrids. The farmers claimed that they have applied fertilizers and sprayed pesticides as recommended but the yields reached are much lower than expected and therefore do not encourage them to continue with cocoa but to replace with coffee.

612. Full sun systems are more vulnerable to damage of fires at large scale and diseases/ pest outbreak. Systems as such require a newly available land fund, while intercropping can take advantage of existing gardens, diversify crop mechanism, and increase income from one land unit. The large scale full sun production will accompany with converting crop mechanism for a large area. Finally, producers' economy will be seriously hit in case of price falling.

613. Tran Ngoc Hai et al (2008) highlight the following differences in term of environmental impacts between these two systems.

Table 208 Comparison in environmental impacts of shade and full sun cocoa in Vietnam

No	Comparing items	Shade cocoa	Full-sun
1	Shade level	>80%	50 – 70%
2	Biodiversity	**High** due to higher number of floral species and becoming habitat for more faunal species	**Low** due to single crop. Cannot be attractive to faunal species
3	Landscape and ecosystem functions	**Diversified** due to having ecosystem functions	Single floral stratum with **low** ecosystem functions
4	Habitat for other species	**Good**	**Not good**
5	Soil erosion prevention	**Good** due to shade and multi strata that help to prevent surface flow	**Low** due to single stratum, cannot prevent surface flow
6	Surface Run-off prevention	**Good** due to change of surface run-off to infiltration	**Lower** - prevents surface run-off to infiltration
7	Humidity maintenance	**Good**	**Low**
8	Temperature and climate regulation	**Good** – Increase humidity and reduce temperature	**Low** regulation
9	Nutrition competition	**High** due to multi species	**Low –** cannot take advantage of stand area
10	Soil nutrition recycling	**High** due to multi species and multi products	**Low** due to single species and few products
11	Production	**Medium** but harvesting period is longer	**High** but harvesting period is short
12	Products and Income	**Good** due to many by- products and products harvested from other crops	**Low** – only one product
13	Labor	**High and regular**	**Medium and professional**
14	Disease resistance	**Not clear**	**Not clear**
15	Cultivation practices	**Complicated**	**Simple**
16	Harvesting period	**Long** (40-60 years)	**Medium** (10-20 years)
17	Risk involved in case of bad harvest	**Low** – income gained from other products	**High** – no other products

J.2.8 Cocoa and Biodiversity

614. The following principles have been culled from the reviewed literature on a system of cocoa cultivation that conserves biodiversity.

1. Integrate biodiversity and productivity objectives in farm planning
2. Assess local knowledge and rural dynamics

3. Select and multiply quality cocoa and companion tree varieties
4. Maintain floristic and structural diversity in canopy and include native species
5. Maintain constant canopy cover for microclimate stability
6. Maintain diverse flora such as epiphytes, lianas, and vines that provide habitat niches
7. Increase domestication and marketing of non-wood forest products (NWFPs)
8. Develop and market by-products
9. Promote farm products for the biological and/or certified product market
10. Limit access of domesticated animals to agroforest
11. Connect cocoa agroforests and forest patches to create green corridors
12. Research carbon sequestration and conservation payments
13. Promote and maintain synergy and feedback among research and development projects in the agroforestry sector
14. Legally protect highly threatened natural resources near farming zones (Sonwa et al., n.d., Asare 2006-1, Beer et al. 2003)

615. Daniels (2006) highlighted other important principles as follows

1. Enhance the diversity of farms in forest buffer zones
2. Increase the productivity of biodiverse farms
3. Include biodiversity conservation in extension programs
4. Align research and farming priorities

616. The potential value of shade cocoa to conservation has been gaining considerable attention in recent years (Parrish et al. 1998, Greenberg 1997). However there is still a paucity of quantifiable data on the specific impacts of different models of cocoa production on various components of biodiversity conservation (Donald 2004, Greenberg et al. 2000).

617. It is clear that shaded diverse farms have a more biodiversity impacts than full-sun monocultures by maintaining more floral and faunal species on one area unit. This is especially true in case of diverse agro-forests if being well managed, otherwise cocoa development and expansion can bring negative impacts to biodiversity such as reduction of natural forest areas, change in landscape and ecosystem, disease/pest outbreak, etc. Using burning method in land clearance and garden cleaning, spraying chemical materials such as herbicides, fungicides and pesticides, as well as applying chemical fertilizers are also causes for biodiversity loss and reduction in cocoa gardens.

618. In Vietnam, except for the C-SCAS site, it seems there has not been any other biodiversity M&E system developed for evaluating impacts of cocoa production on biodiversity. The following part is to give preliminary findings of these impacts at different levels.

J.2.9 Landscape level

619. The landscape level impact of any cocoa system will depend on how the land was used prior to cocoa, the techniques used to convert the land to cocoa, the scale and cultivation practices of the cocoa farms, as well as the overall landscape of land uses. Some of the most important determinants of biodiversity value are the "intensity and history of land use, fire incidence, introduction of exotic species, and the structure of the vegetation" (Siebert 2002 as cited in Gascon et al. 2000).

620. Currently the cocoa production in Vietnam has not yet given considerable impacts on landscape level due to the facts that (i) the production scale is rather small, concentrating on small households with 1-2 ha/cocoa gardens; (ii) the cultivation area is not located in a large area, but scattered in districts of different southern provinces; (iii) cocoa is mostly intercropped with other trees on existing/converted agricultural lands.

621. However, development and expansion of intercropping and agro-forest systems at large scale would bring potential positive impacts at landscape due to preventing soil erosion and surface run-off; maintaining humidity for soil; enhancing nutrition and hydrological cycling; regulating temperature climate; diversifying crops etc.

622. These impacts will become more significant when shade cocoa is introduced at a relatively and concentrated scale on fallow/uncultivated and degraded lands. Cocoa cultivation can be a regeneration tool in areas where conditions are favorable. It is conceivable that cocoa could become an agent of reforestation rather than one of deforestation (Ruf and Zadi 1998) and to be used a tool, as a biodiversity corridor, to connect forests.

J.2.10 On - farm level

623. Siebert (2002) conducted comparative studies of different models of cocoa cultivation from full sun to diversified farms under dense shade. Results included levels of photosynthetic active radiation (PAR) 5-15 times greater and leaf area index (LAI) 6-9 times lower in full sun than in shade cocoa; air and soil temperatures were significantly lower under shade than in full sun systems, soil fertility and soil pH were greater also under shade than in full sun conditions.

624. This same study found that diversified shade farms contained an average of 25-30 different canopy tree species, several epiphytic and liana species, and forest herbaceous and fern species. The shaded farms had 100% ground cover, primarily leaf litter, while the sun cocoa had 80% ground cover consisting of mostly exotic weeds. The full sun had no epiphytes, lianas or forest floor species. Twenty two bird species (including several endemic species) were found in the shaded farms compared with no birds in the full sun farms (Siebert 2002).

625. In Vietnam cocoa intercropping systems, particularly agro-forests, have preliminary brought positive impacts on biodiversity at on-farm level as the systems enhance

diversification of different floral species per land area unit. The biodiversity levels on cocoa gardens much depends on cultivation practices, especially land clearance, garden cleaning and usage of chemical materials.

626. The following table shows a number of typical floral species found in the intercropping systems of the surveyed area. Intercropping trees play functions as permanent/temporary shadings and win-break for cocoa trees, especially in the basic construction stage.

Table 209 Typical floral species found in cocoa gardens in Vietnam

INTERCROPING SYSTEM	FLORAL SPECIES		PROVINCE
	Scientific name	***Common name in Vietnamese***	
Monoculture	*Cassia siamea,*	Muồng đen	Dak lak, Dak Nong
	Leucoena leucocephala	Keo dậu	
	Leucoena sp.	Keo dau An do	
	Gliricidia sepium	*Muong hoa dao*	
	Zea mays	Ngô	
	Vetiveria nemoralis	Cỏ Vetiver	
	Erythrina orientalis	Vông nem	
	Arachis hypogaea	Lạc	
	Glycine max)	Đậu tương	
	Prunus arborea	Xoan đào	
Cocoa - coconut	*Cocos nucifera*	Dừa	Ben Tre, Tien Giang
	Citrus aurantifolum	Chanh	
	Musa sp.	Chuối	
	Ananas comosus)	Dứa	
Cocoa - cashew	*Anacardium occidentale*	Điều	Bình Phước, Lâm Đồng
	Piper nigrum	Tiêu	
Cocoa – coffee	*Coffea* spp.	Cà phê	Dak lak, Dak Nong
	Ipomoea batatas	Khoai lang	
Cocoa – fruit trees	*Dimocarpus longan*	Nhãn	Ben Tre, Ba Ria – Vung Tau, Tien Giang,
	Nephelium lappaceum	Chôm chôm	
	Musa sp.	Chuối	
	Citrus × paradisi	Bưởi	
	Durio zibethinus	Sầu riêng	
	Mangifera indica	Xoài	
	Citrus aurantifolum	Chanh	
	Citrus sinensis	Cam	
	Artocarpus heterophylus	Mít	
Agro-forests*	*Dipterocarpus alatus*	Dầu rái	Lâm Đồng, Bình Phước
	Hopea odorata	Sao đen	
	Aquilaria crassna	Trầm hương	

Note: 150 floral species found in C-SCAS in Lam Dong

627. It is observed that cocoa gardens become habitats for many wild faunal species. Due to humidity and dense canopy maintained, cocoa gardens are homes for more insects in comparison to other agricultural lands. Amongst them, many are indentified pests for cocoa

trees and few are natural enemies for some of the pests themselves. There is also a number of birds and small mammals often found in cocoa gardens (Nguyen Manh Ha (2008).

Table 210 Typical faunal species found in cocoa gardens in Vietnam*

FAUNAL SPECIES	Scientific name	Common name in Vietnamese
Insects	*Helopeltis* spp	Bọ xít muỗi
	Zeuzera sp	Sâu hồng
	Adoretus sp., *Apogonia* spp.	Bọ cánh cứng hại lá
	Hypotactus, Paratactus, Cyphopus and Oribius	Câu cấu
	Toxoptera sp.	Rầy mềm
	Planococcus citri	Rệp sáp
	Prodenia litura	Sâu khoang
	Hyposidra talaca	Sâu đo xám
	Pagodiellia hekmeyeri	Sâu bao
	Cryptophlebia eucarpa	Sâu đục vỏ quả
	Endoclita hosei	Sâu đục vỏ thân và thân
	Termitidae	Mối
	Dolichodrus thoracicus	Kiến đen
	Decophylla smragdina	Kiến vàng
Birds	*Centropus sinensis*	Bìm bịp
	Copsychus saularis	Chích chòe
	Garrulax leucolophus	Khướu đầu trắng
	Orthotomus cuculatus	Chích bông đầu vàng
	Phylloscopus davisoni	Chích đuôi trắng
	Phylloscopus fuscatus	Chim Chích nâu
	Dicaeum chrysorrheum	Chim sâu bụng vạch
	Rhipidura aureola	Rẻ quạt mày trắng
	Dicaeum concolor	Chim sâu vàng lục
	Dicaeum cruentatum	Chim sâu lưng đỏ
	M. phillippinus	Trảu ngực nâu
	Dicrurus macrocercus	Chèo bẻo
	Streptopelia tranquebarica	Cu ngói
	Streptopelia chinensis	Cu gáy
	Passer montanus	Sẻ
	Tyto sp	*Tyto* sp. Cú lợn
	Hirundapus sp	Chim yến
	Alcedo atthis	Bồng chanh
	Merops orientalis	Trảu đầu hung
Reptiles	*Hemidactylus garnoti*	Thạch sùng đuôi dẹp
	Calotes versicolor	Nhông xanh
	Physignathus cocincinus	Rồng đất
	Mabuya longicaudata	Thằn lằn bóng đuôi dài
	Ptyas korros	Rắn ráo thường
Mammals	*Rattus* spp	chuột
	Tamiops spp., *Callosciurus* spp.	Sóc nhỏ
	Tupaia glis	Đồi
	Cynopterus brachyotis	Dơi chó tai ngắn
	Pipistrellus javanicus	Dơi muỗi Java
	Rattus flavipectus	Chuột nhà
	R. koratensis	Chuột rừng
Amphibian	*Bufo melanostictus*	Cóc nhà
	Rana guentheri	Chẫu
	Rana limnocharis	Ngoé
	Rana macrodactyla	Chàng hiu
	Rhacophorus leucomystax	Ếch câu
	Kaloula pulchra	Ếch ương
	Microhyla ornata	Nhái bầu vận

Note * 99 faunal species found in C-SCAS in Lam Dong (see annex 2 in section J.4)

628. The survey results show that there have been changes in species components and population of faunal species found in cocoa gardens at both basic construction and commercial stages due to cocoa production. A large number of farmers (see section B.9) report increase in the number of mammals (30.6% of farmers report this), birds (40 %%), and insects (63.4%). More squirrels eating cocoa pods are found and this considered as a negative impacts for cocoa production.

629. In C-SCAS site in Phuoc Loc alone, the number of bird population has significantly increased as the cocoa plot becomes for stable by time and even new species were found, out of which 42 species are listed as needed to be conserved/protected species by IUCN, Vietnam Red Book and Decree No. 32.

J.3 CDM and Cocoa

630. Within the context of the Kyoto Protocol managing carbon could be an additional potential income source for cocoa farmers.

631. Forty-year-old cocoa agro-forestry systems in Cameroon fix atmospheric carbon at levels of around 154 tonnes/ha. Systems from fifteen to twenty-five years old sequester 111-132 tonnes of carbon respectively. Although being lower than sequestration rates for primary forests (307 tonnes/ha), they are far greater than rates for annual crops, even those with associated fallows (Rice and Greenberg 2000) Depending on the price assigned to carbon, sequestration could supply significant income for producers and also an incentive for them to retain shade trees in their production areas and to reduce chemical inputs. Provided the carbon can continue to be stored, short term crop rotations tend to sequester more carbon per hectare per year (Clay 2003).

632. Global warming concern[50] has led to consideration of carbon trading under the framework of the Clean Development Mechanism of the Kyoto protocol including the possibility of land use changes that lead to higher net carbon stocks. Although there are serious issues yet to be resolved concerning verification and leakages, one of the first questions that need to be answered is what the potential gains from land use change are. The Alternatives to Slash and Burn program (ASB) - a system-wide effort of the Consultative Group on International Agricultural Research (CGIAR) - estimated carbon stocks in various land use systems in southern Cameroon including several shaded cocoa forests (Kotto-Same et al. 1997). From those measures, a C sequestration function measured in t C ha^{-1}, $f(x_t)$ was derived for cocoa agro-forests, where :

$$f(x_t) = 79.8 + 4.216\, x_t \qquad \text{for } 0 \le x_t \le 25$$

$$= 185.2 \qquad \text{for } 25 < x_t < T$$

633. x_t is the age of the perennial crop system, year 0 is the start of the cocoa production cycle and T is the terminal age of the plantation. Plantations older than 25 years were assumed to be in a steady state at 185 t C ha^{-1} (the steady state carbon stock of a forest in Cameroon was estimated at 307 t C ha^{-1}). Taking the integral of $f(x_t)$ and dividing by T results in an estimate of the time averaged carbon stock.

634. From the comparison of steady state C levels, one immediately deduces that conversion of forest land to shaded cocoa will result in a net loss of carbon to atmosphere. However conversion of either short fallow lands or savannah land, which have much lower stocks of carbon will likely result in a net sequestration of carbon and thereby contribute to climate mitigation. Utilizing discounting techniques to account for the long time horizons involved, we estimate the net discounted present value of the net C stocks accumulated. A

[50] Based on the paper "Preservation itself will be a source of income: Cocoa with Agri-Forestry combination in East Africa" from James Gockowski and et at http://www.worldcocoafoundation.org/info-center/pdf/NAS.pdf

change in land use from either short fallow or savannah grassland to shaded cocoa agro-forest will reduce the stock of atmospheric carbon. The time-averaged carbon stock of a rotational two year *Chromolaena odorata* fallow/one year cropping system is estimated by to be 84 t C. Using cocoa agro-forests as a tool to reforest degraded short fallow lands could sequester up to 95 t C ha^{-1} of atmospheric carbon (Table 1). The economic value of this carbon will depend on its price in carbon trading schemes, the social discount rate, the production cycle of the agro-forest, and the rate of sequestration over time. The time-averaged carbon in the cocoa agro-forest was calculated for each year over a 200-year period and the corresponding time-averaged carbon that would have existed if the land had remained in the 2-year fallow—1-year cropping system was subtracted to arrive at the net increment in time-average carbon per annum per hectare. This increment was then multiplied by the assumed price of carbon ($20 t^{-1}) and discounted to its present value. A social discount rate of 4% results in a discounted net present value of carbon ranging from $550 to $740 ha^{-1} (Table 1).

Table 211 Potential value of carbon sequestered in land conversion from short fallow cropping system to cocoa-fruit agro-forest

Mean carbon stock				
Production cycle	***Agro-forest***	***Short fallow crop system***	***Mean carbon sequestered***	***NPV of carbon sequestered***
(yr)	(t ha^{-1} yr^{-1})	(t ha^{-1} yr^{-1})	(t ha^{-1})	($ ha^{-1})
25	133	84	48	$549
30	141	84	57	$609
40	152	84	68	$674
200	179	84	95	$743

J.4 List of endangered faunal species in found at C-SCAS site in Lam Dong

TT	Common name in Vietnamese	Scientific name	Status of conservation/protection		
			Red book IUCN	Red book of VN	Decree 32
I	***Mammals***				
1	Tê tê Ja va	*Manis javanica*	LR/NT		IIB
2	Cu li nhỏ	*Nycticebus pygmaeus*	VU	V	IB
3	Khỉ mặt đỏ	*Macaca arctoides*	VU	V	IIB
4	Khỉ đuôi dài	*Macaca fascicularis*	VU	V	IIB
5	Rái cá	*Lutra sp.*	NT		IB
6	Cầy giông	*Viverra zibetha*			IIB
7	Cầy hương	*Viverricula indica*			IIB
8	Cheo cheo	*Tragulus javanicus*		V	IIB
9	Sóc bay lớn	*Petaurista petaurista*		R	IIB
10	Nhím bờm	*Hystrix brachyura*	VU		
II	***Birds***				
1	Diều hoa miến điện	*Spilornis cheela*			IIB
2	Vẹt ngực đỏ	*Psittacula alexandri*			IIB
3	Cú lợn	*Tyto alba*			IIB
4	Gõ kiến đầu đỏ	*Picus rabieri*	NT		
5	Chích choè lửa	*Copsychus malabaricus*			IIB
6	Khướu mỏ dài	*Jabouilleia danjoui*	NT		
7	Yểng	*Gracula religiosa*			IIB
III	***Reptiles***				
1	Tắc kè	*Euleptes europaea*	NT	V	
2	Ô rô vảy	*Acanthosaura lepidogaster*		T	
3	Rồng đất	*Physignathus concnicinus*		V	
4	Kỳ đà	*Vanarus sp.*		V	IIB
5	Rắn ráo thường	*Ptyas korros*		T	
6	Rắn cạp nia	*Bungarus bungaroides*			IIB
7	Rắn cạp nong	*Bungarus fasciatus*		T	IIB
8	Rắn hổ mang	*Naja siamesis*		T	
9	Cua đinh	*Amyda cartilaginea*	VU	V	
IV	***Amphibians***				
1	Cóc rừng	*Bufo galeatus*		V	
2	Chàng Andeson	*Rana andersoni*		T	

Source: Le Thien Duc, WWF, 2007

Note

IUCả 2007: CR: Critically Endangered; Eả : Endangered; VU: Vulnerable; ả T: ả ear threatened
LR: Low risk; LC: Least concern;

Vietnamese Redbook: E: Endangered; V: Vulnerable; R: Rare; T: Threatened

Decree 32/2006/ả D-CP: IB: Strictly prohibit from exploitation and use for commercial purpose;
IIB: Limit from exploitation and use for commercial purpose.

K TRAINING FACILITATORS AT SUCCESS ALLIANCE PROJECT

S/A designed and implemented a long- term training program for training facilitator (TF - Tập huấn viên) who managed and transferred technology to farmers in Cocoa Club.

At the beginning of their involvement with the project, TF attended a 11 - 12 day training course with title: " Training of Trainers (TOT)". The content of TOT includes some basic training skills, some topics related to cocoa farming practices, and other topics related to market, and project management.

After the initial training, every quarter the TF attended a 4 - 5 day in-service training course (IST) with aim to add more knowledge and skills in both training skills and cocoa farming practices and technology. The content of each IST included 3 - 4 topics to run 3-4 separately FFS and more training methodology and skills.

Topics of FFS that delivered to farmers sometimes differently in each province taking into account differences in natural conditions and issues in each provinces.

The following tables indicate the topics covered in the training courses to farmers and training facilitators.

Table 212 List of common topics of FFS delivered to farmers in Success Alliance Project from 2004 – 2007

	Topics
1	Seasonal Crop Calendars For Intercropping Cocoa
2	Establishment And Management Of Shade Crops For Intercropping Cocoa
3	Seedling selection and Planting Cocoa
4	Estimated Economic Returns for Intercropping Cocoa
5	Agro-Eco-System Analysis (AESA) For Immature Cocoa Tree
6	Agro-Eco-System Analysis (AESA) for Pod Bearing Cocoa Trees
7	Insect Pests of Cocoa, â atural Enermies and Integrated Pest Management (IPM)
8	Cocoa Diseases And Integrated Disease Management (IDM)
9	Safe And Effective Pesticides Use
10	Soil Health Management By Farmers For Sustainable Cocoa Production
11	Pruning For Immature Cocoa Trees
12	Pruning For Pod-Bearing Trees
13	Side Grafting For Rehabilitating Mature, Unproductive Cocoa Trees
14	Harvesting, Fermenting and Drying Cocoa Bean in Smallholder farm
15	Cocoa Bean Quality control

Table 213 Topics delivered to training facilitators in training of trainers course TOT) in 2005 in Success Alliance Project

	Topics of cocoa farming and technologies	Topics of training methods and skills	Other Topics
1	Introduction to cocoa tree Botany of cocoa tree	FFS principles: the 14 Do's & Don'ts of FFS Training	Introduce about Success Alliance Project
2	Criteria for seedling and how to select cocoa seedling	Basic training methods	Cocoa market: a time series analysis
3	Season Crop Calendar for intercroping cocoa	Presentation skills	Training Games: two –way communication; team buiding; agricultural extension case studies
4	Establishment and management of shade crops for intercroping cocoa	Introduce review and evaluation methods (Rich picture & A-Z recall	Estimate the economic return from planting cocoa
5	Cocoa planting	Questioning skills: making question	Gender: concept, women role in croping system and in cocoa farming system.
6	Pest and disease on cocoa in first period.	How to use training materials and tools	Transect analysis - Criteria of farmer selection for Cocoa Club
7	Fertilizing for young cocoa	Lesson plan of FFS : Overview and pratice to preparation a lesson plan	Interview skills to select farmers
8		Facilitate skills	How to set up a monthly and quarterly action plan

Table 214 Main topics dilivered to training facilitators in whole training program from 2004 – 2007 in S/A project

	Topics of cocoa farming practices and technologies	Topics of training methods and skills	Other Topics
1	Introduction to cocoa tree Botany of cocoa tree	FFS principles: the 14 Do's & Don'ts of FFS Training	Introduce about Success Alliance Project
2	Criteria for seedling and how to select cocoa seedling	Presentation skills	Cocoa market: a time series analysis
3	Season Crop Calendar for intercroping cocoa	Introduce review and evaluation methods (Rich picture & A-Z recall	Training Games: two –way communication; team buiding; agricultural extension case studies
4	Establishment and management of shade crops for intercroping cocoa	Questioning skills: making question	Estimate the economic return from planting cocoa
5	Cocoa planting	How to use training materials and tools	Gender: concept, women role in croping system and in cocoa farming system.
6	Pest and disease on cocoa in first period.	Lesson plan of FFS : Overview and pratice to preparation a lesson plan	Transect analysis - Criteria of farmer selection for Cocoa Club
7	Fertilizing for young cocoa	Facilitate skills	Interview skills to select farmers
8	Agro-Eco-System Analysis (AESA) For Immature Cocoa Tree	Basic training Methods	How to set up a monthly and quarterly action plan
9	Agro-Eco-System Analysis (AESA) for Pod Bearing Cocoa Trees	Using Appropriate Training Methods Effectively	
10	Insect Pests of Cocoa, â atural Enermies and Integrated Pest Management (IPM)	Lesson Plan Outline: how to prepare and use it effective	
11	Cocoa Diseases And Integrated Disease Management (IDM)	How to organize and conduct a Farmer Field Day	
12	Safe And Effective Pesticides Use	Questioning And Answering Skills	
13	Soil Health Management By Farmers For Sustainable Cocoa Production		
14	Pruning For Immature Cocoa Trees		
15	Pruning For Pod-Bearing Trees		
16	Side Grafting For Rehabilitating Mature, Unproductive Cocoa Trees		
17	Harvesting, Fermenting and Drying Cocoa Bean in Smallholder farm		
18	Cocoa Bean Quality control		

L ACTION PLAN OF THE PUBLIC PRIVATE PARTNERSHIP BETWEEN MARD AND LNV FOR SUSTAINABLE DEVELOPMENT OF COCOA SECTOR

1. Introduction

During the World Summit on Sustainable Development (WSSD) in Johannesburg, September 2002, a number of commitments were made by the international community. These commitments were described in the WSSD "Plan of Implementation" with the aim of meeting the Millennium Development Goals (MDG). In order to facilitate the implementation of this Plan a number of Partnership Initiatives were launched. These initiatives aim at enhancing the collaboration between public and private partners, civil society organizations and intergovernmental organizations in order to reach common objectives. These objectives ware directed to contribute to improving market access of Vietnamese cocoa, achieving sustainable development and poverty alleviation taken into consideration the aspects of social, economic, and ecological sustainability.

The Government of Viet å am and the å etherlands, the private sector and the å GOs have identified cocoa as a suitable and desirable agricultural commodity to extend the existing WSSD Partnership Market Access.

All parties agreed upon the delivery of an assessment concerning the opportunities and constraints related to the Vietnamese market chain for cocoa.

The cocoa initiative is consistent with the recently agreed Extended Work Programme between MARD and the Dutch Ministry of Agriculture, å ature, and Food Quality signed on the 25th September 2008 in The Hague.

2. Study on Suitability, Feasibility, and Socioeconomic Benefits of Cocoa Production in Viet Nam.

The Dutch Government supported the conduct of a study to assess the constraints and opportunities of the cocoa sector in Viet å am with the aim of formulating a strategy and road map for the sector. As a follow-up to the workshop held in Ha å oi on 21 September 2007, the Department of Crop Production of MARD recruited a team of consultants to conduct the study during the second part of 2008. In å ovember 6-7, 2008 the findings of the study were presented to an International Workshop held in HCMC.

3. Workshop on November 6-7 in HCMC

A stakeholder workshop to assess the findings and recommendations of the study was held on å ovember 6-7, 2008 in HCMC (International Cocoa Workshop on Public-Private Partnership for Sustainable Cocoa Development in Viet å am). The workshop was attended by representatives of the Vietnamese government both at the central and provincial level, the Dutch government, the private sector including international and local companies, å GOs, and research organizations.

The workshop participants assessed the report and expressed their appreciation for the analytical work, the main conclusions and recommendations.

4. Follow up Actions

It is acknowledged that the growth of the sector so far has been the outcome of the actions already undertaken by public and private sector (including å GOs). In addition to the Government of Viet å am at the central and provincial level, key contributions to the sector development have been made by Success Alliance (ACDI/VOCA), Mars, Cargill, WWF, and donors such as the Dutch Government and the US Government (USDA, USAID).

It is generally agreed that, in spite of rapid growth over the past 4 years, the cocoa sector in Viet å am is at its infancy and volumes of production are still low in relation to the potential of the sector. Addressing the core problem of low volume of production through a sustainable expansion of the sector will result in increased opportunity for income and employment generation in rural areas and environmental and biodiversity benefits.

It is generally agreed that there is an urgent need for the approval of a sector strategy if the rapid growth achieved over the past few years has to be continued and the sector take off from its current marginal significance to bring expanded benefits to smallholder farmers and the environment.

The workshop participants agree that all the follow up actions should be driven by the principles of economic, environmental, and social sustainability.

<u>General</u>

MARD will approve a strategy on cocoa development, formulate and approve plans, and identify investment funds. The Ministry of Agriculture, å ature, and Food Quality will contribute to this process by facilitating the mobilization of funds and engage into a dialogue for sustainable agricultural development with donors such as the World Bank, the Asian Development Bank, and the European Commission.

Specific

Market Access

- MARD will issue regulations about quality of beans and establish implementation mechanisms for quality assurance.
- The Ministry of Agriculture, ả ature, and Food Quality will facilitate the development of quality assurance systems for the cocoa sector in Viet ả am.
- Cargill will assist in establishing market access for Vietnamese cocoa.
- Mars and Cargill will assist in establishing a transparent market information system in Viet ả am.
- Mars and Cargill will assist in improving fermentation practices and promote the emergence of fermentation Micro, Small and Medium Enterprises (MSME).

Research and Development

- MARD will establish a long-term Cocoa Research Program including a Cocoa Research Center.
- MARD in coordination with Universities will identify recently graduated scientists and the Ministry of Agriculture, ả ature, and Food Quality together with Mars will provide additional training and opportunities for research experience in universities and laboratories outside of Viet ả am (eg Wageningen University and Research, Research Laboratories of Mars in ả L and US).
- Mars can facilitate the exchange between Viet ả am scientists and international scientists.
- WWF will explore opportunities for carbon crediting and payment environmental services in cocoa production.
- WWF will establish environmental criteria for identifying suitable areas for cocoa production.
- WWF will research environmental standards and guidelines for sustainable cocoa production.
- WWF will continue testing sustainable cocoa agroforestry system models, disseminate lessons learned, and evaluate for further replication.
- Helvetas will provide support to research on organic cocoa production.

Education and Training

- MARD will establish a new Cocoa ả ational Technology Transfer program, provide funds and authorize provincial extension centers to implement program activities.
- MARD will upscale and introduce new approaches to current activities implemented by the provincial extension centers.
- The Ministry of Agriculture, ả ature, and Food Quality will assist the Cocoa ả ational Technology Transfer program to be established by MARD.
- Cargill will continue to provide training and extension.
- Helvetas will provide training and extension in organic cocoa production
- Mars and Cargill will assist in training for the identification of food safety issues in cocoa.

Monitoring and Evaluation

- MARD in coordination with the Provincial Departments of Agriculture and Rural Development (DARDs) will establish a monitoring and evaluation system for cocoa.
- WWF will assist in developing the environmental and biodiversity measures as part of the monitoring and evaluation system of cocoa production.

Communication

- The Department of Crop Production will disseminate the conclusions of the study on *Suitability, Feasibility, and Socioeconomic Benefits of Cocoa Production in Viet Nam* and the workshop (*International Cocoa Workshop on Public-Private Partnership for Sustainable Cocoa Development in Viet Nam held in HCMC on November 6-7, 2008*) to the provinces and obtain feedback from the provinces.
- The Department of Crop Production will post and regularly update information on cocoa on the existing website of the department.

Institutional Setting

- Two Focal Points for the sustainable development of the cocoa sector will be established at the Department of Crop Production and at the Embassy of the å etherlands in Ha å oi.
- A Partnership Management Office in liaison with the Viet å am Cocoa Coordination Committee will be established at MARD to coordinate and monitor the progress of the agreed actions on partnerships and will report quarterly to all members of the Public Private Partnership between MARD and the Dutch Ministry of Agriculture, å ature, and Food Quality.

On behalf of MARD:

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Mr å guyen Tri å goc
Director General of Department of Crop Production

On behalf of Ministry of Agriculture, Nature, and Food Quality:

_____
Mr Leo Hagedoorn
Project Leader of Public Private Partnerships

HCMC, 7 å ovember 2008